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Course Descriptions

Accounting (ACCT)

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ACCT 1201. Financial Accounting and Reporting. 4 Hours.

Covers the basic concepts underlying financial statements and the accounting principles followed in the preparation of the balance sheet, the income statement, and the statement of cash flows. Offers students an opportunity to become familiar with accounting terminology and methods designed to enable them to interpret, analyze, and evaluate published corporate financial reports. Wherever appropriate, the course relates current economic, business, and global events to accounting issues. Analyzes how financial reporting concepts affect the behavior of investors, creditors, and other external users. Emphasizes the importance of ethics in financial reporting. Requires second-semester-freshman standing or above.

ACCT 1202. Financial Accounting in a Global Context. 4 Hours.

Covers the basic concepts underlying financial statements and the accounting principles followed in the preparation of the balance sheet, the income statement, statement of equity, and the statement of cash flows. Compares and contrasts the International Financial Reporting Standards (IFRS) used in other countries with generally accepted accounting principles (GAAP) currently used in the United States. Relates current economic, business, and global events to accounting issues. Emphasizes the importance of ethics in financial reporting. Offers students an opportunity to become familiar with accounting terminology and methods and to understand how the information conveyed in financial reports affects the decision making of investors, creditors, and managers.

ACCT 1209. Financial Accounting and Reporting. 4 Hours.

Does not count as credit for business majors. Counts as ACCT 1201 for business minors only. Requires second-semester-freshman standing or above.

ACCT 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ACCT 2301. Managerial Accounting. 4 Hours.

Focuses on the development and use of information—especially financial information—for managerial decisions within the firm. Introduces managerial accounting concepts, analyses, and practices that support business decisions through class discussions, exercises, and case analysis. Topics include budgeting, cost management and behavior, cost-volume-profit analysis, relevant costs for decision making, cost allocation issues, and performance evaluation. Emphasizes the importance of ethics.

ACCT 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ACCT 3304. Business Law and Professional Ethics. 4 Hours.

Covers business law, professional code of conduct, and the importance of ethical behavior in today's business environment. Examines legal aspects of commercial transactions and business relationships. Specifically, laws relating to contracts and sale of goods under the Uniform Commercial Code, agency law, and product liability law are discussed. May not be used as an accounting concentration elective.

ACCT 3401. Financial Reporting and Analysis 1. 4 Hours.

Examines financial reporting concepts, emphasizing the link between them and financial statements. Focuses on both the preparation and interpretation of financial statements, with students also being introduced to basic tools in financial statement analysis, such as ratio and accounting analysis. Gives students the opportunity to understand how management decisions can influence reported income, asset, and liability values, and the importance of ethics when making accounting choices. Offers students the tools necessary to analyze the impact of alternative reporting decisions on financial statements. In addition to accounting majors, this course is ideal for students who wish to pursue careers in corporate finance, investment banking, investment management, or consulting.

ACCT 3403. Advisory Services and Emerging Accounting Systems. 4 Hours.

Provides an understanding of accounting information systems, with an emphasis on the role of technology and risk analysis. Information is critical for the effective and efficient management of any organization. Addresses concepts and applications relating to the design, analysis, and implementation of accounting systems. Examines the role of e-commerce and Internet-based technologies, including their implications for ethics and privacy, throughout the course.

ACCT 3416. Strategic Cost Analysis for Decision Making. 4 Hours.

Develops understanding of the critical role of cost measurement and management in business decisions and in managing a firm's profitability. Focuses on the strategic use of cost information for planning and control, as well as costing products, services, and customers. Emphasizes the role of management accountants as integral members of decision-making teams and as consultants to senior management. Studies alternate ways of measuring costs to meet different management objectives, the role of budgeting as a planning and management tool, the use of cost analysis as a control tool to help management meet short- and long-term profit objectives, and the importance of ethics in achieving all of these objectives. In addition to accounting majors, this course is ideal for students who wish to pursue a career in finance, general management, operations management, supply chain management, or entrepreneurship.

ACCT 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ACCT 4412. Auditing and Other Assurance Services. 4 Hours.

Focuses on issues relevant to the public accounting profession and to internal auditors and managers in private or governmental organizations. Topics include legal liability and ethics, business and audit risk assessment, fraud detection and prevention procedures, planning of audit engagements, audit reports, other assurance services and reports, and the effect of information technology on the audit process. Offers students the opportunity to think critically about issues facing the auditing profession.

ACCT 4414. Income Tax Determination and Planning. 4 Hours.

Provides a basic understanding of the structure of the federal income tax system. Taxes can have a significant impact on the viability of a number of personal finance and business decisions. Focuses on the individual taxpayer but also considers the implications for other entities. Tax return projects, research cases, and planning projects help demonstrate the potential impact of taxes on decision making.

ACCT 4501. Financial Reporting and Analysis 2. 4 Hours.

Continues ACCT 3401 with a more extensive study of financial statements and the financial reporting rules underlying them. Advanced topics include bonds, pensions, leases, earnings per share, and earnings management. Introduces more advanced financial statement analysis tools. Offers students an opportunity to continue to gain the ethical awareness and the knowledge necessary to analyze the impact of alternative reporting decisions on financial statements.

ACCT 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ACCT 4993. Independent Study. 1-4 Hours.

Allows students who have received approval to undertake independent study in lieu of any course required in the various concentrations. Students present proposals to an Independent Studies Committee for evaluation and approval. Every proposal requires a detailed outline of the objectives and plan of study and must be accompanied by a supporting statement from the supervising faculty member under whose direction the study takes place. A copy of the final report prepared by the student is presented to the appropriate Independent Studies Committee. Further information about the Independent Studies Program can be obtained from concentration coordinators. May be repeated without limit.

ACCT 5230. Federal Tax Issues and Analysis. 3 Hours.

Gives a broad examination of tax authority as it guides action on tax issues including personal and business decisions. Examines the tax structure with a specific focus on the income and expenses for individual taxpayers. Emphasizes property transactions (including the calculation of basis, gain/loss, and the resulting tax treatment). Also incorporates tax planning and research related to these issues. Students who do not meet course prerequisites or restrictions may seek permission of instructor.

ACCT 5232. Estate and Gift Taxation. 3 Hours.

Focuses on the study of the taxes common to the transfer of property and wealth. Topics include gift tax deductions and exclusions, estate valuation, state tax deductions and exemptions, and tax rates. Also explores planning opportunities for these wealth transfer taxes. Students who do not meet course prerequisites or restrictions may seek permission of instructor.

ACCT 5255. Forensic Accounting. 3 Hours.

Offers an overview of occupational fraud and the methodology of fraud examination (i.e., obtaining documentary evidence, interviewing witnesses and potential suspects, writing investigative reports, testifying to findings, and forensic document examination). Offers students an opportunity to learn how to detect the most common types of occupational fraud, determining how each type of fraud is committed, and implementing prevention strategies. Students who do not meet course prerequisites or restrictions may seek permission of instructor.

ACCT 5256. Internal Auditing. 3 Hours.

Offers an overview of the internal audit function and explores the duties and responsibilities of the internal auditor. Offers students an opportunity to learn about the planning and organizing of an internal audit department and its coordination with an outside auditor as well as to learn to analyze how the design of an internal control auditing process can reduce risk exposure and enhance internal controls. Students who do not meet course prerequisites or restrictions may seek permission of instructor.

ACCT 5976. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on chosen topics. May be repeated without limit.

ACCT 6200. Financial Reporting and Managerial Decision Making 1. 3 Hours.

Offers the first of a two-course sequence that focuses on the acquisition, measurement, and management of firm resources. Business managers make strategic decisions about the acquisition and use of a variety of firm resources. Helps enable students to understand and utilize critical information in corporate financial reports to improve business decision making. Offers students the opportunity to learn contemporary methods of financial reporting and analysis used by internal decision makers and external capital providers. Required course for co-op MBA/part-time MBA.

ACCT 6201. Financial Reporting and Managerial Decision Making 2. 1.5 Hour.

Continues ACCT 6200, offering the second of a two-course sequence that focuses on the acquisition, measurement, and management of firm resources. Critical to the effective planning, implementation, and management of successful business strategies is the ability to measure and manage the commitment and utilization of entity resources. Focuses on contemporary methods and frameworks used in the process of measuring, analyzing, and allocating firm resources to achieve strategic and operating objectives. Required course for co-op MBA/part-time MBA.

ACCT 6203. Business Entity Taxation. 3 Hours.

Provides an in-depth look at the structure of the federal income tax system as it relates to different taxable entities. Emphasizes tax compliance, planning, and research as they impact the decision-making process for corporation and flow-through entities. Also examines the implications of wealth transfer taxes.

ACCT 6204. Financial Reporting for Integrated Multinational Enterprises. 3 Hours.

Presents and discusses financial reporting practices for diversified, international business entities. In today's global business environment, many corporations operate diverse economic activities and often conduct those activities across geographic boundaries. Examines accounting and disclosure standards in the United States that are relevant to presenting consolidated financial statements. Also analyzes accounting and disclosure standards in other countries and those developed by international bodies with respect to their effects on reporting entities and the financial markets.

ACCT 6205. Auditing in a Big Data Environment. 3 Hours.

Intended for students with a prior course in assurance services and/or auditing. Focuses on the coverage of current significant issues in the assurance services and big data environment. Topics include the impact of technology on the audit process, client risk assessment and statistical data analysis, other assurance services and nonattestation engagements, and the use of complex decision aids. Emphasis is also on contemporary ethical and legal issues confronting the public accounting profession. Offer students the opportunity to think critically about a number of significant issues facing the auditing profession and also introduces impact of big data, the audit judgment, and decision-making process through the completion of a variety of audit cases.

ACCT 6207. Contemporary and Emerging Issues in Financial Reporting. 3 Hours.

Focuses on the theoretical concepts of accounting with an examination of standards issued by various professional organizations including the FASB, SEC, and AICPA. Also examines emerging issues in corporate, governmental, and nonprofit financial reporting. Real-world cases are used to illustrate and discuss the complex financial reporting process and ethical issues confronted by the business community and accounting profession.

ACCT 6208. Financial Reporting and Managerial Decision Making. 4 Hours.

Offers students an opportunity to understand and utilize critical information in corporate financial reports to improve business decision making regarding the acquisition, measurement, and management of firm resources. Business managers make strategic decisions about acquiring and using a variety of resources. Effectively measuring and managing the acquisition and utilization of resources is critical to the implementation and management of successful business strategies. Teaches contemporary methods of financial reporting to external capital markets; analytic approaches used by external capital providers; and internal frameworks used to measure, analyze, and allocate firm resources to achieve strategic and operating objectives.

ACCT 6216. Financial Reporting for Governments and Nonprofit Entities. 2 Hours.

Covers business issues and financial reporting standards for state and local governments within the United States, as well as for nonprofit organizations. These organizations make up a large and growing share of the economy, and so it is important to consider whether the funds entrusted to them by taxpayers and donors are being used effectively. These entities have unique ways of reporting their financial results, based on their specific business purposes and the needs of their constituents. The course discusses these reporting methods and the use of the resulting financial reports in evaluating performance within the government and nonprofit contexts.

ACCT 6217. Corporate Governance, Ethics, and Financial Reporting. 3 Hours.

Deals with issues related to corporate governance and audit committee mechanisms in preventing financial reporting disasters and in providing high-quality financial reports to global capital markets. Emphasizes the role of the board of directors and its committees, management, shareholders, external auditors, and internal auditors in developing sound ethical practices and a good corporate governance culture. Examines efforts by legislative and regulatory bodies and the accounting profession in improving financial reporting transparency and auditor independence.

ACCT 6220. Corporate Financial Reporting and Decision Making 1. 3 Hours.

Examines the development of financial reports including their underlying concepts and measurement theories. Corporate financial reporting is a dynamic process in which information is provided to internal and external decision makers to assist them in the effective allocation of economic resources. Examines the legal, economic, and political processes that influence the financial reporting process.

ACCT 6221. Corporate Financial Reporting and Decision Making 2. 6 Hours.

Continues ACCT 6220. Examines corporate financial reporting in the decision-making process. Emphasis is on the economic consequences of alternative financial reporting practices. Provides students with the ability to understand and utilize critical information contained in corporate financial reports to improve business decision making.

ACCT 6222. Corporate and Governmental/Nonprofit Financial Reporting and Decision Making. 6 Hours.

Continues the study of corporate financial reporting, covering specialized topics that assume knowledge of the accounting principles covered in the first two courses. Topics include corporate reporting as equity instruments, executive compensation, reporting of fund flows, and reporting and disclosures for corporations engaged in diverse economic activities and those operating across geographic boundaries. Examines accounting and disclosure standards in the United States and in other countries, as well as standards developed by international bodies. Covers financial reporting models used by governmental and nonprofit entities.

ACCT 6223. Audit and Other Assurance Services. 6 Hours.

Introduces the attest function and its application to financial statement opinion audits and other assurance services common in today's professional environment. Emphasizes a risk-based approach to audit planning, the internal control structure, and the control environment; the design of test of controls, substantive tests, and the resultant audit report. Topics include audit sampling, audit evidence, audit procedures, workpaper preparation, the impact of information technology on the audit process, and the auditor's responsibility to detect fraud. A primary focus is the auditor's legal and ethical responsibilities. Emphasis is also on operational audits, compliance audits, reviews, compilation, and other attestation services.

ACCT 6224. Taxation of Individuals and Business Entities. 6 Hours.

Introduces the principles of taxation including income and expenses, tax accounting methods, and the tax implications of property transactions (including the calculation of basis as well as gains and losses). Emphasizes tax compliance, planning, and research as they impact the decision-making process for individuals, corporations, and flow-through entities.

ACCT 6226. Strategic Cost Management. 3 Hours.

Examines the strategic decisions that managers need to make concerning the acquisition, measurement, and management of firm resources. Focuses on the strategic use of cost information for planning and controlling, and the use of cost analysis in making critical business decisions.

ACCT 6227. Accounting for Business Combinations. 3 Hours.

Examines the conceptual and practical aspects of business combinations. Topics include mergers and acquisitions, purchase accounting, cost vs. equity method, and accounting for intercompany transactions between a parent company and its subsidiaries.

ACCT 6228. Contemporary Issues in Accounting Theory. 3 Hours.

Offers a capstone course on the theoretical concepts of accounting, with a focus on standards issued by various professional organizations including the FASB, SEC, and AICPA. Examines emerging issues in financial reporting. Real-world cases are utilized to illustrate the complex financial reporting issues confronted by the business community and accounting profession.

ACCT 6229. Accounting for Foreign Currency Transactions. 1 Hour.

Examines the accounting and reporting issues facing multinational enterprises operating in foreign countries. Business transactions that are denominated in foreign currency may result in risk for the entity as a result of fluctuations in exchange rates. This course evaluates risk management techniques by use of forward exchange contracts and other financial derivatives. Covers reporting issues dealing with the translation of foreign entities financial statements into U.S. dollars and appropriate remeasurement techniques.

ACCT 6231. Corporations and Shareholders. 3 Hours.

Provides an in-depth study of the tax issues related to the corporate form and the corresponding tax implications for its shareholders. Given the importance of corporations in the federal income tax system, an understanding of the tax issues related to this type of business is essential for tax professionals. Topics include capital formation and structure, the operations of the corporation, distributions, dividends and redemptions, sales and liquidations, and taxable and tax-free reorganizations.

ACCT 6233. Tax Research Methodology. 1.5 Hour.

Provides an opportunity for students to develop and enhance their tax research skills. Success as a tax professional often hinges on the ability to find solutions effectively and efficiently. In addition to covering the creation of various sources of tax authority, also introduces students to a variety of research resources. Students are required to complete written research reports.

ACCT 6234. Tax Practice, Procedure, and Ethics. 1.5 Hour.

Investigates the procedures used in dealing with the Internal Revenue Service, with an emphasis on practitioner responsibilities. Reviews the organization of the IRS, filing requirements, appeal procedures, civil/criminal statutes, assessments, and protests. Also examines a study of the value and moral judgments inherent in the field of taxation including client confidentiality, disclosure of false or misleading information, and advice counter to the law or public good.

ACCT 6235. Partners and Partnerships. 3 Hours.

Provides an in-depth study of the tax issues related to one of the central flow-through entities, the partnership. The increasing popularity of flow-through entities as an organizational form has made an understanding of the tax issues related to this type of entity an important area of study for tax professionals. Topics include capital formation, operations, transactions between the partner and the partnership, distributions, sales of partnership interests, and liquidation of the partnership.

ACCT 6239. State and Local Taxation. 3 Hours.

Addresses the most common types of taxes imposed by state and local governments. Examines state and local income, sales, excise, property, and city taxes. Emphasis is on the underlying principles governing the application of each type of tax and the interrelationships where they exist.

ACCT 6240. International Taxation: Inbound Transactions. 3 Hours.

Addresses the taxation of foreign individuals or corporations receiving income from sources, or conducting business, in the United States. With the globalization of the economy, a greater number of taxpayers must consider the impact of international taxation. Topics include the sourcing of income, taxation of passive income, taxation of income connected to a U.S. trade or business, branch-level taxes, issues of foreign-owned U.S. corporations, income tax treaties, and transfer pricing.

ACCT 6241. International Taxation: Outbound Transactions. 3 Hours.

Examines the federal taxation of U.S. individuals receiving income from sources or conducting business in foreign jurisdictions. An increase in the number of U.S. individuals and corporations operating in other countries has enhanced the importance of an understanding of international transactions for tax professionals. Examines sourcing of income, allocation and apportionment of deductions, foreign tax credits, taxation of U.S. citizens and residents abroad, controlled federal corporations, passive foreign investment companies, foreign currency translations and transactions, and special entities.

ACCT 6243. Advanced Flow-Through Entities. 3 Hours.

Offers an in-depth look at the tax consequences of businesses formed as flow-through entities (including partnerships, S corporations, and LLCs). Discusses allocation rules, liability sharing rules, disguised sales rules, partnership debt workouts, the S corporation election, and tax treatment of shareholders in an S corporation.

ACCT 6246. Retirement Plans. 3 Hours.

Examines employee benefit plans including requirements for qualification, funding, coverage, and distribution requirements. Discusses a variety of plans including pension, profit-sharing, CODAs, IRAs, SEPs, TSAs, and stock plans.

ACCT 6248. Income Taxation of Trusts and Estates. 3 Hours.

Examines the general rules for the taxation of estates and trusts. Topics include trusts that distribute current income only, grantor trusts, irrevocable trusts, charitable vehicles, income in respect of a decedent, estates and trusts that may accumulate income or may distribute corpus, and treatments of excess distributions and beneficiaries.

ACCT 6249. Financial Planning for Investments. 3 Hours.

Surveys the investment products that can be used for financial planning. Emphasis is on constructing the investment plan, the investment policy statement, the asset allocation strategy, and implementation recommendations.

ACCT 6250. Financial Planning for Insurance. 3 Hours.

Surveys insurance products used for financial planning. Topics include life, accident, health, disability, long-term care, homeowner, auto, and personal liability, with emphasis on personal risk management and the use of insurance products in the financial planning process.

ACCT 6253. Ethics in the Accounting Profession. 3 Hours.

Focuses on the roles and ethical responsibilities in the accounting, auditing, and tax professions. Also covers ethical behavior by management as well as the legal guidelines that apply in a business setting.

ACCT 6254. Accounting Research and Communication. 3 Hours.

Requires students to research and analyze auditing issues by using quantitative and/or qualitative research methods. Offers students an opportunity to learn how to more effectively communicate those findings in a professional format.

ACCT 6260. Advanced Topics in Accounting. 3 Hours.

Offers an in-depth examination of selected issues and problems in accounting that are of current interest to faculty and students. Specific topics alternate depending on faculty availability and interest as well as student enrollment criteria. May be repeated without limit.

ACCT 6262. Advanced Topics in Accounting. 1.5 Hour.

Offers an in-depth examination of selected issues and problems in accounting that are of current interest to faculty and students. Alternates specific topics depending on faculty availability and interest as well as student enrollment criteria. May be repeated without limit.

ACCT 6264. Planning for Estate Tax Issues. 3 Hours.

Examines advanced strategies for maximizing personal goals (including probate avoidance, tax minimization, and asset protection) related to property passed from one generation to another. Emphasizes trust vs. will planning and other vehicles for estate planning; the principles of estate taxation; the impact of employee benefits, trusts, and their taxations; and life insurance policies and associated annuities.

ACCT 6265. Tax Accounting for Income Taxes. 3 Hours.

Investigates the reporting of uncertain positions and accounting treatment accorded current and deferred income tax liabilities and expenses. Topics include accounting for uncertain tax positions, accounting methods and periods (particularly in cases where the accounting and tax records differ), special elections available to taxpayers, installment reporting, inventory methods, long-term contract accounting, and cash vs. accrual reporting.

ACCT 6272. Financial Statement Preparation and Analysis. 2.25 Hours.

Offers students an opportunity to understand how to prepare corporate financial reports and utilize critical information in these reports to improve business decision making. Introduces contemporary methods of financial statement analysis used by internal decision makers and external capital providers.

ACCT 6273. Identifying Strategic Implications in Accounting Data. 2.25 Hours.

Focuses on developing and analyzing accounting information to identify strategic implications and, using that information, to make effective decisions in various business functions that must work together for overall strategic success. Introduces key management accounting concepts and techniques, including the impact of different cost behaviors, activity-based costing, evaluating profitability of products and customers, flexible budgeting, and variance analysis. Offers students an opportunity to learn to use the data they develop to think objectively about the business, to ascertain why a situation occurs, to identify the implications of data for management decisions, and to use the data to discover strategically important opportunities and challenges.

ACCT 6280. Planning and Budgeting for Innovation. 3 Hours.

Covers the fundamental methods by which the financial successes and failures of business enterprises are measured and reported to management and external capital providers. Offers students an opportunity to become proficient at analyzing financial statement information in order to assess the effects of business decision making on firm performance. Addresses analytics focusing on the identification of capital to fund innovation initiatives in conjunction with metrics to measure the potential value associated with new product and service offerings. Seeks to help students understand how management decisions and innovation initiatives affect enterprise financial statements and shareholder perceptions of value creation.

ACCT 6292. Tax Research, Practice, and Ethics. 3 Hours.

Offers students an opportunity to develop and refine their tax research skills through practical exercises. Covers the creation of various sources of tax authority. Exposes students to the procedures used in dealing with the Internal Revenue Service (IRS), with an emphasis on practitioner responsibilities. Reviews the organization of the IRS, filing requirements, appeal procedures, civil/criminal statutes, assessments, and protests. Includes a study of the value and moral judgments inherent in the field of taxation, including client confidentiality, disclosure of false or misleading information, and advice counter to the law or public good.

ACCT 6318. Analyzing Accounting Data for Strategic Decision Making. 2 Hours.

Highlights managerial decisions affecting a company's performance in generating revenues, controlling costs, and producing profits. Begins with a brief review of financial accounting, then focuses on the development and use of information, especially financial information, for managerial decisions related to the firm's planning—operations—control cycle.

ACCT 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ACCT 7976. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on chosen topics. May be repeated without limit.

Accounting - CPS (ACC)

Search ACC Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=ACC>)

ACC 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ACC 2100. Financial Accounting. 3 Hours.

Examines the development, objective, and purpose of financial statements. Emphasizes the preparation, analysis, and use of these statements to make operating, financial, and investment decisions. Covers the underlying methods, concepts, principles, and measurement theories. Topics include understanding the operating cycle, receivables, inventories, plant and equipment, intangible assets, liabilities, bonds, ownership, and stockholders' equity. Special topics include the mathematics of present value theory, calculations, and applications.

ACC 2200. Managerial Accounting. 3 Hours.

Examines the fundamental tools and principles of managerial accounting for decision-making purposes, including planning and control. Covers cost determination, assignment, definition, and behavior. Requires students to prepare management accounting reports and statements for internal decision-making purposes, including the preparation of budgets and contribution margin statements. Topics include job order, process costing, activity-based costing (ABC), inventory techniques, variance analysis, CVP analysis, and budgeting.

ACC 3103. Cost Accounting. 3 Hours.

Continues in greater depth the study of managerial accounting for decision-making purposes, including profitability, planning, and control. Studies cost analysis and explores statistical methods in measuring cost behavior, overhead, and fixed costs. Emphasizes capital budgeting techniques for equipment replacement and long-term asset management given the relevant range of productive capacity. Compares and analyzes decentralization, segment, and divisional management accounting. Topics include marginal cost relevancy, make-or buy decisions, multiple product cost assignment and production methods, joint costs and by-products, responsibility accounting, activity-based costing, just-in-time cost systems, economic value added, residual income, the balance scorecard, and return on investment techniques.

ACC 3201. Financial Reporting and Analysis 1. 3 Hours.

Examines in greater depth the foundational principles, concepts, and measurement theories relating to financial reporting and stewardship. Focuses on the objectives of financial statements for various users such as lenders, investors, and various stakeholder groups. Emphasizes the accounting conceptual framework, including the guidance and standards promulgated by various standards-setting and regulatory bodies. Topics include the measurement, valuation, and disclosure of receivables, inventories, tangible and intangible assets, depreciation methods, revenue-recognition principles, and required footnotes.

ACC 3202. Financial Reporting and Analysis 2. 3 Hours.

Continues the examination in greater depth of the foundational principles, concepts, and measurement theories relating to financial reporting and stewardship. Focuses on the objectives of financial statements for various users such as lenders, investors, and various stakeholder groups. Emphasizes the accounting conceptual framework, including the guidance and standards promulgated by various standards-setting and regulatory bodies. Topics include the measurement, valuation, and disclosure of liabilities, bond obligations, retirement obligations, reconciliation of deferred taxes and required tax disclosures, various corporate ownership interests, stock options, accounting changes, statement of cash flows, and required footnotes.

ACC 3410. Principles of Taxation. 3 Hours.

Covers the objectives and principles of taxation, including the economic policy underlying various tax systems—property, consumption, value added, federal, and state income tax regimes. Explores the marginal tax structure and studies the component parts of the tax accounting equation in full, including the definitions and terminology described in the U.S. tax code. Emphasizes the tax compliance responsibilities and tax accounting methods and required reporting obligations for individuals, corporations, and various pass-through entities such as partnerships and subchapter S corporations.

ACC 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ACC 4320. Financial Statement Analysis. 3 Hours.

Explores the process, tools, principles, and concepts of financial reporting, financial statement analysis, and valuation used by investors and analysts. Covers analysis of financial information and firm-specific data, emphasizing the structure of financial statements. Focuses on use of this data for equity and debt valuation as part of security analysis and portfolio management. Studies analysis of individual investments, focusing on pricing shares of stock and creating valuation models and specific criteria used in lending decisions. Topics include models of intrinsic value; comparison of accrual accounting and discounted cash flow approaches to valuation; analysis of firm profitability, growth, risk analysis, and value generation; and assessment of accounting quality, forecasting earnings and cash flows, pro forma analysis for strategy and planning, and study of nonfinancial metrics.

ACC 4330. Principles of Auditing. 3 Hours.

Examines audit principles, concepts, and standards relevant to the attest function. Explores the objectives of audited financial statements performed by certified public accountants in compliance with AICPA auditing standards, PCAOB standards and guidelines, and SEC rules and regulations for publicly held companies. Also explores the objectives of audited financial statements and other lower-level services (such as reviews and compilations) performed for privately held nonpublic companies. Topics include ethical and legal liabilities of the auditor, including the independence and skepticism requirement, internal control, audit evidence, audit procedures, audit compliance and substantive testing, statistical sampling, transaction cycle testing, and the role of the audited reports on the efficiency of capital markets.

ACC 4410. Advanced Taxation. 3 Hours.

Continues the study of taxation, including tax-planning strategies, the tax legislative process, tax controversies and litigation, the hierarchy of tax authorities, and tax research and writing techniques. Emphasizes the tax-planning techniques and opportunities for individuals and businesses to avoid or minimize the present value of tax liabilities through property acquisitions; exchanges and dispositions; deferred and installment sales; corporate reorganizations; liquidations; and other pass-through entity structures such as limited liability companies, trusts, estates, and personal holding companies. Integrates the analysis of legislative motives to provide incentives to promote desired economic and social behavior and to exact penalties to discourage undesirable economic and social activity.

ACC 4420. Advanced Accounting. 3 Hours.

Covers Securities and Exchange Commission reporting requirements, including segment and interim reporting requirements for large publicly held companies. Focuses on the equity method of accounting for investments; consolidations of financial information and consolidated reporting requirements for activities subsequent to the date of acquisition; consolidated financial statements as they pertain to outside ownership, intercompany asset transactions, and ownership patterns and income taxes; and intercompany debt, consolidated statement of cash flows, and other multi-entity issues. Other related matters covered include multinational accounting for foreign currency transactions and financial instruments, including the currency translation of foreign entity financial statements. Special advanced topics include accounting for partnerships, estates and trusts, fund accounting, bankruptcy liquidations and reorganizations, and accounting for governmental units and not-for-profit entities.

ACC 4955. Project. 1-4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student's major field. May be repeated without limit.

ACC 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ACC 6210. Forensic Accounting Principles. 4 Hours.

Seeks to provide students with a broad conceptual overview of the field of forensic accounting, the key internal controls required to deter/detect frauds or abuse, and the newly enacted corporate governance laws. Covers the roles, responsibilities, and requirements of a forensic accountant; basic legal and fraud examination theory; ethics in business; identifying the major types of cash, payroll, and other financial fraud schemes; detailed examination of the proper required internal audit controls (transaction authorization, segregation of duties, supervision, adequate documentation and records, physical safeguards, independent verification); and accounting/auditing standards and corporate governance needed to comply with the AICPA, SAS, CFE, government regulations, and Sarbanes-Oxley 2002 legislation. Discusses actual fraud cases to highlight the impact of auditing and forensic accounting on businesses and our society.

ACC 6220. Dissecting Financial Statements. 4 Hours.

Offers students an opportunity to learn how to review, detect, and investigate possible financial statement concerns of publicly and privately held businesses, as well as nonprofit organizations and family businesses. Financial records of the companies studied span a variety of industries. Topics include legal elements of financial statement fraud, management's and auditor's responsibilities, improper revenue/sales recognition, inadequate disclosure of related-party transactions, improper asset valuation, improper deferral of costs and expenses, financial statement red flags, and inadequacies in management's discussion and analysis. Addresses such factors as off-balance-sheet activity, liquidity, financial performance indicators, unreported intangibles, and lease auditing. Typical cases could include WorldCom, Enron, Rite Aid, Crazy Eddie, and ESM Government Securities.

ACC 6230. Investigative Accounting and Fraud Examination. 4 Hours.

Offers students an opportunity to learn how to identify and investigate accounting frauds and irregularities. Includes the in-depth review of sophisticated fraud schemes; how fraudulent conduct can be deterred; how allegations of fraud should be investigated and resolved; the recovery of assets; methods of writing effective reports; complying with SAS 82 and other fraud standards; and recent antiterrorist and money-laundering regulations, including the Patriot Act of 2002. Sessions are interactive, with students working through actual cases, developing investigative strategies, and seeking to prove how the fraud was committed. Topics covered include acts of skimming, cash larceny, check tampering, register disbursement schemes, billing schemes, payroll and expense reimbursement schemes, improper accounting of inventory and other assets, corruption, bribery, conflicts of interest, security fraud, and insurance fraud.

ACC 6240. Litigation Support. 4 Hours.

Covers the litigation process and civil and criminal statutes used to prosecute white-collar crimes. Offers students the opportunity to learn the appropriate analytical tools to quantify values for future earnings or damages resulting from fraud, breach of contract, or insurance disputes and to perform business valuations, including those arising from hostile situations such as divorce. Topics covered include how to assist in obtaining documentation necessary to support or refute a claim, assist in the examination for discovery, formulate questions to be asked regarding the financial evidence, review an opposing expert's damages report and report on both the strengths and weaknesses of the positions taken, assist with settlement discussions and negotiations, and provide assistance at trial in testimony or with cross-examination.

ACC 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

African Studies (AFRS)

Search AFRS Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=AFRS>)

AFRS 1101. Introduction to African Studies. 4 Hours.

Uses a multidisciplinary approach to offer an introduction and overview of the geographical, demographic, socioeconomic, and political conditions of the African continent, emphasizing sub-Saharan Africa. Africa, "the cradle of humankind," is a vast, complex continent of diverse peoples that has fascinated observers and evoked multiple images. Topical areas of interest range from ethnic relations, politics, colonial experience, and international relations to religion, environment, health, economic development, gender, culture, and literature. Course materials aim to provide contemporary African perspectives and analyses that offer students an opportunity to acquire and interpret broad knowledge about the continent.

AFRS 1180. African History. 4 Hours.

Explores the history of the African continent from 1000 C.E. to the present era. Topics include medieval kingdoms (Ghana, Mali, Songhai, Zimbabwe, the city-states of East Africa, and the Kongo kingdom); slave trades (Indian Ocean, trans-Saharan, and transatlantic); the partition of Africa and European colonization; and the decolonization process. Due consideration is given to the interactions of African peoples with the rest of the world, particularly the relations between Africa and Europe after 1500 C.E.

AFRS 1270. Introduction to Global Health. 4 Hours.

Introduces global health in the context of an interdependent and globalized world focusing on four main areas of analysis: infrastructure of global health; diseases; populations; and terms, concepts, and theories. While the focus is on lower-income countries, the course examines issues in a broader global context, underscoring the interconnections between global health disparities and global health policy response. Applies case studies describing interventions to improve healthcare in resource-poor settings in sub-Saharan Africa and elsewhere to help illuminate the actors, diseases, populations, and principles and frameworks for the design of effective global health interventions. AFRS 1270 and PHTH 1270 are cross-listed.

AFRS 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

AFRS 2307. Africa Today. 4 Hours.

Offers a basic survey of the latest innovations and cultural and socioeconomic trends of 21st-century Africa. Examines the political transformations of some of the 49 Sub-Saharan African nations. Focuses on a culturally and ethnically diverse continent of five regions with linguistic and religious diversity and tribal societies reflecting an ancient triple heritage—Indigenous, Arab, and European. Presents complex and critical perspectives on topics including governance and civil strife, gender empowerment, the impact of globalization, trade and investment developments, public health challenges, the visual and performing arts, identity formation among a rising youth demographic to pervasive mobile technology, food security, and the new "African" passport. .

AFRS 2464. Natural Resources and Sustainable Development. 4 Hours.

Examines the social dimensions of resource extraction. Focusing mainly on developing nations, studies global issues, including developments in industrial nations, to assess their impact on resource extraction and living and working conditions in resource-rich regions. Uses case studies of key countries producing oil/gas, minerals, and forest/agricultural commodities to illustrate the past/current causes of resource mismanagement; their social consequences; and how public policies, legislation, and financial and human resource management with industrialization can be used to avert or reduce the adverse effects of resource extraction, especially in poor countries. Major theories examined include the resource curse and alternative approaches to problems faced by resource-bearing developing nations. AFRS 2464 and INTL 2464 are cross-listed.

AFRS 2465. The Scope and Dynamics of Conflicts in Africa. 4 Hours.

Surveys the faces, character, and manifestations of violent and nonviolent conflicts across the landscape of continental Africa. Addresses the causes/sources of conflict, types of conflicts and their impact on society, and the conflict resolution mechanisms. The contemporary history of the continent of Africa is defined most markedly by conflict that has impacted heavily on the continent's diverse multicultural societies, politics, and economies. The structure of conflicts in the continent is complex and, indeed, exhibits diverse faces; conflicts differ in their roots, causes, and explanations and between the different regions and population groups in the south, east, central, west, and north. The course critically analyzes this broad range of aspects with specific focus on sub-Saharan Africa using country- and case-based analyses and critical thinking. AFRS 2465 and INTL 2465 are cross-listed.

AFRS 2900. Swahili, Culture, and Politics in Kenya. 4 Hours.

Introduces and immerses students in Kenyan African culture, the Swahili language and politics, and studies their impact on the everyday life of the local population. Offers students an opportunity to learn Swahili, which is the national language of Kenya; its use in a context of varied indigenous languages; and cultural dynamics. Exposes students to the major issues that characterize everyday life in rural and urban settings through visits to and stays in the rural areas and transect walks in villages and urban communities. Students visit projects run by community-based organizations, observing the everyday life of ordinary Kenyans and attending formal and informal classes and settings on Swahili language, culture, and the local politics.

AFRS 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

AFRS 3410. Religion and Spirituality in the African Diaspora. 4 Hours.

Examines religious thought and rituals and the Diaspora in a comparative context. Topics include traditional religions, Islam, Christianity, and Judaism in Africa, and the Diaspora. Emphasizes the transformation of religions practiced in Africa when African captives were forced into the three slave trades affecting the continent of Africa: trans-Saharan, Indian Ocean, and transatlantic.

AFRS 3424. Epidemiology of Pandemic Diseases and Health Disparities in the African Diaspora. 4 Hours.

Examines the epidemiology and determinants of diseases and the public health practice among continental African peoples and African-derived populations in the Americas and elsewhere in the African Diaspora. Emphasizes such epidemic diseases as malaria, yellow fever, tuberculosis, smallpox, the current AIDS pandemic, obesity, and cancer. The course also aims to critically address the breadth of factors behind these pandemics, such as socioeconomic, political, health system, behavioral, and genetic. A cross-cutting theme throughout the course is the entrenched health disparities in society.

AFRS 3460. Contemporary Government and Politics in Africa. 4 Hours.

Explores contemporary politics in African nations south of the Sahara. Studies South Africa, Nigeria, Kenya, and Ethiopia, among others. Examines apartheid, colonialism, Afro-Marxism, chieftaincy, development, and Pan-Africanism.

AFRS 3464. Natural Resources and Sustainable Development. 4 Hours.

Examines the social dimensions of resource extraction. Focusing mainly on developing nations, studies global issues, including developments in industrial nations, to assess their impact on resource extraction and living and working conditions in resource-rich regions. Uses case studies of key countries producing oil/gas, minerals, and forest/agricultural commodities to illustrate the past/current causes of resource mismanagement; their social consequences; and how public policies, legislation, and financial and human resource management with industrialization can be used to avert or reduce the adverse effects of resource extraction, especially in poor countries. Major theories examined include the resource curse and alternative approaches to problems faced by resource-bearing developing nations. AFRS 3464 and INTL 3464 are cross-listed.

AFRS 3900. Gender and Black World Literatures. 4 Hours.

Explores different aspects of the literary and cultural productions of black women throughout history. Examines writing by women in the United States—like Octavia Butler, Zora Neale Hurston, and Toni Morrison—in addition to writing by women across the global African diaspora—like Chimamanda Adichie and Jamaica Kincaid. Students may also engage with theories such as Black feminism, womanism, or intersectionality; consider issues of genre such as the novel, poetry, or science fiction; and explore key themes such as class, sexuality, and disability. AFRS 3900, WMNS 3900, and ENGL 3900 are cross-listed.

AFRS 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

AFRS 4700. Capstone. 4 Hours.

Offers students an opportunity to prepare a professional research project or paper under the close supervision of a scholar interested in students' particular research areas.

AFRS 4939. Community Health, Culture, and Development in Kenya. 4 Hours.

Introduces the community health and development arena in Kenya. Community development has been presented as the panacea to many of Africa's problems, including leadership, democracy, conflict, disease, and poverty. Through teaching, research, and action, the course seeks to expose and sensitize students to the global and local debate on poverty, primary healthcare, and community development. Offers students an opportunity to gain hands-on experiences in some of the major determinants and solutions to poverty and disease by interacting with community stakeholders and organizations in a variety of cultural, rural, and urban settings and through visits to, and participating in, projects run by community-based organizations.

AFRS 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

AFRS 4992. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

African-American Studies (AFAM)

Search AFAM Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=AFAM>)

AFAM 1101. Introduction to African-American Studies. 4 Hours.

Explores several of the possible historical, sociological, cultural, and political avenues of study in the broad interdisciplinary spectrum of African-American studies. Provides an introductory overview of the field and offers an opportunity to identify areas for more specific focus.

AFAM 1104. The African-American Experience through Music. 4 Hours.

Explores the various musical traditions of African Americans, with a specific focus on the United States. Examines the impact of African, European, and Native American traditions on African-American music as well as the role of music as an expression of African-American aesthetics, traditions, and life. Considers historical and contemporary forms of African-American music, with selected video presentations. Not open to students who have taken MUSC 1104.

AFAM 1113. Black Popular Culture: Music, Movies, and More. 4 Hours.

Surveys Black popular culture from the mid-1950s to the present through music, movies, music videos, and other forms of multimedia, paying close attention to social commentary, political critique, economic inference, cultural formation, explications of religious and spiritual beliefs, and the like. Issues of representation, identity, values, and aesthetics are pondered and discussed. Seeks to cause students to rethink and reexamine the intent and impact of Black popular culture as a method and means of expression and communication.

AFAM 1135. John Coltrane and Black America's Quest for Freedom. 4 Hours.

Studies the life of John Coltrane, one of the greatest musicians of all time. Presents his growing up in a Black North Carolina community during the era of U.S. apartheid to becoming a world-class artist whose music touched listeners around the globe and continues to be a major influence in current times. His advanced and innovative conceptions (melodic, rhythmic, and harmonic) and stylistic contributions to African-American creative improvisation changed the way to play the music forever. Emphasizes his immense impact on jazz and other improvisational music and expressive art forms, as well as his spiritual legacy, which focused on using music for the improvement of humanity. Not open to students who have taken MUSC 1135.

AFAM 1225. Gender, Race, and Medicine. 4 Hours.

Examines the basic tenets of "scientific objectivity" and foundational scientific ideas about race, sex, and gender and what these have meant for marginalized groups in society, particularly when they seek medical care. Introduces feminist science theories ranging from linguistic metaphors of the immune system, to the medicalization of race, to critiques of the sexual binary. Emphasizes contemporary as well as historical moments to trace the evolution of "scientific truth" and its impact on the U.S. cultural landscape. Offers students an opportunity to develop the skills to critically question what they "know" about science and the scientific process and revisit their disciplinary training as a site for critical analysis. AFAM 1225, HIST 1225, and WMNS 1225 are cross-listed.

AFAM 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

AFAM 2270. Race and Ethnic Relations. 4 Hours.

Focuses on racial and religious groups, particularly with reference to the United States. Emphasizes historical development, specific problems of adjustment and assimilation, and present-day problems and trends. SOCL 2270 and AFAM 2270 are cross-listed.

AFAM 2296. Early African-American Literature. 4 Hours.

Surveys the development and range of black American writers, emphasizing poetry and prose from early colonial times to the Civil War. ENGL 2296 and AFM 2296 are cross-listed.

AFAM 2339. Analysis of American Racism. 4 Hours.

Discusses the cycle by which racism in our institutions helps form our attitudes and the manner in which our attitudes, in turn, shape our institutions. Emphasizes the practical, day-to-day aspects of racism, rather than the theoretical and historical.

AFAM 2360. Politics of Poverty. 4 Hours.

Explores how and why there is poverty, how it affects people's lives, and how it can be eliminated. Examines the relations between poverty, racial and ethnic factors, and the economic, political, and administrative systems. Evaluates a number of alternatives and provides an opportunity for clarifying individual assumptions and feelings about poverty.

AFAM 2399. Black Community and Social Change. 4 Hours.

Explores the dynamic changes experienced by black communities in the United States since the civil rights era in the 1950s and 1960s. Includes discussions and applications of key concepts and methods in several fields of the social sciences, and seeks to understand the relationship of race, class, gender, and social change in addressing the current search for policies and programs for community development.

AFAM 2455. American Women Writers and Race. 4 Hours.

Surveys the diversity of American women's writing to ask what it means to describe writers as disparate as Phillis Wheatley, Edith Wharton, Toni Morrison, and Alison Bechdel as part of the same 'tradition.' With attention to all genres of American women's writing, introduces issues of race, genre and gender; literary identification; canons; the politics of recuperation; silence and masquerade; gender and sexuality; intersectionality; sexual and literary politics, compulsory heterosexuality, and more. AFAM 2455, ENGL 2455, and WMNS 2455 are cross-listed.

AFAM 2549. Public Policy and Black America. 4 Hours.

Examines the impact of public policy on African Americans and the role of African Americans in the formulation of public policy. These roles include protest, interest-group politics, electoral politics, and blacks as policy researchers and advisers. The process of public policy formulation as it affects blacks is explored through a series of case studies ranging from the formulation and enforcement of fugitive slave laws in the pre-Civil War era to strategic military and foreign policy, affirmative action, welfare reform, and reparations in our own time.

AFAM 2690. Boston in Literature. 4 Hours.

Explores the various ways in which the city of Boston and its environs are represented in literature and other media. Each semester, the course focuses on a different aspect of Boston in literature, such as representations of Boston's different communities, different historical eras, particular genres or concepts associated with the city, and so forth. Offers students an opportunity to build upon their readings about the city by experiencing independent site visits, class field trips, guest speakers, and other activities. In addition to a culminating group or individual research project about Boston, students may also have the opportunity to participate in a community-based reading project. AFAM 2690 and ENGL 2690 are cross-listed. .

AFAM 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

AFAM 3663. The African American Novel. 4 Hours.

Focuses on the black novelist's place in the history of American fiction. Emphasis is given to Chesnut, Toomer, Wright, Ellison, and contemporary novelists, and to their different perceptions of the black experience in America. AFAM 3663 and ENGL 3663 are cross-listed.

AFAM 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

AFAM 4020. Race, Crime, and Justice. 4 Hours.

Provides students with an overview of the role and treatment of racial/ethnic minorities in the criminal justice system. Covers historical and theoretical frameworks for understanding the relationship between race, crime, and criminal justice. In so doing, students become familiar with trends and patterns in criminal offending by racial/ethnic minorities, as well as system response to such behavior. CRIM 4020 and AFAM 4020 are cross-listed. .

AFAM 4642. Topics in African-American Art History. 4 Hours.

Explores special topics in African-American art history in this advanced seminar. May be repeated without limit.

AFAM 4700. Capstone. 4 Hours.

Offers students the opportunity to prepare a professional research project under the close supervision of a scholar interested in students' particular research areas.

AFAM 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

AFAM 4991. Research. 4 Hours.

Offers an opportunity to conduct research under faculty supervision.

AFAM 5001. Special Topics in Race and the Law. 4 Hours.

Explores the various questions, relationships, and connections between the law and racial issues and concepts. Each offering focuses on a special topic such as reparations, civil rights, gender, or the environment and energy policies. May be repeated up to three times for a maximum of 16 credits.

American Sign Language (AMSL)

Search AMSL Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=AMSL>)

AMSL 1101. Elementary ASL 1. 4 Hours.

Introduces students to American Sign Language (ASL). Students develop expressive and receptive competence in using ASL to fulfill various social functions (such as introductions, explanations of personal history, and descriptions of simple narratives). Additional topics include the use of signing space and further use of nonmanual components including facial expression and body postures.

AMSL 1102. Elementary ASL 2. 4 Hours.

Continues AMSL 1101. Continues development of expressive and receptive competence in using American Sign Language to fulfill various social functions (such as introductions, explanations of personal history, and descriptions of simple narratives). Emphasizes further development of receptive and expressive skills, finger spelling, vocabulary building, grammatical structures; encourages more extensive use of nonmanual behaviors, classifiers, body postures, and signing space. Students are also introduced to regional and ethnic sign variations and political and educational institutions of the Deaf community.

AMSL 1511. ASL Classifiers. 4 Hours.

Seeks to improve understanding of and use of ASL classifiers, including appropriate nonmanual grammatical features and other nonmanual markers. Discusses classifier hand shapes and how movement, location, and orientation of classifiers affect meaning in ASL. Covers eight types of ASL classifiers: semantic, instrumental, descriptive, locative, plural, body part, sport, and elemental. Offers students an opportunity to build on existing classifier vocabulary and eventually use an expanded range of classifiers to express narratives.

AMSL 1512. ASL Numbers and Fingerspelling. 4 Hours.

Offers students an opportunity to improve receptive and expressive skills in the specific areas of fingerspelling and numbers. Includes a brief history of fingerspelling. Focuses on strategies for understanding fingerspelling/word phrases and number recognition; recognizing number patterns (e.g., ordinal and cardinal numbers, height, age, time); and additional strategies for understanding and using numbers and fingerspelling in context. Uses drills to improve speed, clarity, and fluency skills.

AMSL 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

AMSL 2101. Intermediate ASL 1. 4 Hours.

Continues the student's development of expressive and receptive competence in using American Sign Language to fulfill various communicative functions, such as making and responding to inquiries, constructing and comprehending narratives, and engaging in debates. Students also continue to expand their ASL lexicon.

AMSL 2102. Intermediate ASL 2. 4 Hours.

Continues AMSL 2101. Emphasizes further development of receptive and expressive skills, finger spelling, vocabulary building, grammatical structures; encourages more extensive use of nonmanual behaviors, classifiers, body postures, and signing space. Continues exposure to regional and ethnic sign variations and political and educational institutions of Deaf people. Offers intensive practice involving expressive and receptive skills in storytelling and dialogue. Introduces language forms used in American Sign Language poetry and the features of culture as they are displayed in art.

AMSL 2900. Specialized Instruction in ASL. 1-4 Hours.

Designed for individuals whose language skills are at the intermediate level and who seek specially focused language instruction. Such instruction might be the use of the language in specific settings (e.g., media, medical, legal, mental health), or it might be focused on specific conversational nuances of the language. May be repeated without limit.

AMSL 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

AMSL 3101. Advanced ASL 1. 4 Hours.

Focuses on continued development of syntactic competence in American Sign Language with particular attention to the use of ASL in formal discourse. Also focuses on lexical semantics and semantic equivalents for multiple meaning English lexical items.

AMSL 3102. Advanced ASL 2. 4 Hours.

Continues AMSL 3101. Focuses on further development and refinement of American Sign Language competence in various discourse settings, predominantly formal and consultative. Continues development of lexical semantics and uses individual diagnostic assessment of ASL competence to determine individual competency goals.

AMSL 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

AMSL 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

AMSL 4992. Directed Study. 1-4 Hours.

Offers students a way of going beyond work given in the regular curriculum; may also enable students to complete major requirements in certain situations. Priority is given to American Sign Language majors and to juniors and seniors. May be repeated without limit.

American Sign Language - CPS (ASL)

Search ASL Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=ASL>)

ASL 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

Analytics - CPS (ALY)

Search ALY Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=ALY>)

ALY 2010. Probability Theory and Introductory Statistics. 3 Hours.

Introduces statistics for business analytics from an analysis-of-data viewpoint. Topics include frequency distributions; measures of location; mean, median, mode; measures of dispersion; variance; graphic presentation; elementary probability; populations and samples; sampling distributions; categorical data; regression and correlation; and analysis of variance. Explores the use of statistical software in data analysis. Emphasizes hands-on application of probability and statistics in SPSS.

ALY 2100. Introduction to Programming for Data Analytics. 3 Hours.

Offers a hands-on first programming course for those with no prior programming experience. Covers basic programming logic and syntax with Python. Students apply Python packages mostly used on data analytics. Offers students an opportunity to learn how to code on the most used language in the job market.

ALY 3015. Intermediate Statistics for Data Analytics. 3 Hours.

Expands upon the earlier introduced statistical approaches. Emphasizes more advanced analysis and multivariate methods. The goal is to provide students with the fundamental data management, review, reengineering, and exploration skills as necessary data analytical competencies.

ALY 3040. Data Mining. 3 Hours.

Introduces the theories and tools for data mining techniques such as rule-based learning, decision trees, clustering, and association-rule mining. Also covers interpretation of the mined patterns using visualization techniques. Offers students an opportunity to gain the knowledge and experience to apply modern data-mining techniques for effective large-scale data pattern recognition and insight discovery. Introduces data analysis software—student teams evaluate, analyze, and report data for the methods used and insights discovered during case studies.

ALY 3070. Communication and Visualization for Data Analytics. 3 Hours.

Offers an interdisciplinary examination of design concepts and cognitive and communication theories that support effective practices for data visualization and communication. Considers the relationship between information and audience and studies effective techniques in the written, spoken, and visual communication of complex quantitative information. Project-based activities offer students opportunities to apply these techniques in a manner that makes data understandable, compelling, and actionable. Introduces R and Python visualization packages.

ALY 3110. Big Data and Web Mining. 3 Hours.

Offers students an opportunity to work with very large data sets and learn how to write code to browse the internet in a methodical and automated manner to search for publicly available data.

ALY 4000. Analytics using R. 3 Hours.

Offers an overview of analytics concepts and practices across a diverse range of organizational contexts. Case studies of successful analytics initiatives from varied domains examine how the collection and analysis of data impacts decision making within a variety of contexts. Introduces the use of R for fundamental data analysis methods and provides context essential to preparing students to engage with the individual courses that follow.

ALY 4020. Predictive Analytics Using R and Python. 3 Hours.

Introduces the end-to-end data-driven statistical modeling and predictive modeling approach in R and Python with applications and case studies. Includes all the data and modeling steps in a full modeling cycle; exploratory data analysis and data cleansing for outlier imputation and data normalization; commonly applied modeling techniques such as classification, linear regression, and logistic regression; and modeling steps such as model training, validation, and testing.

ALY 4850. Analytics Capstone. 3 Hours.

Offers an advanced practicum in the development and delivery of data analysis for strategic decision making in organizations. Students apply the principles and tools of analytics to a comprehensive real-world problem or project within a sponsoring organization. Expects students to present analytical insights and recommendations for successful implementation of their capstone project.

ALY 6000. Introduction to Analytics. 3 Hours.

Offers an overview of analytics concepts and practices across a diverse range of industries and organizational contexts. Case studies of successful analytics initiatives from fields including retail, government, education, and the arts provide opportunities to examine how the collection and analysis of data impacts decision making within a variety of contexts. Offers students an opportunity to engage with the current theories, practices, and debates in the field of analytics to critically examine its practice. Distinctions among specific analytical techniques and tools, including the use of Excel for fundamental data analysis methods, provide context essential to preparing students to engage more deeply with the individual courses that follow.

ALY 6010. Probability Theory and Introductory Statistics. 3 Hours.

Introduces statistics for business analytics from an analysis-of-data viewpoint. Topics include frequency distributions; measures of location; mean, median, mode; measures of dispersion; variance; graphic presentation; elementary probability; populations and samples; sampling distributions; categorical data; regression and correlation; and analysis of variance. Explores the use of statistical software in data analysis. Lab sessions emphasize hands-on application of probability and statistics in Excel and data problem solving with advanced Excel techniques.

ALY 6015. Intermediate Analytics. 3 Hours.

Builds on the foundation laid in ALY 6000 and ALY 6010 by introducing fundamental data due diligence, data correction and recoding processes and practices, in addition to expanding upon the earlier introduced approaches to discerning and validating patterns in data through sound applications of the scientific method. Emphasizes hypothesis testing, the notion of statistical significance, and tests of difference. The goal of this course is to endow students with the fundamental data management, review, reengineering, and exploration skills as necessary data analytical competencies.

ALY 6020. Predictive Analytics. 3 Hours.

Introduces the end-to-end data-driven statistical modeling and predictive modeling approach in R with applications and case studies. Includes all the data and modeling steps in a full modeling cycle, including data ETL process, exploratory data analysis and data cleansing for outlier imputation and data normalization, commonly applied modeling techniques such as linear regression and logistic regression, modeling steps such as model training, and validation and testing. R is introduced as the data processing, analysis, and modeling tool and is used in the case studies.

ALY 6030. Data Warehousing and SQL. 3 Hours.

Focuses on the management, mining, and interpretation of patterns in large databases. Offers students an opportunity to learn how organizations construct data warehouses from operational databases, about different data warehouse architectures, how to build a data warehouse, and how to structure databases for efficient data mining. Discusses relational databases and Structured Query Language (SQL) for the fundamentals in data modeling, database management, and SQL queries. Introduces other modern database systems such as NoSQL (non SQL) and column-based databases.

ALY 6040. Data Mining Applications. 3 Hours.

Introduces the theories and tools for intensive data analysis methods and data mining techniques such as rule-based learning, decision trees, clustering, and association-rule mining. Also covers interpretation of the mined patterns using visualization techniques. Offers students an opportunity to gain the knowledge and experience to apply modern data-mining techniques for effective large-scale data pattern recognition and insight discovery. Introduces data analysis software; student teams evaluate, analyze, and report data for the methods used and insights discovered during case studies.

ALY 6050. Introduction to Enterprise Analytics. 3 Hours.

Introduces the field of enterprise data analytics, which is defined as the extensive use of data, statistical and quantitative analysis, exploratory and predictive models, and fact-based decision making to drive business strategies and actions. Discusses a few widely practiced data analytics areas, such as marketing analytics, retail analytics, financial analytics, people analytics, as well as general industry practices in end-to-end analytics development cycles, including data management, data engineering, analytics modeling, and strategy development. Offers students an opportunity to learn how to use quantitative techniques for strategic business decision making. Introduces specific analysis techniques including forecasting, simulation, linear programming, and optimization.

ALY 6060. Decision Support and Business Intelligence. 3 Hours.

Introduces current and emerging business analytical concepts and information technologies to support decision making and business intelligence. Commercial decision support systems in various application areas are introduced and discussed using case studies, including CRM (customer relationship management) for customer management, web analytics applications, sales force management systems, etc. Introduces business intelligence technology and applications, such as OLAP (Online Analytical Processing), OBIEE (Oracle Business Intelligence Enterprise Edition), and IBM Cognos. Offers students an opportunity to gain hands-on experience using business intelligence tools, including Tableau or QlikView.

ALY 6070. Communication and Visualization for Data Analytics. 3 Hours.

Offers an interdisciplinary examination of design concepts and cognitive and communication theories that support effective practices for data visualization and communication. Considers the relationship between information and audience and studies effective techniques in the written, spoken, and visual communication of complex quantitative information. Project-based activities offer students opportunities to apply these techniques in a manner that makes data understandable, compelling, and actionable. Introduces R Shiny in the lab sessions as the tool for data visualization.

ALY 6080. Integrated Experiential Learning. 3 Hours.

Offers a practicum in the development and delivery of predictive data analysis for strategic decision making in organizations. Offers students an opportunity to apply the principles and tools of analytics to real-world problems in business organizations and to develop and present analytical insights and recommendations for successful implementation of their capstone project.

ALY 6100. Data-Driven Decision Making. 3 Hours.

Designed to provide an in-depth focus on data-driven decision making in organizations. Examines the models, tools, techniques, and theory of data-driven decision making that can improve the quality of business leadership decisions through solution-based case studies.

ALY 6110. Data Management and Big Data. 3 Hours.

Designed to provide the student with the core concepts of data collection and management. Topics include systems for collecting data and implications for practice; types of data (textual, quantitative, qualitative, etc.); and storing data with privacy and security issues in mind. Offers students an opportunity to obtain a high-level understanding of big data technologies for data accessibility, efficiency, and security of data management at scale, including big data storage and computing technologies and big data analytics applications. Students create a working system for data acquisition and management using publicly available data sets and evaluate traditional data warehouse platforms as well as cloud-based big data storage and computing technologies. Azure is also introduced and used in the lab sessions.

ALY 6120. Leadership in Analytics. 3 Hours.

Covers analytical leadership principles for the structure and dynamics of organizations, combining relevant research to offer students an opportunity to deepen their understanding of effective change in business analytical decision making.

ALY 6130. Risk Management for Analytics. 3 Hours.

Seeks to provide a conceptual overview of analytic risk management. Offers students an opportunity to evaluate and analyze financial, technical, and other business risk-assessment and risk-modeling techniques and tools.

ALY 6140. Analytics Systems Technology. 3 Hours.

Presents a selection of analytics systems technologies that are deployed in lab sessions throughout the analytics program. A multitude of analytics systems technologies are used for different purposes to describe data numerically and graphically, for data visualization, file systems (HFS) for a large data mart, applications of structured query language, and filtering and transforming to ingest the data through scripting languages. Some of the tools are taught in greater detail (e.g., Python, machine learning), whereas others are introduced more broadly.

ALY 6150. Healthcare/Pharmaceutical Data and Applications. 3 Hours.

Introduces a selection of healthcare/pharmaceutical data used for a variety of purposes, and its specific application in data-driven business decision making. Healthcare/Pharmaceutical data is collected as part of Medicare and Medicaid databases and as mandated by the PPACA (Patient and Affordable Care Act) and the PPSA (Physicians Payment Sunshine Act). Data is available in the form of medical records, social networks, outcomes databases, syndicated data reports, epidemiological data, demographic data, analyst information, RD Pipeline Database, market data, and online journals and newsletters. Organizations, corporations, and companies use these varieties of data for a host of different reasons - to better profile and segment customers, to answer performance questions, and to identify and capture key opportunities.

ALY 6160. Business Intelligence in Healthcare/Pharmaceutical. 3 Hours.

Focuses on the use of and interplay between secondary data, primary market research, competitive intelligence, and forecasting within healthcare/pharmaceutical organizations. Introduces excellence in analytics on the pathway to market and launch planning. Discusses the approach and contribution of competitive intelligence as a critical component to the success of creating business insight. Also discusses excellence in forecasting and how the different business intelligence components of data, primary market research, and competitive intelligence shape sales and demand forecasts.

ALY 6170. Decision Makers. 3 Hours.

Discusses the fundamentals and applications of modern analytics. Shares real-world examples to illustrate excellence in analytics and how a complete understanding of its potential and power can translate into data-driven decision making that mitigates risk in decision making via efficient processes and has the potential to create competitive advantages for an organization. Offers decision makers (C-Suite, product managers, etc.) that instruct and receive analytics an opportunity to obtain a comprehensive understanding and the opportunities of modern analytics, allowing them to ask better questions, make better-informed decisions quicker, and achieve more efficient outcomes. Introduces students to what modern analytics and the Black Box is capable of, without deconstructing the Black Box and the advanced analytics tool itself.

ALY 6980. Capstone. 3 Hours.

Offers an advanced practicum in the development and delivery of predictive data analysis for strategic decision making in organizations. Students apply the principles and tools of analytics to a comprehensive real-world problem or project within a sponsoring organization. Expects students to present analytical insights and recommendations for successful implementation of their capstone project.

ALY 6983. Topics. 3 Hours.

Discusses contemporary topics in analytics for a rotating variety of industries (nonprofit and for-profit).

Anthropology (ANTH)

Search ANTH Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=ANTH>)

ANTH 1000. Anthropology at Northeastern. 1 Hour.

Intended for first-year students in the College of Social Sciences and Humanities. Introduces students to liberal arts; familiarizes them with their major; develops the academic skills necessary to succeed (analytical ability and critical thinking); provides grounding in the culture and values of the University community; and helps to develop interpersonal skills—in short, familiarizes students with all skills needed to become a successful university student.

ANTH 1101. Peoples and Cultures. 4 Hours.

Surveys basic concepts in cultural anthropology by looking at a range of societies and the issues they face in a globalizing world. Examines the manner in which cultures adapt to, reject, or modify all of the changes they face. These changes impact everything from traditional family structure, to religion, gender, all the way to patterns of joking and concepts of beauty the world over.

ANTH 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ANTH 2300. Reading Culture through Ethnography. 4 Hours.

Examines culture by reading some of the discipline's best-known ethnographic works and by revisiting core anthropological themes and methods. Emphasizes critical reading practices within anthropology, how ethnographies and their subjects are constructed, and how anthropologists bring their perspectives to bear upon the study of culture.

ANTH 2302. Gender and Sexuality: A Cross-Cultural Perspective. 4 Hours.

Examines popular and scientific notions about sex, gender relations, family, and kinship. Examines why our images of family, masculinity, and femininity are not universal by analyzing the patterns of sex roles, sexual practices, and kinship in other cultures. Discusses how and why relations between men and women change during times of socioeconomic and political change. ANTH 2302 and WMNS 2302 are cross-listed.

ANTH 2305. Global Markets and Local Culture. 4 Hours.

Examines selected topics in the socioeconomic transformation of other cultures, including urbanization, industrialization, globalization, commodity production, and international labor migration. Focuses on the impact of global capitalist development on contemporary developing and postcolonial societies as well as local responses and/or resistances to those changes.

ANTH 2306. Global Markets and Local Cultures Abroad. 4 Hours.

Examines selected topics in the socioeconomic transformation of other cultures, including urbanization, industrialization, globalization, commodity production, and international labor migration. Focuses on the impact of global capitalist development on contemporary developing and postcolonial societies as well as local responses and/or resistance to those changes. To be taken as part of a Dialogue of Civilizations. May be repeated without limit.

ANTH 2315. Religion and Modernity. 4 Hours.

Introduces a cross-cultural, comparative perspective on religious practice and belief. Explores theoretical definitions of and methodological approaches to the study of religion, as well as more specific concepts of ritual, myth, healing, and identity. Select case studies allow for an in-depth look at the unique formations of a few religious practices and groups.

ANTH 2365. Sport, Culture, and Society. 4 Hours.

Looks at the ways in which sport reflects and obscures social and cultural institutions. Half of the course focuses upon American sport, and the rest upon the global character that modern sport has taken on. Case studies are used from the United States, Dominican Republic, Japan, Brazil, and elsewhere.

ANTH 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ANTH 3120. Consumer Cultures. 4 Hours.

Introduces students to anthropological theories of consumption and debates about the "social life of things." Explores the politics invested in material objects ranging from hijab fashions in Teheran to forms of global hipsterism, debates about nationalism and commodity cultures, as well as the political economy of production and consumption. Includes, but is not limited to, commodity fetishism, value, social/cultural capital, distinction, neoliberalism, consumerism, and materiality.

ANTH 3410. Ethnographic Field Experience. 4 Hours.

Offers students an opportunity to experience fieldwork while studying current ethnographic methods and theory and to design a semester-long ethnographic field research project. Field sites may include public and outdoor spaces, online communities, cultural centers, schools, immigrant neighborhoods, sports organizations, social service agencies, nonprofit groups, religious institutions, etc.

ANTH 3417. Political Anthropology. 4 Hours.

Examines the anthropology of politics, focusing on the anthropology of the state. Studies the history of political anthropology with its roots in British structural-formalism and contextualizes it within the anthropology of Africa and witchcraft. Explores the linkages between the nation and the state, using classic works of Benedict Anderson on nationalism, before commencing an in-depth study of the problems of the state, classical theories of the state and statecraft, and how these ideas are traced to contemporary ethnographies of politics. Students interested in the study of resistance, displacement, social exclusion, citizenship, state violence, and communities may find this course relevant to their interests.

ANTH 3418. Wired/Unwired: Cybercultures and Technopolitics. 4 Hours.

Explores the impacts of technology and new media on politics, society, and culture. Emphasizes the socioeconomic and political frameworks within which technologies are embedded as well as the role of technology and the Internet in contemporary political and cultural movements. Topics may include the political and cultural effects of the census, the radio, and the camera; the history of the Internet; virtual worlds and communities; online politics and activism; as well as blogging, gaming, and social networking.

ANTH 3421. Foundations of Anthropological Theory. 4 Hours.

Introduces the foundations of anthropological theory. Examines recurring themes surrounding structure and agency, culture and power, and the tension between the individual and society. Addresses these questions by returning to anthropology's Enlightenment roots, early evolutionary thought, classic and contemporary theories, as well as ongoing critiques of the discipline. Explores different schools of thought, including functionalism, structural functionalism, symbolism, interpretivism, and more recent theoretical developments that address history, political economy, reflexivity, poststructuralism, and feminism, as well as transnational/global and activist approaches. Requires prior completion of two ANTH courses numbered 1000 or above.

ANTH 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ANTH 4350. Ethnography of Southeast Asia. 4 Hours.

Offers a seminar on the societies and cultures of Southeast Asia. Uses an interdisciplinary approach to this diverse and dynamic geopolitical region, with readings from anthropology, history, political science, and literature. Covers the major political and cultural changes that have shaped Southeast Asia in relation to the world—from the age of colonial expansion, to the rise of nation-states, to the present global era. Examines central questions in the ethnography of Southeast Asia, emphasizing the postcolonial legacies of Southeast Asia, states and violence, culture and mobility, and pressing contemporary issues in globalizing Southeast Asia. ANTH 4350 and INTL 4350 are cross-listed.

ANTH 4500. Latin American Society and Development. 4 Hours.

Explores the processes of social, economic, and cultural change in Latin America. While concentrating on the present, traces class formation, agrarian structures, ethnic identity, ceremonial organization, gender roles, and political conflict since the colonial era in a range of countries. Emphasizes the relationship of communities and national political and economic systems. May emphasize Central America and Mexico or countries in South America through case studies. ANTH 4500 and INTL 4500 are cross-listed.

ANTH 4505. Native North Americans. 4 Hours.

Examines Native American cultures and their reactions to Anglo-American attempts to, first, remove them from their lands and, then, incorporate them into the contemporary framework of modern America. Selects specific groups to explore contemporary issues, including native gaming, racism, gender, cultural appropriation, and economic development.

ANTH 4510. Anthropology of Africa. 4 Hours.

Explores Africa's changing place in the world. Studies the history of Africa and explores the role of ethnography in the making of colonial Africa and the cultural transformations and continuities produced by the emergence of African cities during and after colonialism. Studies postcolonial Africa to critically and comparatively engage with contemporary issues facing African societies. Considers the efflorescence of new cultural forms of music, art, film, and literature, in conjunction with new sources of identity such as nationality, religion, ethnicity, consumption, and migration. ANTH 4510 and INTL 4510 are cross-listed.

ANTH 4515. Culture and Politics in Modern India. 4 Hours.

Introduces the histories, cultures, and peoples of India. Seeks to convey a sense of how knowledge has been constructed about the region and how the subcontinent has been shaped by its engagements with the world through such processes as colonization, state building, and globalization. Uses readings, films, and class discussions to examine themes and topics that include Orientalism, postcolonialism, caste and community, gender and sexualities, conflict and violence, development and resistance, and transnational structures and processes. Critically evaluates some commonly held assumptions, including classical understandings of tradition and modernity, cohesion and conflict, and nation and identity. ANTH 4515 and INTL 4515 are cross-listed.

ANTH 4580. Special Topics in Anthropology. 4 Hours.

Designed as a specialized themes course for students with prior experience in anthropology and/or sociology. Offers unique opportunities—visiting guests, special thematic interests—which are not part of the regular curriculum. May be repeated without limit.

ANTH 4600. Senior Seminar. 4 Hours.

Designed to deal with anthropological theory and work with students who are asked to apply these theories to some of their own work. Content may vary.

ANTH 4970. Junior/Senior Honors Project 1. 4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student's major field. Combined with Junior/Senior Project 2 or college-defined equivalent for 8-credit honors project. May be repeated without limit.

ANTH 4971. Junior/Senior Honors Project 2. 4 Hours.

Focuses on second semester of in-depth project in which a student conducts research or produces a product related to the student's major field. May be repeated without limit.

ANTH 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ANTH 4992. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

ANTH 5400. Cities in Global Context. 4 Hours.

Examines the roots of the urbanization process, major ways of thinking about it, and the development of world cities and megacities. The 21st century will be a century in which urbanism is a central problem and opportunity. Considers the economic, political, cultural, and environmental dimensions of urbanism across the globe. Includes specific case studies from around the world. Encourages students to develop a knowledge of particular cities in order to examine the key themes of the course. INTL 5400, ANTH 5400, and SOCL 5400 are cross-listed.

Anthropology - CPS (ANT)

Search ANT Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=ANT>)

ANT 1150. Cultural Anthropology. 3 Hours.

Investigates the field of cultural anthropology. Covers a range of societies in terms of such sociocultural institutions as kinship, gender relations, economics, politics, and religion. Examines important political and economic processes, such as colonialism and development, affecting cultures around the world.

ANT 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ANT 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ANT 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ANT 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

Arabic (ARAB)

Search ARAB Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=ARAB>)

ARAB 1101. Elementary Arabic 1. 4 Hours.

Designed for students with very little or no prior knowledge of Modern Standard Arabic. Provides a lively introduction to basic oral expression, listening comprehension, and elementary reading and writing. Uses practical vocabulary drawn from realistic situations, and aims at good pronunciation and ease in response. Laboratory practice complements class work, enables students to work aloud at their own speed, reinforces their acquisition of essential structures, and acquaints them with various audio-visual resources.

ARAB 1102. Elementary Arabic 2. 4 Hours.

Continues ARAB 1101. Reviews and continues the study of grammar and basic language skills. Offers progressively more intensive practice in oral and written communication. Laboratory practice complements class work, enables students to work aloud at their own speed, reinforces their acquisition of essential structures, and acquaints them with various audio-visual resources.

ARAB 1301. Elementary Arabic Immersion 1. 4 Hours.

Designed for students who are in an Arabic-speaking country, this is an off-campus immersion course. Focuses on standard Arabic. Offers students an opportunity to develop grammatical and conversational competence. Focuses on oral and aural skills that are enhanced by the immersion environment.

ARAB 1302. Elementary Arabic Immersion 2. 4 Hours.

Designed for students who are in an Arabic-speaking country, this is an off-campus immersion course. Focuses on standard Arabic. Offers students an opportunity to continue to develop grammatical and conversational competence. Focuses on oral and aural skills that are enhanced by the immersion environment.

ARAB 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ARAB 2101. Intermediate Arabic 1. 4 Hours.

Emphasizes further vocabulary building. Offers students an opportunity to master the fine points of grammar through written composition, prepared oral reports, and reading and discussion from current standard Arabic materials.

ARAB 2102. Intermediate Arabic 2. 4 Hours.

Builds on ARAB 2101 and focuses on further development of vocabulary. Offers students an opportunity to continue to master grammar and conversation through written composition, prepared oral reports, and reading and discussion from current standard Arabic materials.

ARAB 2301. Intermediate Arabic Immersion 1. 4 Hours.

Designed for students who are in an Arabic-speaking country, this is an off-campus immersion course. Focuses on standard Arabic. Offers students an opportunity to continue to develop grammatical and conversational competence. Focuses on oral and aural skills that are enhanced by the immersion environment.

ARAB 2302. Intermediate Arabic Immersion 2. 4 Hours.

Designed for students who are in an Arabic-speaking country, this is an off-campus immersion course. Focuses on standard Arabic. Offers students an opportunity to continue to develop grammatical and conversational competence. Focuses on oral and aural skills that are enhanced by the immersion environment.

ARAB 2900. Specialized Instruction in Arabic. 1-4 Hours.

Designed for individuals whose language skills are at the intermediate level and who seek specially focused language instruction. Such instruction might be the use of the language in specific settings, or it might be focused on specific conversational nuances of the language. Students must have at least an elementary level of competence in the language. May be repeated without limit.

ARAB 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ARAB 3301. Advanced Arabic Immersion 1. 4 Hours.

Designed for students who are in an Arabic-speaking country, this is an off-campus immersion course. Focuses on standard Arabic as well as the local dialect. Offers students an opportunity to continue to develop grammatical and conversational competence.

ARAB 3302. Advanced Arabic Immersion 2. 4 Hours.

Designed for students who are in an Arabic-speaking country, this is an off-campus immersion course. Focuses on standard Arabic as well as the local dialect. Offers students an opportunity to continue to develop grammatical and conversational competence.

ARAB 3900. Specialized Instruction in Arabic. 1-4 Hours.

Designed for individuals whose language skills are at an advanced level and who seek specially focused language instruction. Such instruction might be the use of the language in specific settings, or it might be focused on specific conversational nuances of the language. Requires at least an advanced level of competence in the language. May be repeated without limit.

ARAB 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ARAB 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ARAB 4992. Directed Study. 1-4 Hours.

Offers students a way of going beyond work given in the regular curriculum; may also enable students to complete major or minor requirements in certain situations. Priority is given to language majors and to juniors and seniors. May be repeated without limit.

ARAB 5976. Directed Study. 1 Hour.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

Architecture (ARCH)

Search ARCH Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=ARCH>)

ARCH 1000. Architecture at Northeastern. 1 Hour.

Introduces students pursuing a major in the School of Architecture to the intellectual and extracurricular opportunities within the school and within the College of Arts, Media and Design. Exposes students to the cultural vibrancy of Boston with the goal of building networks to facilitate the creation of a vibrant and supportive learning community.

ARCH 1110. Fundamental Architectural Representation. 4 Hours.

Introduces students to architectural representation as a form of documentation, experimentation, and communication through a series of exercises in orthographic, axonometric, and perspectival projection as well as physical and digital modeling. Supports the development of an iterative design methodology by introducing students to the tools of representation. Includes theoretical lectures and workshops in analog and digital media.

ARCH 1120. Fundamental Architectural Design. 6 Hours.

Introduces architectural design. Examines a number of approaches to spatial organization, massing, and envelope articulation through the analysis of pertinent case studies as well as through a series of fast-paced design exercises. Offers students an opportunity to develop a single design through a series of design studies that deal with issues of site planning, program, user input, and collective negotiation. Requires a portfolio demonstrating the student's representational abilities and iterative design process.

ARCH 1310. Buildings and Cities, A Global History. 4 Hours.

Introduces students to architecture, as understood through buildings, cities, and landscapes from antiquity to the present. Studies important monuments in the global history of architecture, as well as tools for analyzing the built environment. Considers buildings in relation to their political, social, economic, and cultural context, and as expressions of diversity in human societies and cultural perspectives. Topics include the language of architecture, architectural drawings, the classical orders, the problem of ornament, construction techniques, materials, site, and the role of the patron. Develops students' eye for composition in two and three dimensions, aesthetic discrimination of detail, ability to see buildings as part of a larger social and cultural fabric, and critical judgment in speaking and writing.

ARCH 1311. Recitation for ARCH 1310. 0 Hours.

Offers a small-group discussion format to cover material in ARCH 1310.

ARCH 1320. Architecture and Global Cultures, 1400 to Present. 4 Hours.

Offers a chronological history of early modern architecture. Focuses on significant moments in Western culture as well as the architecture and planning of Mughal India, Ottoman Empire, and Japan. Continues major themes from ARCH 1310. Also covers ideal cities and urban planning, the relationship between theory and practice, the Enlightenment, the emergence of the professional architect, trade, colonization, and landscape.

ARCH 1321. Recitation for ARCH 1320. 0 Hours.

Offers a small-group discussion format to cover material in ARCH 1320.

ARCH 1350. American Architecture. 4 Hours.

Offers an introduction to the history, theory, and criticism of American architecture and urban planning from the mid-1600s to the 1930s. Explores the social and cultural forces that shape the built environment. Examines European influences as well as uniquely American contributions. Emphasizes the work of Louis Sullivan, H. H. Richardson, and Frank Lloyd Wright.

ARCH 1370. Special Topics in Architectural History. 4 Hours.

Focuses on various topics in architectural history.

ARCH 1450. Understanding Design. 4 Hours.

Introduces undergraduates at all levels to the importance of design thinking as a method of inquiry and problem solving. Each class meeting includes a short presentation on a different kind of design problem (houses, furniture, electronics, automobiles, apparel, tools, interiors, cities, typography, information, tall buildings, networks, etc.) and then an interview with a leading practitioner at a roundtable on the stage. Evaluation is based on quizzes and student presentations. Seeks to expose students to the power of design thinking as a tool for multi-variable problem solving.

ARCH 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ARCH 2130. Site, Space, and Program. 6 Hours.

Studies how to analyze, draw, and model the built environment. Students engage in issues of program, composition, type, and material. Offers students the opportunity to think conceptually about architectural design.

ARCH 2140. Urban Institutions. 6 Hours.

Studies how to analyze, model, and intervene in the city. Offers students an opportunity to engage in urban analysis, urban massing strategies, and architectural design of urban institutions.

ARCH 2170. Urban Research Studio: Context, Sustainability, Development. 6 Hours.

Seeks to develop students' technical skills and critical thinking in the studio environment through a semesterlong research and design project. Offers students an opportunity to investigate an urban site in the Boston area: investigating possible solutions, focusing on strengthening conceptual strategies, and articulating a developed argument through their research and design process.

ARCH 2240. Architectonic Systems. 4 Hours.

Introduces the theory of materials and structures. Examines basic structural elements in masonry and wood construction. Uses historical and current building types to explore the relationship between structure, materials, construction process, and architectural space. Includes lectures, discussions, field trips, and student presentation of structural models and diagrams.

ARCH 2250. Introduction to Sustainable Design in Architecture. 4 Hours.

Explores the issues and practices of architectural design as it relates to natural systems, using critical readings of seminal and current texts, lectures, films, field trips, and projects that use both design and analysis as means of inquiry. Examines varied approaches to sustainable design, including using nature and wilderness as models; biophilia; biomimicry; material sources and reuse; accounting systems such as LEED, Zero Net Carbon, and the 2030 Challenge; and the Living Building Challenge. Course work couples these thematic explorations with projects that investigate the application of the ideas in built form. Designed to offer both a broad understanding of sustainable design and a deep understanding of the varied ways one might approach green as a design professional.

ARCH 2260. Introduction to Building Systems. 4 Hours.

Introduces fundamentals of building technology and explores technology as means and manifestation of architecture in the world. Using a systems approach, studies the interactions among natural forces, material properties, technological capabilities, and human cultural values and the ways these relationships give rise to architecture. Considers a series of physical principles—including gravity, moisture, heat, light, and air—to reveal specific architectural possibilities and material responses. Explores the ways design shapes the interaction of materials and forces to provide for human safety, shelter, comfort, and delight through a combination of hands-on workshops, seminal readings, and design exercises.

ARCH 2310. Chinese Architecture 1: Premodern. 4 Hours.

Covers the development of the built environment in China from prehistory to the nineteenth century. Emphasizes technological transformation, structural and stylistic evolution, cultural exchange, and ideological engagement.

ARCH 2320. Chinese Architecture 2: Modern. 4 Hours.

Covers the development of the built environment in China from 1840 to the present. Emphasizes educational and professional shifts in architectural practice, political engagement in the design process, structural and technological transformation, conceptual background, and global impact.

ARCH 2330. Architecture, Modernity, and the City, 1800 to 1910. 4 Hours.

Focuses on architecture and urban design in the United States and Europe from 1800 to 1910. Major topics include the birth of the modern city and urban planning, capitalism and industrialization, modern typologies, infrastructure, urban parks and early suburbs, materials and technology, Western architecture in colonial India and Asia, architectural education, and modern architectural theory.

ARCH 2331. Recitation for ARCH 2330. 0 Hours.

Offers a small-group discussion format to cover material in ARCH 2330.

ARCH 2335. Architecture and Politics. 4 Hours.

Draws on examples from the late 19th century to the present to study how governments have sought to use buildings and public spaces to advance political ideals. Considers a range of building projects (public buildings, housing, public spaces, infrastructure) advanced by liberal democracies as well as those designed for authoritarian regimes. Focuses on individual projects and the political circumstances tied to their making. Also considers the afterlife of projects associated with discredited regimes—especially those of Nazi Germany and Fascist Italy—as well as the ways in which private individuals, corporations, and other agencies have worked in tandem or in opposition to official narratives. Theoretical and critical texts that explore the dynamic between physical environment and political power help frame class discussion at key moments.

ARCH 2340. Architecture, Modernity, and the City, 1910 to 1980. 4 Hours.

Examines the forms and principles of European and American architecture of the twentieth century in the context of society's changing conditions. Major topics include craft vs. industry, avant-garde and "other" modernisms, the architect and critical positions, suburbs, new concepts of space, modernism and its critique, and global extensions of modernism.

ARCH 2341. Recitation for ARCH 2340. 0 Hours.

Offers a small-group discussion format to cover material in ARCH 2340.

ARCH 2350. American Architecture. 4 Hours.

Examines several recurring themes in the history of architecture and urbanism in the United States from the mid-18th century to the mid-20th century. Discusses how notions of environmental determinism continuously shaped and reshaped American understandings of architecture, especially in urban settings. Questions the relationship between architecture and power and the ways in which the burgeoning republic, and then the imperial superpower, attempted to reconcile its often contested identity through built form. Explores the role of technology in shaping architectural designs and construction practices.

ARCH 2550. Real Estate Development and Design. 4 Hours.

Introduces the challenges and opportunities in real estate development for design professionals. Offers students an opportunity to obtain the knowledge and skills necessary to engage meaningfully in real estate development, which is exercised through application to real-life problems. Reviews the property types, terminology, and core concepts in the real estate industry; introduces a set of analytical tools and techniques for evaluating real estate investment and development; and explores innovation and entrepreneurship in real estate development practice models.

ARCH 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at consortium institutions. May be repeated without limit.

ARCH 2991. Research in Architecture. 1-4 Hours.

Offers an opportunity to conduct introductory-level research or creative endeavors under faculty supervision.

ARCH 3155. Studio Abroad. 1-6 Hours.

Offers students an opportunity to understand the challenges of designing contemporary building types in parallel situations—the dense historic fabric of a city with ancient origins that has been manipulated over centuries and the more diffused, diverse, and irregular landscape typically found on the edge of the modern city. Offered only abroad.

ARCH 3170. Architecture, Infrastructure, and the City. 6 Hours.

Offers a studio course addressing the architectural and urbanistic consequences at the intersection of large-scale infrastructure and the contemporary city. Focuses on how to integrate buildings and neighborhoods with highways, rail lines, storm water management, bus, bike, parking, rivers, watersheds, and industrial networks.

ARCH 3210. Environmental Systems. 4 Hours.

Explores the interaction of environmental, physical, and energy systems in architecture. Offers students an opportunity to learn the fundamentals of building science as design opportunities to create particular conditions of light and shadow; provide shelter from heat, cold, and rain; and incorporate systems that provide for water, electricity, and sanitation. Course revolves around a series of workshops, labs, and design exercises.

ARCH 3211. Recitation for ARCH 3210. 0 Hours.

Offers a small-group discussion format to cover material in ARCH 3210 and provide opportunities for hands-on and creative work, both individually and in teams.

ARCH 3351. Architecture Topics Abroad: Theory. 1-4 Hours.

Explores, defines, and analyzes the embodied time within urban artifacts (ruins, buildings, urban landscape and space, infrastructure) of a historic context. Focuses on the architecture and urban artifacts that are the consequence of the evolutionary forces of urban civilization over long durations of time rather than focusing on iconographic examples of architecture and urbanism produced within a specific moment in history. Students engage in theoretical readings, group discussions, site visits, analyses of evolutionary urban artifacts, writing, and drawings. Assigned readings cover a broad range of theories about analyzing and interpreting the urban context and its history. These readings are complemented by both required writing assignments and site visits to many urban artifacts, buildings, and spaces. May be repeated without limit.

ARCH 3352. Architecture Topics Abroad: Drawing. 4 Hours.

Examines and engages historic architecture and urbanism through freehand drawing. Offers students an opportunity to learn how to draw in freehand like an architect—drawing in a creative, interpretive, precise, and analytical manner—as well as to learn about the history and cultural context of the great architectural monuments and urban spaces that they are analyzing and drawing, including major architectural monuments. Studies new skills of drawing, the conventions of architectural representation, and the cultural history of the built environment. May be repeated without limit.

ARCH 3361. Architecture and Urbanism Abroad. 4 Hours.

Covers the detailed history of architecture and urban development in the host city, from its founding to the present. Offered only abroad.

ARCH 3362. Seminar Abroad. 1-4 Hours.

Offers students an opportunity to learn and discuss historical and contemporary European theory and criticism, from Vitruvius and Alberti to contemporary figures. Raises and addresses architectural questions of composition, society, politics, and environment. Offered only abroad.

ARCH 3363. Field Study Topics Abroad. 1-4 Hours.

Offers students an opportunity to travel to select cities where, together with the faculty lead, they study firsthand the built and natural environment. This field study course is closely tied to ARCH 3361.

ARCH 3370. Topics in Architectural History. 4 Hours.

Covers a variety of topics in architectural history and theory with the aim of offering students a greater degree of choice in shaping their curriculum and the opportunity to study subjects that interest them in greater detail. Course topics encompass a wide range of themes and complement the mission of the department, the college, and the university. Taught by a number of different faculty members according to their interests and expertise.

ARCH 3440. Workshop Topics Abroad. 1-4 Hours.

Offers students an opportunity to develop their analytical, artistic, and craft abilities, dealing with topics and methods outside the confines of the architectural disciplines such as site-specific installations, graphic novels, and short films, among others.

ARCH 3450. Advanced Architectural Communication. 4 Hours.

Builds on CAD (computer-aided design) skills to develop ability to model in three dimensions and develop surfaces and lighting. Also addresses strategies in design communication for effective presentation of digital material.

ARCH 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at consortium institutions. May be repeated without limit.

ARCH 4850. Urban and Architectural History Abroad. 4 Hours.

Offers an on-site study of architecture and urban history conducted abroad. Instructors accompany students to visit and lecture about the most significant sites in the history of architecture, art, and urban development of a specific country. In comparison to a traditional on-campus course, the number of examples covered is smaller; however, each example is discussed in much greater detail. Encourages students to discover problems and aspects in art, architecture, and urbanism that have not been raised before, something only possible through direct survey and observation. Offers students an opportunity to obtain a real sense of architectural research without neglecting the basics of the field. Interactions with practicing architects, city planners, policymakers, preservationists, museum professionals, and artists are integral parts of this course. May be repeated without limit.

ARCH 4960. Architectural Studies Capstone. 4 Hours.

Offers students an opportunity to deeply explore topics related to architecture and the built environment. Students complete a semester-long intensive research and writing capstone project. Offered in the final year of the BS in Architectural Studies program.

ARCH 4970. Junior/Senior Honors Project 1. 4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student's major field. Combined with Junior/Senior Project 2 or college-defined equivalent for 8 credit honors project. May be repeated without limit.

ARCH 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at consortium institutions. May be repeated without limit.

ARCH 4993. Independent Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

ARCH 4996. Experiential Education Directed Study. 4 Hours.

Draws upon the student's approved experiential activity and integrates it with study in the academic major. Restricted to those students who are using the course to fulfill their experiential education requirement. May be repeated without limit.

ARCH 5115. Option Studio. 6 Hours.

Offers an upper-level design studio that covers new studio topics, content, and studio instructors each semester. The studio instructors offer topical content that best aligns with their research and practice expertise, which provides students with the latest concepts in architectural design, theory, and research on a consistently updated and rotating basis. Students select their top choices of studio topics and instructors, giving them more flexibility in the areas for which they would like to focus their education.

ARCH 5120. Comprehensive Design Studio. 6 Hours.

Focuses on the materials and making of architecture. Considers architectural connections at all scales, from the nut and bolt to the scale of a door or window to the scale of the whole building and the city. Grounds design proposals upon a tectonic strategy, unlike traditional design studios that produce a schematic design before considering constructional ideas.

ARCH 5210. Environmental Systems. 4 Hours.

Explores the ways in which architectural form can create particular conditions of light and shadow; provide shelter from heat, cold, and rain; and incorporate systems that provide for water, electricity, and sanitation. Provides a series of simple and straightforward small-scale design projects.

ARCH 5211. Recitation for ARCH 5210. 0 Hours.

Offers a small-group discussion format to cover material in ARCH 5210.

ARCH 5220. Integrated Building Systems. 4 Hours.

Studies how to integrate into students' building designs all the environmental and tectonic systems that they have covered in previous architecture courses.

ARCH 5230. Structural Systems. 4 Hours.

Introduces the fundamental concepts of structural analysis and design for architecture. Examines the nature of forces and their effects on different types of structural elements; the structural properties of shapes and materials; and the selection, analysis, and design of efficient structural systems that resist the loads acting upon them. Uses historical and contemporary examples to illustrate how the changing context of architectural ideas drives structural form and the selection of structural systems. Includes field trips and student presentations of structural models and diagrams. Restricted to students in the architecture BS program and to students in the three-year MArch program.

ARCH 5231. Recitation for ARCH 5230. 0 Hours.

Provides a small-group discussion format to cover examples from the material in ARCH 5230.

ARCH 5310. Design Tactics and Operations. 4 Hours.

Encourages students to develop the connections between critical attitudes and techniques in design, through important historical texts. Offers a kind of "great books" approach to the integration of design and history, introducing the writings and seminal designs of Alberti, Palladio, Wright, Le Corbusier, Semper, Sitte, Rowe, Colquhoun, Moneo, Koolhaas, Rossi, Frampton, Venturi and Scott Brown, Scarpa, and Lynch.

ARCH 5530. Innovative Models in Real Estate Development and Design. 4 Hours.

Addresses advanced topics in real estate development and finance and examines innovative models of practice in real estate development available to design professionals. Studies a set of advanced analytical tools and techniques for evaluating the cash flows and economic returns of real estate investment and development. Introduces advanced methods of financing real estate and the structure of capital markets involved in property assets. Uses the case instruction method and includes active, discussion-oriented learning.

ARCH 6100. Graduate Skills Studio. 6 Hours.

Presents students new to architecture with the fundamentals of three-dimensional thinking and spatial representation with a series of increasingly complex assignments. Offers students an opportunity to learn a wide variety of graphical software tools and then use these tools to complete their assignments. Covers freehand sketching and physical model building skills. This intensive course is taught as a hands-on design studio (with ample studio access outside class meetings).

ARCH 6200. Graduate Studio 1: Architectural Design. 6 Hours.

Focuses on a series of increasingly complex assignments that emphasize the fundamentals of architectural design. Offers students an opportunity to propose and test proposals through an iterative process using a wide variety of tools and media, including design software, physical models, and freehand sketches. Explores spatial definition, the orchestration of a spatial sequence, modulation of natural light, and responsiveness to existing conditions (whether natural or man-made). Taught as a hands-on design studio (with ample studio access outside class meetings).

ARCH 6330. Seminar in Modern Architecture. 4 Hours.

Examines the state of architecture and urbanism in the two decades leading up to 2000. Explores contemporary issues in architectural theory and urban design. Examines a broad range of ideas affecting contemporary developments in architectural practice. Engages cultural and historical forces as well as contemporary criticism to define the nature of modernism, late modernism, postmodernism, and deconstruction. Case studies, analysis of theoretical models, and application of methods of history provide students with support for their own design work in studio and co-op experiences.

ARCH 6340. Graduate Topics in Architecture. 4 Hours.

Explores focused research topics relevant to the graduate program curriculum. The professor presents his or her research related to a particular urban, architectural, or technical topic. This exposes the students to methods of research and topics in current and ongoing research in the field. The students have an opportunity to engage in related and parallel research projects during the course of the semester. May be repeated without limit.

ARCH 6430. Case Studies 1. 4 Hours.

Focuses on how architectural practice occurs and must be understood within a larger social context. The cultures-interests and objectives-of the constellation of participants in the bringing of a building to completion are dynamic, diverse, and complex, especially in an urban environment. Seeks to make sense of this broader social contract from within the perspective of professional design practice. As one of many participants in the process of bringing a building to completion, students review the roles, responsibilities, and interests of each contributor. Our task is to understand the obligations and constraints that constitute these relationships. Examines the products of design as manifestations of these relationships and situates them within a discourse of value-determined actions. Investigates normative and critical professional practices through selected readings and individual field research. Develops project case studies that provide examples of excellent design results achieved through the application of expert professional practices.

ARCH 6440. Case Studies 2. 4 Hours.

Continues ARCH 6430. Builds on the understanding of professional practice developed in the previous course and investigates the array of "artful ways in which some practitioners deal competently with the indeterminacies and value conflicts of practice." These indeterminacies, uncertainties, and value conflicts are part of a rapidly changing, dynamic world. There is an unprecedented need for flexible and responsive practices that can bridge the gap between traditional professional techniques and these situations. Requires core competencies that are not mismatched with the changing situations of practice. Requires new skills as well as traditional analytic techniques to respond adequately to these unique conditions of work. Through a closer examination and development of an in-depth project case study, students speculate on possible approaches to a revised and restructured model of professional knowledge and guidelines for reflective practice that can sustain a culture of design excellence.

ARCH 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ARCH 7130. Master's Research Studio. 6 Hours.

Offers the research portion of a two-part graduate project focused on the complex issues facing the postindustrial landscape of the contemporary city. Examines in detail the design elements of everyday building types, such as office buildings, labs, parking garages, and retail spaces, with an eye toward creating new prototypes for urban architecture that are informed by the realities of contemporary market forces. Provides the foundation for the more speculative design proposals of ARCH 7140. May be repeated without limit.

ARCH 7140. Master's Degree Project. 6 Hours.

Offers the second of a two-part degree project focused on manipulating contemporary market-driven building types. Seeks to invent new variations and hybrids from the existing store of urban building types to address new challenges, such as irregular sites, new adjacencies, and other unmet demands in cities. Based on research, analysis, and modeling of different types done in the first semester, offers students an opportunity to propose synthetic solutions to the complex problems of postindustrial development, housing, and identity facing the contemporary city. May be repeated without limit.

ARCH 7962. Elective. 1-4 Hours.

Offers elective credit for courses taken at consortium institutions. May be repeated without limit.

ARCH 7976. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on chosen topics. May be repeated without limit.

Army ROTC (ARMY)

Search ARMY Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=ARMY>)

ARMY 1101. Introduction to the Army and Critical Thinking. 1 Hour.

Introduces cadets to the Army and the Profession of Arms. Examines the Army profession and what it means to be a professional in the U.S. Army. Offers students an opportunity to develop basic knowledge and comprehension of the Army Leadership Requirements Model while gaining a complete understanding of the Reserve Officers' Training Corps (ROTC) program, its purpose in the Army, and its advantages for the student. Cadets also have an opportunity to learn how resiliency and fitness support their development as an Army leader. Includes a leadership laboratory where cadets conduct practical applications of their military science curriculum.

ARMY 1102. Introduction to the Profession of Arms. 1 Hour.

Introduces cadets to the personal challenges and competencies that are critical for effective leadership. Offers cadets an opportunity to learn how the personal development of life skills such as critical thinking, time management, goal setting, and stress management relate to leadership and the Army profession; to learn the basics of the communications process; and the importance for leaders to develop the essential skills to effectively communicate in the Army. Includes a leadership laboratory where cadets conduct practical applications of their military science curriculum.

ARMY 1111. Introduction to the Army and Critical Thinking Lab. 0 Hours.

Accompanies ARMY 1101. Introduces basic soldier skills and introduces squad-level tactical operations in Leadership Lab. Students also participate in physical fitness training three days per week.

ARMY 1112. Introduction to the Profession of Arms Lab. 0 Hours.

Accompanies ARMY 1102. Introduces basic soldier skills and introduces squad-level tactical operations in Leadership Lab. Students also participate in physical fitness training three days per week.

ARMY 2201. Leadership and Decision Making. 3 Hours.

Focuses on leadership and decision making. Seeks to add depth to the cadets' understanding of the Adaptability Army Learning Area. Outcomes are demonstrated through critical and creative thinking and the ability to apply troop leading procedures (TLP) to apply innovative solutions to problems. The Army profession is also stressed through leadership forums and a leadership self-assessment. Requires students to apply their knowledge outside the classroom in a hands-on performance-oriented environment during leadership labs and other field activities (team-building exercises, leadership development exercises).

ARMY 2202. Army Doctrine and Team Development. 3 Hours.

Focuses on Army doctrine and team development. Begins the journey to understand and demonstrate competencies as they relate to Army doctrine, Army values, teamwork, and warrior ethos. Stresses their relationship to the law of land warfare and philosophy of military service. Covers the ability to lead and follow through team-building exercises in small units up to squad level. Requires students to apply their knowledge outside the classroom in a hands-on performance-oriented environment during leadership labs and other field activities (team-building exercises, leadership development exercises).

ARMY 2211. Leadership and Decision Making Lab. 0 Hours.

Accompanies ARMY 2201. Introduces basic soldier skills and squad-level tactical operations in leadership lab. Includes participation in physical fitness training.

ARMY 2212. Army Doctrine and Team Development Lab. 0 Hours.

Accompanies ARMY 2202. Introduces basic soldier skills and squad-level tactical operations in leadership lab. Includes participation in physical fitness training.

ARMY 3301. Training Management and the Warfighting Functions. 4 Hours.

Focuses on training management and the warfighting functions. Constitutes an academically challenging course where the cadet is required to study, practice, and apply the fundamentals of training management and how the Army operates through the warfighting functions. At the conclusion of this course, the successful cadet should be capable of planning, preparing, and executing training for a squad conducting small-unit tactics. Requires students to apply their knowledge and leadership competencies outside the classroom in a hands-on performance-oriented environment during leadership labs and other field activities (team-building exercises, leadership development exercises). Requires prior completion of ARMY 1101, ARMY 1102, ARMY 2201, and ARMY 2202 or equivalent military experience.

ARMY 3302. Applied Leadership in Small Unit Operations. 4 Hours.

Focuses on applied leadership in small-unit operations. Constitutes an academically challenging course where the cadet is required to study, practice, and apply the fundamentals of direct-level leadership and small-unit tactics at the platoon level. At the conclusion of this course, the successful cadet should be capable of planning, coordinating, navigating, motivating, and leading a platoon in the execution of a mission. Seeks to prepare the cadet for the ROTC Cadet Leader Course (CLC), which the cadet attends in the summer at Fort Knox, KY. Requires students to apply their knowledge and leadership competencies outside the classroom in a hands-on performance-oriented environment during leadership labs and other field activities (team-building exercises, leadership development exercises). Requires prior completion of ARMY 1101, ARMY 1102, ARMY 2201, and ARMY 2202 or equivalent military experience.

ARMY 3311. Training Management and the Warfighting Functions Lab. 0 Hours.

Accompanies ARMY 3301. Introduces basic soldier skills and introduces squad-level tactical operations in leadership lab. Includes participation in physical fitness training.

ARMY 3312. Applied Leadership in Small Unit Operations Lab. 0 Hours.

Accompanies ARMY 3302. Introduces basic soldier skills and introduces squad-level tactical operations in leadership lab. Includes participation in physical fitness training.

ARMY 3503. American Military History. 4 Hours.

Focuses on the employment of the armed forces while examining the underlying factors that affected warfare, starting in the seventeenth century. Begins with European warfare and concludes with the issues facing the United States military today. Provides significant coverage of military operations and innovations to warfare. Encourages new ideas, thoughts, and creative discussion from students. ROTC students are expected to register concurrently for ARMY 3513.

ARMY 3504. Contemporary Army Operations. 2 Hours.

Introduces the roles and organization of the United States Army's Active, Reserve, and National Guard components. Uses these concepts as building blocks to discuss United States Army doctrine and tactics, and examines recent and ongoing military operations around the world. ROTC students are expected to register concurrently for ARMY 3514.

ARMY 3513. American Military History Lab. 0 Hours.

Offers a leadership lab introducing basic soldier skills and squad-level tactical operations.

ARMY 4011. The Army Officer. 4 Hours.

Focuses on development of the Army officer. Constitutes an academically challenging course where the cadet has an opportunity to develop knowledge, skills, and abilities to plan resources and assess training at the small-unit level and to learn about Army programs that support counseling subordinates and evaluating performance, values, and ethics; career planning; and legal responsibilities. At the conclusion of this course, the successful cadet should be familiar with how to plan, prepare, execute, and continuously assess the conduct of training at the company or field-grade officer level. Requires students to apply and refine their leadership competencies as they develop and plan outside the classroom in hands-on performance-oriented environments during leadership labs and other field activities (team-building exercises, leadership development exercises).

ARMY 4012. Mission Command and the Company Grade Officer. 4 Hours.

Offers cadets an opportunity to develop knowledge, skills, and abilities required of junior officers pertaining to the Army in unified land operations and company-grade officer roles and responsibilities. Includes small-group assignments, briefings, case studies, practical exercises, and an oral practicum. The oral practicum explores the cadet's knowledge of preparation for the 20 Army warfighting challenges covered throughout the advanced course. Seeks to assist the cadet in preparing for the BOLCB course and is a mandatory requirement for commissioning. Requires students to apply and refine their leadership competencies as they develop and plan outside the classroom in hands-on performance-oriented environments during leadership labs and other field activities (team-building exercises, leadership development exercises).

ARMY 4411. The Army Officer Lab. 0 Hours.

Introduces basic soldier skills and squad-level tactical operations in leadership lab. Includes participation in physical fitness training.

ARMY 4412. Mission Command and the Company Grade Officer Lab. 0 Hours.

Introduces basic soldier skills and squad-level tactical operations in leadership lab. Includes participation in physical fitness training.

ARMY 4993. Independent Study. 1-4 Hours.

Offers independent study under direction of department staff. Intended for terms abroad. Students research the organization, characteristics, and mission of the military forces of the country where they are studying abroad. Emphasis is on recent and current operations in a regional and/or global context as well as engagement activities with the United States military. Requires prior completion of basic course or equivalent military experience (prior service, USAR, ARNG, ROTC, Leader's Training Course). May be repeated without limit.

Art - CPS (ART)

Search ART Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=ART>)

ART 1101. Introduction to Art. 3 Hours.

Introduces the language of the visual arts with an emphasis on style, techniques, and content in painting, sculpture, graphic arts, and architecture. Includes slide lectures, discussions, and student visits.

ART 1145. American Cinema. 3 Hours.

Explores the uniquely distinguishing characteristics of American cinema. Covers camera angles, lighting, editing, sound, acting, narrative structure, and construction of point of view. Analyzes such recurring concerns of American cinema as the individual and community, issues of masculinity and violence, urban alienation, uprootedness, and adolescence.

ART 1200. Digital Photography. 3 Hours.

Designed to acquaint the beginner with the use of digital tools to manipulate and create digital imagery. Offers students an opportunity to learn to create a 360-degree panoramic photograph, digital slideshows, photographs for the web, and advanced techniques for negative scanning and advanced RAW file manipulation. Requires weekly assignments, demonstrations, hands-on experience, and a final portfolio. Students must supply their own 4-megapixel or greater camera. Intended as an entry-level course for visual artists and amateur photographers who wish to learn to express themselves using digital imaging.

ART 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ART 2000. Typography: Communicating Content with Form. 3 Hours.

Offers students an opportunity to obtain an understanding of effects produced by fonts and typographic techniques used in contemporary visual design. Uses computer-based graphic design software to present a historical overview of typography and to explore formal qualities of characters and typefaces through applied projects. Seeks to guide students' understanding of how successful graphic design that includes letters and words depends on clear and appropriate typography to express and communicate information.

ART 2100. Foundation in Visual Communication. 3 Hours.

Offers students an opportunity to gain knowledge of the fundamental elements of 2D design in order to explore the concept of pictorial order and to understand the principles of organization and formal elements of 2D design as communication tools.

ART 2200. Fundamentals of Graphics and Publishing Production. 3 Hours.

Introduces the terminology, concepts, and applications of computer graphic software, including vector-based, raster-based, page layout, and PDF (Portable Document Format) creation programs. Offers students an opportunity to design, develop, and produce a variety of communication projects using a combination of industry-standard production tools.

ART 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ART 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ART 4100. Graphic Communication 1. 3 Hours.

Builds on students' understanding of elements of design, spatial relationships, typography, and imagery. Guides development of graphic design skills using traditional and digital tools, along with materials and procedures employed in the communication arts industry. Offers students an opportunity to learn to solve problems in graphic design, including typographic and pictorial elements and their integration with verbal content to communicate ideas.

ART 4110. Graphic Communication 2. 3 Hours.

Continues the examination of elements of design, spatial relationships, typography, and imagery. Offers students an opportunity to engage in creative work in graphic design with an emphasis on design concepts for client presentations. Explores effective problem-solving techniques by taking a variety of projects from concept to finished presentation. Introduces students to operating procedures in the art department, design studio, and printing plant.

ART 4120. Advertising Design. 3 Hours.

Studies principles and concepts of layout and design as applied to a variety of advertising and graphic design assignments such as ads, brochures, logos, posters, book jackets, and sales promotion material. Offers students an opportunity to obtain an understanding of marketing fundamentals and issues for different media. Presents creative work in advertising research analysis, layout, and preparation of client presentations. Covers advanced concepts and design principles used in planning visualizations and layouts for advertising and editorial presentations using art, photography, type, color, and illustrations.

ART 4950. Seminar. 1-4 Hours.

Offers an in-depth study of selected topics.

ART 4955. Project. 1-4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student's major field. May be repeated without limit.

ART 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ART 4995. Practicum. 1-4 Hours.

Provides eligible students with an opportunity for practical experience.

ART 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

Art - Design (ARTG)

Search ARTG Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=ARTG>)

ARTG 1250. Design Process Context and Systems. 4 Hours.

Explores common design practices, principles, and vocabularies, introducing the design process as a method of inquiry and problem solving through studio projects. Emphasizes the importance of an awareness of audience and context in the creation of meaningful communications and experiences. Explores the practice of design as an iterative process, offering students an opportunity to obtain an understanding of the value of systems thinking and the importance of feedback and exchange as a means for assessing the quality of design's effectiveness in helping users achieve their goals.

ARTG 1255. Design Process Context and Systems Abroad. 4 Hours.

Explores common design practices, principles, and vocabularies, introducing the design process as a method of inquiry and problem solving through studio projects. Emphasizes the importance of an awareness of audience and context in the creation of meaningful communications and experiences. Explores the practice of design as an iterative process, offering students an opportunity to obtain an understanding of the value of systems thinking and the importance of feedback and exchange as a means for assessing the quality of design's effectiveness in helping users achieve their goals. Taught abroad. May be repeated without limit.

ARTG 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ARTG 2250. Typography 1. 4 Hours.

Introduces typography as the basis of graphic design and visual communication. Guides students through an understanding of letterforms, words, sentences, and text as both image and information. Studies form, context, and visual meaning. Introduces use of the typographic grid and issues of hierarchy and legibility through assigned projects, readings, and lectures. Includes the historical evolution of typefaces and their classification as a rational system.

ARTG 2251. Type Tools. 1 Hour.

Offers students an opportunity to acquire technical software skills used in typesetting, such as Adobe InDesign, in this introductory lab.

ARTG 2252. Graphic Design 1. 4 Hours.

Explores graphic form and vocabulary through the development of icons and symbols. Applies graphic design principles to the correlation of forms with their function, content, and context. Incorporates a variety of media as visual communication elements.

ARTG 2260. Programming Basics. 4 Hours.

Exposes students to basic programming design for user interfaces. Offers students an opportunity to become familiar with the logical elements of programming languages. Through lectures, hands-on in-class exercises, and modular projects, explores Web-based design and programming solutions for managing interaction and animation.

ARTG 2400. Interaction Design 1: Responsive. 4 Hours.

Applies information design principles to Web and mobile interface design. Explores user-centered interface and programming design strategies for the delivery of responsive data-driven websites. Discusses audience definition, content development, information structuring, and navigation. Emphasizes tools and strategies for design, such as site maps, wireframes, prototypes, usability testing, and iterative development. Offers students an opportunity to obtain meaningful interactive experiences through team-based projects.

ARTG 2401. Interaction Design Tools. 1 Hour.

Introduces skills and software used in designing and developing Web-based interactive environments. Explores Web-page scripting and tagging, CSS-based design coding, options for front- and back-end page design connections, and alternative technologies.

ARTG 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ARTG 3250. Physical Computing. 4 Hours.

Explores the communication between the physical world and the interactive, computer-based interface. Examines the potential of reactive analog and digital devices embedded within the physical realm. Offers students an opportunity to use simple kit sensors and indicators designed to enable student teams to create interfaces triggered by gesture, bodily movement, physical forces, and other tangible actions. Concludes with discussions of more complex interactive devices, the relationship between physical computing and robotics, and possible future directions.

ARTG 3350. Typography 2. 4 Hours.

Continues ARTG 2250, exploring structures and hierarchies through increasing typographic complexity. Investigates meaning, legibility, and readability with an emphasis on voice, organization, sequence, and the typographic grid.

ARTG 3351. Time-Based Design. 4 Hours.

Introduces principles of time-based media—such as anticipation, interval, succession, and rhythm—through a series of analog and digital projects. Explores the potential of communicating information over time with a focus on kinetic typography and visual/sonic narratives. Examines concepts from film, music, and other related time-based arts through assignments, lectures, and student presentations. .

ARTG 3450. Graphic Design 2. 4 Hours.

Explores the conceptual potential inherent in the merging of words/text with images/symbols to achieve a level of communication that exceeds the sum of visual and verbal components. Examining how the relationship of verbal and visual content can enhance meaning and comprehension, students identify a social issue of personal relevance and create a visual campaign targeting a core audience. Through a process including projects, readings, and lectures/discussions, students research, frame concepts, explore visual decisions, and determine appropriate deliverables.

ARTG 3451. Information Design 1. 4 Hours.

Introduces basic concepts, methods, and procedures of information design with a focus on mapping information. Students investigate visual systems and information structures such as maps, graphs, charts, and diagrams. Emphasizes the creative process of organizing, visualizing, and communicating data by making complex information easier to understand and use.

ARTG 3460. Identity and Brand Design. 4 Hours.

Addresses the origins, significance, and consequence of identity and branding expressions, in diverse media, in terms of personal, cultural, and commercial values. Using design research and studio methods, a series of exercises explores expressions of individual and collective identity. Offers students an opportunity to work in teams to develop branding projects in a process designed to increase their capacity to create effective brand expressions and analyze semiotic significance and cultural and economic value. Critique of work and presentation of concepts of identity and brand seek to sharpen students' skills and challenge their ideas about brand. External critique seeks to create valuable tests of bias and assumptions, while principles of managing attention and trust seek to build the ability to function as a brand steward in actual practice. .

ARTG 3462. Experience Design 1. 4 Hours.

Investigates a wide range of design research methods and means of representing user intentions and actions in order to develop coherent designs based on the needs of the user. Includes use of context assessment, user experience audits, and scenario development as means to understand the motivations, behaviors, and values of audiences and participants.

ARTG 3463. Experience Design 2. 4 Hours.

Continues ARTG 3462 processes and strategies for creating compelling human-centered experiences. Offers students an opportunity to use design processes from multiple disciplines to develop real-world solutions.

ARTG 3465. Experience Design 1 Abroad. 4 Hours.

Investigates a wide range of design research methods and means of representing user intentions and actions in order to develop coherent designs based on the needs of the user. Includes use of context assessment, user experience audits, and scenario development as a means to understand the motivations, behaviors, and values of audiences and participants. Taught abroad. May be repeated without limit.

ARTG 3510. Contextual and Theoretical Studies 2. 4-6 Hours.

Seeks to develop broader knowledge and understanding of the historical, social, practical, theoretical, and cultural ideas, practices, and phenomena of contemporary culture, design, art, and media in its broadest sense, from architecture to sound design. Offers students an opportunity to further contextualize aspects of art, media, design, and social theory by focusing upon a specific option and by writing a thesis proposal. Provides a program of work based on one option subject from the field of art, design, media, and visual culture. Offered by the University of Arts London for students pursuing international study.

ARTG 3520. Marketing Communications and Cultures 2. 4-6 Hours.

Explores the theories and principles of contemporary marketing communications tools and practices and sets them within a global, cultural, social, and historical context. Considers market engagement with human motivation and behaviors in terms of persuasion techniques, analyzing both historical models and contemporary trends. Offers students an opportunity to investigate global market landscapes, target markets, and consider how communication strategies and tactics are developed and organized to respond to stakeholders' needs in terms of traditional and new media platforms. Investigates the histories, theories, and processes of branding and debates its pros and cons while considering the ways in which branding could benefit your own practice. Offered by the University of Arts London for students pursuing international study.

ARTG 3530. Interdisciplinary Projects and Practices. 4-6 Hours.

Continues ARTG 3520, drawing together the elements of the course by offering students an opportunity to work collaboratively on interdisciplinary/industry projects. Offered by the University of Arts London for students pursuing international study.

ARTG 3700. Interaction Design 2: Mobile. 4 Hours.

Explores user-centered interface design for information exchanges using handheld and mobile devices. Studies the potentials for leveraging both the social and locative possibilities of mobile devices through research, discussions, and project assignments.

ARTG 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ARTG 4550. Design Degree Project 1. 4 Hours.

Draws on a range of theoretical and critical texts that address current issues and research methodologies in graphic design. This course is writing intensive and offers students an opportunity to complete weekly writing assignments and to visit local design studios, galleries, and museums. Writings and discussions are designed to lead to identification of a focus for ARTG 4551.

ARTG 4551. Design Degree Project 2. 4 Hours.

Forms the graphic design major capstone together with ARTG 4550. This intensive research-driven studio explores the realm of designing authorship. A single project theme extends in phases through an entire term to mirror the development sequence of complex professional design projects. Essential to the process is that the medium is not predetermined. Offers students an opportunity to investigate a topic of their choice, author and edit content, and determine the most effective medium for their message, which they design to resonate with a specific audience. Central to the course is a substantive written problem definition and proposal designed to integrate each student's academic and design experience.

ARTG 4552. Information Design 2. 4 Hours.

Builds on concepts from ARTF 2223 and ARTG 3451. Offers students an opportunity to develop strategies for structuring and communicating complex information to increase understanding through dynamic states, which are controlled through the interaction of end users. Explores possibilities offered by interfaces that mediate between a person and information space through research, projects, readings, and discussions.

ARTG 4553. Environmental Information Design. 4 Hours.

Explores visual communication as experienced in the time-space continuum. Projects investigate social issues that contribute to shaping the concept of spaces, such as public art installations, interpretive exhibits, and wayfinding.

ARTG 4554. Typography 3. 4 Hours.

Offers an advanced course exploring a variety of typographical solutions, including expressive formal and complex content-based projects.

ARTG 4555. Graphic Design Synthesis. 4 Hours.

Offers students experience in the design of identity, information, persuasive messaging, and publication projects. Focuses on cross-platform (print, digital, and three-dimensional) manifestations—all based on a single area of content.

ARTG 4700. Interaction Team Degree Project 1. 4 Hours.

Encompasses the definition, research, planning, and proposal of a large-scale project in graphic, interaction, or experience design. Guides students in interdisciplinary teams in the process of investigating and developing a topic of their choice, from defining audience to authoring and editing content and determining the most effective medium to resonate with a specific audience and context. A central aspect is writing a substantive problem definition and proposal that integrates each student's academic and design expertise. This course is the first of two courses in a capstone sequence. The project concept and preliminary groundwork are completed in this course in preparation for final design and production the following term in ARTG 4701.

ARTG 4701. Interaction Team Degree Project 2. 4 Hours.

Continues ARTG 4700. Guides the completion of the capstone project initiated in ARTG 4700 through a design process of prototyping, iteration, realization, testing, implementation, and presentation.

ARTG 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ARTG 5100. Information Design Studio 1: Principles. 4 Hours.

Explores the theories and practices of information design through studio projects. Investigates visual systems and information structures such as maps, timelines, charts, and diagrams. Emphasizes the creative process of organizing, visualizing, and communicating data by seeking to make complex information easier to understand and use. Requires graduate standing or permission of program coordinator or instructor.

ARTG 5110. Information Design History. 4 Hours.

Investigates the history of visualization practices across disciplines and in relation to technology developments. Critically examines seminal visualizations in social, cultural, and technological contexts by means of discussions and writing activities in a seminar format. Requires graduate standing or permission of program coordinator or instructor.

ARTG 5120. Research Methods for Design. 4 Hours.

Examines qualitative and quantitative research methods pertinent to design. Through discussion and writing activities, offers students an opportunity to investigate varied inquiry toward the development of researchable questions, argument formation, and assessment methodologies. Students who do not meet course restrictions may seek permission of instructor.

ARTG 5130. Visual Communication for Information Design. 4 Hours.

Explores graphic and typographic theory, principles, and practices. Introduces students to visual communication design with a primary focus on typography as the fundamental means of conveying content. Readings locate design and typography within the larger history of visual art and writing development. Covers methods of organizing content through hierarchy and spatial organization of grid structures. Considers relationships between positive and negative space, depth perception, transparency, and color theory. Requires graduate standing or permission of program coordinator or instructor.

ARTG 5150. Information Visualization Principles and Practices. 3 Hours.

Introduces information visualization from theoretical and practical perspectives. Defines the information visualization domain and advances principles and methods for the effective visual representation of data. Contextualizes the field from a historical perspective. Presents the perceptual and cognitive tasks enabled by visualizations. Studies an extensive range of visualization models. Illustrates good and bad practices in visualization with real-world examples. Introduces concepts in computer programming in an information visualization context.

ARTG 5151. Information Design Critique Seminar. 1 Hour.

Requires students to present their work in design critique sessions to peers, faculty, and guests. Through these critiques, offers students an opportunity to improve their projects based on feedback, learn how to present their work effectively, and articulate design problems in verbal discourse. Can only be taken in conjunction with ARTG 5150.

ARTG 5310. Visual Cognition. 4 Hours.

Introduces human visual cognition as it applies to information design and visualization. Focuses on perception, attention, pattern recognition, information acquisition, memory, and creation of mental models. Explores reasoning, cognition, decision making, and problem solving in relation to visual artifacts. Students who do not meet course restrictions may seek permission of instructor or program coordinator.

ARTG 5320. Statistics Basics for Designers. 4 Hours.

Offers design students an opportunity to obtain the necessary skills to collect, summarize, analyze, and interpret data. Introduces concepts and methods in statistical reasoning and analysis. Topics include data mining, comparison, assessment, and delivery. Students who do not meet course restrictions may seek permission of instructor or program coordinator.

ARTG 5330. Visualization Technologies 1: Fundamentals. 4 Hours.

Introduces programming languages that allow computational analysis and digital delivery of dynamic information. Examines implications of environmental and personal sensor data sources, mobile collection and analysis of data, real-time networked data sets, and social use of shared data visualization tools. Students who do not meet course restrictions may seek permission of instructor or program coordinator. May be repeated once.

ARTG 5430. Visualization Technologies 2: Advanced Practices. 4 Hours.

Builds on the foundational skills acquired in ARTG 5330. Introduces students to intermediate- to advanced-level topics in web-based interactive visualization. Focuses on building greater proficiency in working with d3 and related JavaScript libraries and on acquiring knowledge of best practices and common patterns in data visualization problem solving. Through lectures, workshops, and a final project, offers students an opportunity to learn to effectively deploy their data visualization skills to explore and extract understanding from data in a critical and productive way.

ARTG 5600. Experience Design Studio 1: Principles. 4 Hours.

Offers students hands-on project development of systems, artifacts, communication, environments, or service offerings with a focus on the unique personal experience of the audience exposed to the project. Experience design is a holistic approach to design that investigates the human experience in specific situations to improve its quality, given an understanding of human goals, needs, and desires. This course provides a context for a cohesive experience through interaction, movement, and understanding, which builds on previous knowledge of audiences and applications. Presents students with design methods and processes for experience design by developing a semester-long project. Offers students an opportunity to develop competency in tools used to create the various elements that create the context for experiences in specific situations and events including interaction, artifact, and environment design. Understanding a design process and knowledge of studio critique practices is recommended.

ARTG 5610. Design Systems. 4 Hours.

Explores a systems-based perspective on our environment by addressing questions that are fundamental to design practice: What is a system, and what are the different types? How do we observe, analyze, and represent systems? What interactions can we have with systems and what are the different types of interaction? Explores structures and processes for the design of systemic relationships between people, artifacts, environments, and activities. Systems may be physical, virtual, social, or a combination. Through discussion, writing, diagramming, and project exercises, offers students an opportunity to learn principles of systems theory and explore the connection between design methods and systems thinking. Students who do not meet course restrictions may seek permission of instructor or program coordinator.

ARTG 5620. Notational Systems for Experience. 4 Hours.

Examines theoretical foundations, concepts, and methods of visual notational systems used in the effective analysis and communication of existing experiences and in the envisioning of conditions for future experiences. Notational systems are sets of graphic signs and codes that denote or prescribe specific actions, forces, operations, events, or performances that occur over time. Students engage with concepts and models through readings, discussion, case study analyses, and speculative design projects. Evaluates the role that notational systems play in documenting, analyzing, and understanding the human goals, actions, behaviors, and perceptions key to experience and assesses their value in designing for agency and new experiences. Students who do not meet course restrictions may seek permission of instructor or program coordinator.

ARTG 5640. Prototyping for Experience Design. 4 Hours.

Explores tools, technologies, and processes to create prototypes of artifacts, environments, and interactive systems for experience design projects. Offers students the opportunity to learn, use, experiment with, and test prototypes using a wide range of state-of-the-art prototyping technologies to further their understanding of multiple strategies and techniques of prototyping for experience design. Tools and techniques change over time but typically include laser cutting, 3D printing, CNC machining, electronics prototyping, augmented reality, machine tools and 2D forming, fast prototyping, and hand tools. .

ARTG 6100. Information Design Studio 2: Dynamic Mapping and Models. 4 Hours.

Continues the exploration of data representations in a variety of media. Focuses on interactive and time-based techniques. Emphasizes computational methods of data collection, manipulation, and encoding. Requires graduate standing or permission of program coordinator or instructor. May be repeated once.

ARTG 6110. Information Design Theory and Critical Thinking. 4 Hours.

Examines various theoretical models of information visualization and delivery systems. Evaluates the concepts and effectiveness of the models through discussions and writing activities. Students who do not meet course prerequisites or restrictions may seek permission of program coordinator or instructor.

ARTG 6200. Information Design Studio 3: Synthesis. 4 Hours.

Continues the exploration of theories of information design and visualization through focused projects that are intended to lead to development of a thesis project. Requires graduate standing or permission of program coordinator or instructor.

ARTG 6310. Design for Behavior and Experience. 4 Hours.

Examines the potential of interfaces as mediators between information and users. Explores iterative prototyping and research methods to analyze patterns of behavior and implications of interface on effective communication. Utilizes observation, empathy, ethnography, and participatory design methods to offer students an opportunity to increase their understanding of audiences' and stakeholders' motivations and expectations. Requires graduate standing or permission of program coordinator or instructor.

ARTG 6320. Design of Information-Rich Environments. 4 Hours.

Explores methods of information organization, presentation, and navigation in physical space. Introduces concepts of wayshowing and embodiment and examines the bridging of physical and virtual spaces through the use of mobile and locative technologies. Encourages collaborative studio projects exploring interventions in public or urban environments and in exhibit-based learning environments. Undergraduate students may seek permission of instructor.

ARTG 6330. Information Design Mapping Strategies. 4 Hours.

Examines the relationships between content and context through mapping methods. Emphasizes the impact of geographic information systems, evolving technologies, community mapping tools, globalization, and delivery systems. Undergraduate students may seek permission of instructor.

ARTG 6555. Graphic Design Synthesis. 4 Hours.

This course has been designed for graduate students in the Information Design and Visualization program. It builds on skills obtained in the ARTG 5100 Information Design Studio: Principles course. The course is intended to give the students experience in the design of identity, information, and publication projects, as well as focus on cross-platform (print, digital, and three-dimensional) manifestations – all based on a single area of content. Its scope reflects the multi-faceted components that comprise real-world comprehensive design projects. Through additional research and readings, students are to perform at high level, and demonstrate how the readings of theoretical material reflect in their projects.

ARTG 6600. Experience Design Studio 2: Group and Interpersonal. 4 Hours.

Offers students an opportunity to learn a human-centered design perspective and to develop experience design competency in the complex context of interpersonal and group interactions. Experience design is a holistic approach that investigates the human experience in specific situations in order to improve its quality. Students study the person-to-person aspect of human-centered design through readings and in-class activities, as well as practice applying its perspectives, models, and theories to the project process. Students are asked to participate in class discussions and create compelling experience design projects to address the needs, desires, fears, and aspirations of their audience.

ARTG 6700. Experience Design Studio 3: Synthesis. 4 Hours.

Extends the exploration of design principles and methods by starting the development of the Experience Design Master Thesis. Examines how to develop effective design interventions capable of enriching human experience in specific situations, sites, and in the context of comprehensive activities. Emphasizes a systems perspective in both research and design development—the relationships between diverse participant groups and communities as well as the complex implications and interrelations of interventions at multiple scales and dimensions.

ARTG 6900. Special Topics in Design. 4 Hours.

Explores focused research topics relevant to the graduate program curriculum. Undergraduate students may seek permission of program coordinator or instructor. May be repeated up to five times.

ARTG 7100. Thesis Seminar for Design. 4 Hours.

Examines emerging research and critical practices in design. Offers students an opportunity to develop the visual and verbal expression of the thesis through writing, discussion, presentation, and critique.

ARTG 7990. Thesis. 4,8 Hours.

Offers students support in developing and producing the written component of a design thesis that integrates and applies their accumulated knowledge. Encourages student participation within a practice and research community consisting of classmates, advisor(s), and external professionals. Restricted to students in experience design and Information design and visualization.

ARTG 7996. Thesis Continuation. 0 Hours.

Offers students continuing thesis supervision by members of the department.

ARTF 1000. Art and Design at Northeastern. 1 Hour.

Introduces students to the intellectual and extracurricular opportunities within the Department of Art + Design and the College of Arts, Media and Design. Exposes students to the cultural vibrancy of Boston with the goal of building networks that facilitate a supportive learning community. Familiarizes students with their major and introduces them to the resources at the university and across the city to help them succeed academically. Provides grounding in the culture and values of the university community and seeks to help students develop interpersonal skills.

ARTF 1120. Observational Drawing. 4 Hours.

Focuses on developing an understanding of the structure of object and figure through freehand drawing. Offers students an opportunity to explore a wide range of materials, including wash, charcoal, and pencil.

ARTF 1121. Conceptual Drawing. 4 Hours.

Seeks to expand the student's knowledge and skills through a mark-making process. Offers students an opportunity to begin to understand the relationship between form and meaning while relating the drawing process to broader concepts of communication.

ARTF 1122. 2D Fundamentals: Surface and Drawing. 4 Hours.

Offers an opportunity to discover and research basic principles, language, and concepts inherent in two-dimensional visual systems. Offers students an opportunity to learn to think critically, analyze, and apply basic principles to design and art projects. In a studio workshop setting, three primary phases explore art, design, and photography.

ARTF 1123. 2D Tools. 1 Hour.

Introduces skills and software, such as Adobe Photoshop and Illustrator, used in creating and manipulating pixel- and vector-based images, in a technology workshop format.

ARTF 1124. 3D Fundamentals: Structure and Drawing. 4 Hours.

Continues ARTF 1122. Explores three-dimensional form. Examines principles including mass, volume, line, plane, and texture. Introduces basic materials and structure through constructing models and prototypes. Presents sequential exercises with simple eye/hand skills and form recognition. Explores complex projects that require an understanding of context, content, and developing original forms.

ARTF 1125. 3D Tools. 1 Hour.

Introduces skills and software used in creating 3D forms with the computer. Explores basics of 3D modeling, surfacing, lighting, and rendering in this technology workshop.

ARTF 1132. Recitation for ARTF 1122. 0 Hours.

Convenes for additional work, viewing, discussion, study, and project-based application of course content.

ARTF 1140. Understanding Art. 4 Hours.

Offers an introduction to the characteristics of the visual arts including painting, sculpture, graphic arts, and architecture. Studies various examples of works of art as means of understanding style and techniques. Includes visits to museum collections and contemporary art galleries.

ARTF 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ARTF 2220. 4D Fundamentals: Sequence and Drawing. 4 Hours.

Explores time-based art and design in an introductory lecture/studio format. Introduces formal, narrative, and alternative concepts for creative time-based communication. Assignments investigate video, animation, and a mixture of media in a screen based context.

Art - Fundamentals (ARTF)

Search ARTF Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=ARTF>)

ARTF 2221. 4D Tools. 1 Hour.

Introduces skills and software used in animating 2D and 3D images, graphics, and forms. Explores the basics of key framing, layering, parenting, 3D modeling, surfacing, and rigging in this technology workshop.

ARTF 2223. 5D Fundamentals: Experience and Drawing. 4 Hours.

Explores the language of interactive experience as a compelling medium to communicate meaning. Examines how variables within the environment can change how we inhabit an experience physically, conceptually, and emotionally. Studies historical and contemporary examples of art and design projects designed as exchanges or experiences. Incorporates drawing as a means to understand the present and project potential future experiences.

ARTF 2224. 5D Tools. 1 Hour.

Introduces skills and software used in creating basic Web-based content. This technology workshop introduces software using HTML and style sheets such as Adobe Dreamweaver.

ARTE 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ARTE 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ARTE 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

Art - General (ARTE)

Search ARTE Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=ARTE>)

ARTE 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ARTE 2301. The Graphic Novel. 4 Hours.

Explores the word-and-image relationship in a narrative form. Offers students an opportunity to learn how to read comics—and what they teach us about reading—in addition to the creative practices that go into making them. Examines antecedents including “engraved novels,” newspaper comic strips, “wordless novels,” underground comic books, and punk fanzines to understand the graphic novel’s rise in the 1970s. Explores current directions in production. Includes visits from artists to discuss the craft of this verbal-visual form. ARTE 2301 and ENGL 2301 are cross-listed.

ARTE 2500. Art and Design Abroad: Studio. 4 Hours.

Offers an intensive studio course taken abroad and taught by an art and design faculty member. Exposure to regional artists, history, culture, museums, architecture, and physical geography provide focus of study and creative exploration. May be repeated without limit.

ARTE 2501. Art and Design Abroad: History. 4 Hours.

Offers an intensive history course taken abroad and taught by an art history, design, or art faculty member. Exposure to regional and international artists, history, culture, museums, landscape architecture, galleries, material culture, and architecture provide a rich context for studying the history of art and design. Offers students an opportunity to understand narrative and visual components through detailed hands-on workshops and detailed creation of artistic formats, including design, text essays, photographic essays, temporary exhibitions, video art projections, and live performances as artifacts. May be repeated without limit.

ARTE 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ARTE 2991. Research in Art and Design. 1-4 Hours.

Offers an opportunity to conduct introductory-level research or creative endeavors under faculty supervision.

ARTE 3901. Art and Design Special Topics. 4 Hours.

Offers an art and design course in which format and content are determined by the instructor. May be repeated up to five times.

ARTE 3902. Recitation for ARTE 3901. 0 Hours.

Convenes for additional viewing, discussion, study, and project-based application of course content.

ARTE 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ARTE 4901. Special Topics in Art and Design Studio. 4 Hours.

Offers an art and design studio in which format and content are determined by the instructor. May be repeated up to five times.

ARTE 4970. Junior/Senior Honors Project 1. 4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student’s major field. Combined with Junior/Senior Project 2 or college-defined equivalent for 8 credit honors project. May be repeated up to five times.

ARTE 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ARTE 4992. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

ARTE 4996. Experiential Education Directed Study. 4 Hours.

Draws upon the student’s approved experiential activity and integrates it with study in the academic major. Restricted to those students who are using it to fulfill their experiential education requirement. May be repeated without limit.

ARTE 5901. Special Topics in Art and Design Studio. 4 Hours.

Offers an opportunity for the intensive study of specialized themes in areas of research in studio and aesthetics related to art and design. Instructor determines format and content. May be repeated up to five times.

ARTE 6210. Research Methods for the Creative Arts. 4 Hours.

Introduces major methodologies commonly used in contemporary, interdisciplinary creative practice. Emphasizes blended methods drawing on the humanities, qualitative social sciences, and design, such as the use of archival sources, visual and discursive analysis, interviews and participant observation, and human-centered and participatory design. Emphasizes questions of power and the ethical implications of creative work as framed through various theoretical lenses. Provides a venue for the design of a creative research project in support of the graduate thesis.

ARTE 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ARTE 6964. Co-op Work Experience. 0 Hours.

Provides eligible students with an opportunity for work experience. May be repeated without limit.

ARTE 6976. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated up to four times.

ARTE 6984. Research. 1-4 Hours.

Offers students an opportunity to conduct research under faculty supervision. May be repeated up to four times.

ARTE 7100. Thesis Proposal. 4 Hours.

Offers candidates an opportunity to select a topic and present a proposal for a topic of study/research to a faculty committee for approval. A definition of the scope of the project, the methodologies for the research, and the assumptions being questioned or analyzed are determined. The thesis research proposal must demonstrate the student's ability to carry out sustained and independent research to develop critical and specialist knowledge of contemporary topics in a field related to public art. Research includes aspects of scholarship in some or all of the following: theory, semiotics, ontology, phenomenology, and social or critical approaches to cultural studies.

ARTE 7990. Thesis. 4 Hours.

Offers the candidate, working with a thesis advisor, an opportunity to continue to complete the research project defined and proposed in ARTE 7100. The research is carried out in an independent manner, with periodic presentations to the thesis committee. These presentations define the benchmarks for determination of successful progress in the project. The ultimate result is an exhibition, screening, performance, or other form of public display or presentation, together with a thesis paper or written corollary.

ARTE 7996. Thesis Continuation. 0 Hours.

Offers continued work on the thesis project.

Art - History (ARTH)

Search ARTH Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=ARTH>)

ARTH 1100. Interactive Media and Society. 4 Hours.

Offers a critical historical survey of interactive media from analog to digital techniques and from physical to virtual spaces. Examines the social, ethical, and cultural impact of interactive media. Concludes with a study of current issues and directions in interactive media. Through weekly lectures, research projects, and critical analyses, offers students an opportunity to consider current and historical aspects of interactive media and design.

ARTH 1110. Global Art and Design History: Ancient to Medieval. 4 Hours.

Investigates the history of painting, sculpture, design, and related arts through a study of masterpieces from prehistoric times to the end of the Middle Ages. Offers students an opportunity to become familiar with specific works, styles, and terminology of art and design and to develop an ability to communicate about the visual arts.

ARTH 1111. Global Art and Design History: Renaissance to Modern. 4 Hours.

Explores the evolving history of visual art and architecture from 1300 through the 20th century. Combines integrated modules and activities together with observation and analysis of art and architecture, with the goal of interpreting cultures and understanding societies. Offers students an opportunity to learn specific works, styles, and specialized terminology, thereby developing an ability to communicate about the visual arts.

ARTH 1121. Recitation for ARTH 1111. 0 Hours.

Convenes for additional viewing, discussion, study, and project-based application of course content.

ARTH 1400. The Science of Art, the Art of Science. 4 Hours.

Explores the intersection of science and art in Renaissance Italy, and the broad themes of observation, imagination, and invention. Topics include engineering, anatomy, botany, zoology, cartography, perspective and ecology. Observation will be considered both as a historical topic and as a practical method in the course. Students have an opportunity to hone their skills in both writing and drawing through weekly visits to the Museum of Fine Arts and study of original works of art.

ARTH 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ARTH 2210. Modern Art and Design History. 4 Hours.

Surveys modernist movements from early to mid-20th century. Emphasizes the reciprocal evolution of art and design within cultural and social contexts.

ARTH 2211. Contemporary Art and Design History. 4 Hours.

Offers a study of contemporary culture in an art and design survey from mid-twentieth century to present. Presents a thematic approach to late-modern and postmodernist movements, focusing on interrelationships among media.

ARTH 2212. Survey of the Still and Moving Image. 4 Hours.

Examines the history of still and moving images in relationship to other artistic, documentary, and journalistic practices.

ARTH 2213. Nineteenth-Century Art. 4 Hours.

Presents a selection of major works and movements of art from 1780 to 1900. Studies the development of Neoclassicism, Romanticism, Realism, naturalism, Impressionism, Post-Impressionism, and Art Nouveau in terms of major changes in society such as industrialization, urbanism, colonialism, scientific discoveries, nationalism, Japonisme, gender politics, and the workings of patronage. Themes include the relationship between revolution and art, heroes and antiheroes, the nature and responsibility of citizenship, the seeming inevitability of war, urbanism, and the intersection with social issues. Field trips and museum visits further enhance students' appreciation of the historical context for interpreting cultures and understanding societies, thereby making our engagement with the art more enduring. .

ARTH 2215. History of Graphic Design. 4 Hours.

Follows a chronological survey of graphic design from 4000 BC to the beginning of the 21st century, emphasizing work from 1880 to 2000, and the relationship of that work to other visual arts and design disciplines. Demonstrates how graphic design has responded to (and affected) international, social, political, and technological developments since 1450. Traces developments in the areas of typography and publication, persuasion, identity, information, and theory.

ARTH 2220. Recitation for ARTH 2210. 0 Hours.

Convenes for additional viewing, discussion, study, and project-based application of course content.

ARTH 2221. Recitation for ARTH 2211. 0 Hours.

Convenes for additional viewing, discussion, study, and project-based application of course content.

ARTH 2225. Recitation for ARTH 2215. 0 Hours.

Convenes for additional viewing, discussion, study, and project-based application of course content.

ARTH 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ARTH 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ARTH 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ARTH 5100. Contemporary Art Theory and Criticism. 4 Hours.

Introduces the major critical and philosophical approaches that have transformed the reception, interpretation, and production of contemporary art since the 1960s. Examines a range of key interpretive methodologies—including modernism, postmodernism, psychoanalysis, feminism, Marxism, poststructuralism and deconstruction, critical race theory, visual studies, and globalism—designed to provide practitioners with the means to critically frame their own art making within contemporary debates about the meaning and social functions of art.

ARTH 5200. Issues in Contemporary Art. 4 Hours.

Introduces the major artists, movements, and issues that have redefined contemporary art since the late twentieth century. Examines, both critically and historiographically, topics such as conceptualism, earth art, appropriation, installation, street art, identity politics, activist art, performance, globalism, relational art, and new media. Offers an overview aimed at helping students negotiate the relationship between their own artistic practice and global art worlds.

ARTH 5400. Contemporary Visual Culture. 4 Hours.

Explores the implications of the erosion of the traditional boundary between fine art and mass culture for artistic theory and practice as well as art's place in an increasingly globalized world. Situates contemporary artistic practice within the broader context of visual culture—including film, television, advertising, architecture, and the Internet.

ARTH 5902. Special Topics in Art and Design History. 4 Hours.

Offers an opportunity for the intensive study of specialized themes in areas of research in art history, aesthetics, or critical studies. Format and content are determined by the instructor in this elective in Art + Design history. May be repeated up to five times.

ARTH 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ARTH 6976. Directed Study. 1-4 Hours.

Offers directed study of a specific topic not normally contained in the regular course offerings but within the area of competence of a faculty member. May be repeated without limit.

Art - Media Arts (ARTD)

Search ARTD Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=ARTD>)

ARTD 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ARTD 2100. Narrative Basics. 4 Hours.

Explores narrative sequence and story development in a variety of story architectures and media combinations, including text, video, music, audio, and design. Uses lectures, in-class workshops, and collaborative projects to expose students to the critical role of narrative in society and interactive media, including games. Offers students an opportunity to develop an interactive media design document over the second half of the semester.

ARTD 2350. Photo Basics for Nonmajors. 4 Hours.

Offers a basic photography course that introduces students to the use of camera controls, computer-based image and file management systems, lighting, and final printing. Additionally, books on demand, slide shows, and image archiving are demonstrated and then explored by students. No previous experience is necessary. Does not fulfill major or minor requirements for students within the Department of Art + Design.

ARTD 2360. Photo Basics. 4 Hours.

Offers an introductory lecture/lab photography class. Explores the technical and theoretical concepts throughout the history of photography. The lab component of the course covers processing, editing, and output of images. Culminates in a final project designed to demonstrate both technical and conceptual knowledge of the medium.

ARTD 2361. Photo Tools. 1 Hour.

Offers an introductory photography lab designed to enable the student to acquire basic technical camera usage and digital capture. Explores photographic image management applications.

ARTD 2370. Animation Basics. 4 Hours.

Offers an introductory studio course that explores the creative potential of animation. Exposes students to a variety of traditional animation processes and techniques through lectures, demonstrations, and hands-on assignments. Provides an historical survey of animation art through the twentieth century. Emphasizes using the computer to develop concepts creatively while learning the fundamental skills of constructing animated images and forms.

ARTD 2371. Animation Tools. 1 Hour.

Introduces intermediate skills and software used in creating 3D animation. Explores modeling, surfacing, lighting, key framing, and rigging in this technology workshop.

ARTD 2380. Video Basics. 4 Hours.

Offers an introductory exploration into the moving image as an art form. Covers the fundamental technical and aesthetic aspects of contemporary video production. Emphasizes personal, experimental works from an individual point of view. Analysis of projects is directed toward the development of a personal voice.

ARTD 2381. Video Tools. 1 Hour.

Introduces intermediate skills and software used in capturing, manipulating, and editing video and audio in this technology workshop.

ARTD 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ARTD 3460. Photography 1. 4 Hours.

Continues ARTD 2360, spending significant time on idea generation and research based on contemporary theoretical principles. Explores digital capture and image management in conjunction with project development. Requires a final project based on individual research and the establishment of a concise point of view.

ARTD 3470. Animation 1. 4 Hours.

Introduces the fundamentals of three-dimensional computer animation. Class lectures and demonstrations are followed by substantial hands-on exploration. Students gain fundamental skills for modeling, surfacing, and animating. Projects progress from creating simple geometric objects to realistic organic characters. Basic systems for animating are introduced and explored.

ARTD 3471. Virtual Environment Design. 4 Hours.

Utilizes elements of story and game play in the design of both 2D and 3D environments, integrating architecture, landscape, and set dressing. Introduces real-time procedurally generated terrain and flora, asset optimization, and nonlinear path finding. Explores content ranging from historically accurate and contemporary hyperrealistic to stylized and fanciful.

ARTD 3472. Character Design for Animation. 4 Hours.

Focuses on the development of characters as they relate to game design and animation. Explores, through treatments and synopsis, theme-based character back story, rationale, and visual design. Integrates learning objectives of both 2D and 3D, optimized rigging, movement study, and accessory and prop design.

ARTD 3473. Animation for Games. 4 Hours.

Explores all areas of 3D game asset creation—animation, modeling, shading, effects, and their integration. Working in small groups, students have an opportunity to learn how to construct animated assets that work efficiently within a game programming environment. Encourages students to specialize in at least one area of asset creation.

ARTD 3480. Video: Sound and Image. 4 Hours.

Continues the study of video as an art form. Focuses on the dynamic relationship between sound and the moving image. Begins with audio exercises exploring various aspects of sound design that are integrated into an in-depth video production. Emphasizes the production of innovative video art with powerful visual imagery, complex editing rhythms, and creative sound design.

ARTD 3485. Experimental Video. 4 Hours.

Constitutes an advanced video production and analysis course. Emphasizes the development of personal vision and building a working knowledge of contemporary experimental video art techniques. Offers students an opportunity to expand conceptual ideas and visual language skills by interrogating concepts of time, movement, light, and space within their exploratory working process. Visual research and discussion supplement the studio work.

ARTD 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ARTD 4530. Media Arts Degree Project 1. 4 Hours.

Explores the criticism and theory associated with digital art. Offers students an opportunity to apply this knowledge to research in one of the digital media (photography, animation, and video) in preparation for completion of their degree project.

ARTD 4565. Photography 2. 4 Hours.

Continues ARTD 3460 with intensive project research based on specific theoretical principles chosen by the student. Explores various photographic formats, digital scanning, and Web usage. Requires a final written theoretical and visual project for successful completion of the course.

ARTD 4570. Animation 2. 4 Hours.

Continues ARTD 3470. Focuses on seamless integration of animated three-dimensional models with digital photographic backgrounds. Continued emphasis on building comprehensive modeling, surfacing, and animation skills. Students develop original content based on course objectives. Complex systems for creating realistic movement are introduced. Exposes students to compositing and animation processes through lectures, demonstrations, and hands-on assignments.

ARTD 4575. Animation 3. 4 Hours.

Continues ARTD 4570. Focuses on building comprehensive modeling, animation, and compositing skills in this advanced studio course. Students explore creating special effects through seamless mixture of computer-generated imagery and digital video footage. Advanced compositing and lighting techniques are introduced and explored. Students create original characters using organic modeling and surfacing techniques. Exposes students to animation and compositing processes through lectures, demonstrations, and hands-on assignments.

ARTD 4577. Digital Sculpture and Model Making. 4 Hours.

Focuses on the potential of sculpture and model making as a means of creative expression and for the communication of visual ideas. Offers students an opportunity to develop formal and technical skills for digital sculpting and the application of those skills for creating tangible models. Explores traditional and digital modeling techniques and utilizes 3D scanning and 3D printing techniques for physical model construction. Examines the historic role of model making and prototyping in the development and creation of fine art, game art, animation, and product design. Students who do not meet course prerequisites may seek permission of instructor.

ARTD 4660. Studio Photography. 4 Hours.

Examines studio practices and lighting techniques. Offers students an opportunity to obtain a thorough understanding and working knowledge of contemporary practice in the photography studio. Includes comprehensive exercises and assignments with various types of lighting equipment.

ARTD 4661. Alternative Photographic Processes. 4 Hours.

Focuses on analog-based conventional black-and-white photography. Explores, demonstrates, and uses nineteenth- and twentieth-century photographic processes to explore alternative delivery systems for creative and professional applications.

ARTD 4670. Media Arts Degree Project 2. 4 Hours.

Continues ARTD 4530. Offers students an opportunity to research and produce a final semester project and a written thesis.

ARTD 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ARTD 5001. Art, Context, Action 1. 4 Hours.

Offers an advanced studio-seminar to foster the creation and understanding of contemporary interdisciplinary art, emphasizing its role in reflecting and shaping its social contexts. Course activities include viewing, reading, and discussion of key projects, theories, methods, and professional practices as they have evolved over time, as well as regularly scheduled critique of the students' ongoing bodies of work. Experiential learning opportunities allow students to interact with practitioners, curators, and institutions in the field. Offers students an opportunity to grow as practicing artists, designers, and arts professionals. .

ARTD 5002. Art, Context, Action 2. 4 Hours.

Continues the study of interdisciplinary arts theory and practice begun in ARTD 5001.

ARTD 5301. Independent Research Project 1. 4 Hours.

Offers students an opportunity to independently create practiced-based design of new media performance or experiences. Expects students to independently research interactive technologies used in contemporary-based artworks. Under faculty mentorship, students independently explore methods of creative research and thematic development that result in a unique individual and/or stylistic expression in original works of art. Includes student presentations of ongoing research and works in progress to faculty for assessment.

ARTD 5582. Collaborative Video and Community Engagement. 4 Hours.

Offers students an opportunity to explore the process of collaborative video making with a focus on the ethics and social dynamics of civic engagement in this video production course. Expects students to participate in interactive team-based production labs that mix theoretical analysis and technical training. Examines different theories that inform conceptualizations of social justice and ethics. Explores different forms of authorship, video genres, and digital tools for collaboration ranging from crowdsourcing to remix platforms. Offers students an opportunity to produce reflection papers on the process of collaboration and engagement with diversity, as well as video art projects for organizations working on campus and in the Boston area.

ARTD 6001. Art, Media, Participation 1. 4 Hours.

Offers a graduate studio-seminar to foster the creation and understanding of contemporary interdisciplinary art, emphasizing how varied media strategies foster audience interaction and public engagement. Course activities include readings and discussions of key projects, theories, and professional practices as they have evolved over time, as well as scheduled critique of the students' ongoing bodies of work. Experiential learning opportunities allow students to interact with practitioners, curators, and institutions in the field. Paves the way toward the development of a graduate thesis project and offers students an opportunity to grow as practicing artists, designers, and arts professionals. .

ARTD 6002. Art, Media, Participation 2. 4 Hours.

Continues the study of interdisciplinary arts theory and practice begun in ARTD 6001.

Art - Studio (ARTS)

Search ARTS Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=ARTS>)

ARTS 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ARTS 2330. Sculpture Basics. 4 Hours.

Offers a studio course with an in-depth exploration into the process of creating sculpture. Builds on the introductory experience of ARTF 1124, with more advanced 3D concepts, materials, tools, and techniques. Emphasizes personal exploration, concept development, and creative innovation. Exposes students to sculpture through lectures, demonstrations, critiques, and hands-on assignments. Requires permission of instructor. May be repeated up to two times.

ARTS 2340. Painting Basics. 4 Hours.

Presents an introductory studio course in the fundamental techniques of painting. Formal problems in the study of color, light, space systems, form, and composition establish the foundation for more individual creative expression. Uses critiques and slide lectures as needed.

ARTS 2341. Figure Drawing. 4 Hours.

Focuses on developing the student's awareness of the structure of the figure as well as the emotive qualities of "figuration." Students draw from a model in each class. They also develop drawings based on the political and social concerns of contemporary culture and the role of gender as seen through "image."

ARTS 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ARTS 3449. Drawing in Mixed Media. 4 Hours.

Offers an upper-level course designed for students who want to explore the ever-changing discipline of drawing, which has now become a medium that stands on its own. Explores a range of media for generating drawings, including traditional techniques and computer-based media. Emphasizes open-ended application and interpretation of drawing as a medium. Requires students to attend lectures and exhibitions and keep a journal.

ARTS 3510. Studio Practice and Exhibition. 4-6 Hours.

Seeks to help students develop a body of work within their chosen pathway, to test and articulate concerns in discourse and writing, and to present ideas and practice through exhibition and publication. Students work in groups to explore common ideas and concepts and expand chosen themes to propose, curate, and stage a collaborative exhibition or intervention to capture, reflect on, and share their projects through different forms of publication. Offers students an opportunity to deepen artistic concerns; engage with the potential and challenges of different types of public, institutional, and exhibition space; and expand critical skills around their ideas. Offered by the University of Arts London for students pursuing international study.

ARTS 3520. Critical Disclosures. 4-6 Hours.

Offers students an opportunity to engage in current debates and further develop familiarity with art and visual culture. Guides students in the reading of specific texts and works and provides bibliographic advice for further study and discussions of related ideas in seminars. Through specialized attention to a specific theme or subject, seeks to enable students to develop critical perspectives in relation to cultural and theoretical production. Studies are designed to offer students an opportunity to expand and reevaluate the methodologies and discourses related to their thinking and practice. Reviews students' practice in order to describe the questions and issues that arise. Offered by the University of Arts London for students pursuing international study.

ARTS 3530. Studio Practice, Cross-Pathway, and External Projects. 4-6 Hours.

Offers students an opportunity to obtain a broad understanding of practice through a critical consideration of the production and reception of works of art within or outside the art institution. Students select one of a range of projects that explore shared concerns and communities of practice and/or collaboration. Choice of project reflects and supports the concerns of ongoing practice. Offered by the University of Arts London for students pursuing international study. .

ARTS 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ARTS 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ARTS 4992. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

ARTS 5100. Visual Ideation. 4 Hours.

Explores drawing in a variety of media that communicate critical and analytical thinking about arts in the public sphere. Offers students an opportunity to learn how to use drawing and visualization to communicate effectively in a variety of media, either on paper or in digital media. Students can use collage, photo, digital media, and freehand drawing to express ideas for larger environmental and public projects. (Drawing is the way that artists such as Christo propose large-scale projects and is a viable way to secure acceptance of an idea.)

ARTS 6000. Studio. 4 Hours.

Offers students an opportunity to be mentored by a faculty member while completing the studio art portion of the master's degree. May be repeated up to four times.

Arts Administration and Cultural Entrepreneurship (AACE)

Search AACE Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=AACE>)

AACE 6000. Arts and Culture Organizational Leadership. 3 Hours.

Offers an overview and introduction to leadership knowledge areas, tools, and skills sets for the arts and culture sector. Key topics include issues and challenges in the management of arts-oriented organizations, leadership characteristics and techniques for arts and culture teams, balancing organizational priorities with artistic vision and values, board formation and management, audience outreach, and operational practices. Focuses on the administration of people and processes to communicate mission; realize goals; and effectively manage the creative resources, human resources, and financial challenges of nonprofit arts and cultural organizations.

AACE 6010. Planning for Arts and Cultural Organizations. 3 Hours.

Offers an overview and introduction to knowledge areas and primary skills sets for planning, launching, and sustaining arts and cultural organizations. Key topics include evaluating opportunities in the arts and culture sector; building effective vision, mission, and values for arts and culture initiatives in balance with civic and community contexts; smart approaches to arts and culture funding; developing sustainable and flexible strategic plans; and planning challenges for the contemporary strategic arts organization.

AACE 6020. Experiential Study in Arts Administration. 3 Hours.

Offers students an opportunity to learn best practices in arts project management, including how to assess and scope a project, develop a timeline with clear action items and goals, relay needs and expectations to clients, research materials to assist in the process, and measure and deliver project results. Faculty coach students to cultivate professional skill sets, build competency around key areas of student interest, and bridge theory with practice. Students receive feedback from their project sponsor, review lessons learned, and incorporate suggestions to improve and further develop their career plans. Seeks to support the development of business communication skills, project and client management skills, and frameworks for analysis.

AACE 6110. Information Technology for Arts and Cultural Organizations. 3 Hours.

Offers nontechnical students an opportunity to obtain a clear and current understanding of key information technology (IT) concepts set in the context of arts and cultural organizations and to empower them to make decisions that map technology to strategy. Covers how to identify technical terms, stakeholders, and issues; evaluate IT challenges; apply best-practice frameworks; and identify business needs and compare technical solutions in order to minimize cost and maximize strategic alignment. Combines readings, casework, video lectures, screen casts, guest videos, and a hands-on approach to researching solutions and leading change. Includes both group and individual deliverables that students synthesize to create and present a final project.

AACE 6200. Programming and Community Engagement for Cultural Entrepreneurs. 3 Hours.

Examines the role and tools of the cultural entrepreneur and investigates practical and tactical approaches centered around real-world examples. Topics include how cultural entrepreneurs turn new ideas into concrete initiatives and how they communicate with and learn from their audiences and communities to assess and evaluate the implementation of cultural endeavors. Offers students an opportunity to create their own cultural initiative from the ground up. Through modules covering mission and vision, program evaluation, community engagement, and basic resource management, the successful student should finish the course with a real project "in a box," ready to launch.

AACE 6210. Building Value Through Cultural Enterprise. 3 Hours.

Examines the question of value through the lens of cultural institutions big and small. Explores examples from real-world case studies. Focuses on areas of value, ways to measure impact on both qualitative and quantitative levels, and how to demonstrate that impact to a variety of audiences from our daily visitors to our federal government. Value in the cultural sector is a critical question that institutions and individuals working in this area must answer on a regular basis for themselves, their constituents, and their supporters.

Asian Studies (ASNS)

Search ASNS Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=ASNS>)

ASNS 1150. East Asian Studies. 4 Hours.

Seeks to provide an understanding of the constituent characteristics that originally linked East Asia as a region and the nature of the transformations that have occurred in the region over the last two thousand years. Concentrates on China and Japan, and addresses Korea and Vietnam where possible. Also seeks to provide students with effective interdisciplinary analytical skills as well as historical, ethical, cultural diversity, and aesthetic perspectives. ASNS 1150 and HIST 1150 are cross-listed.

ASNS 1160. Contemporary South Asia. 4 Hours.

Takes a multidisciplinary approach in exploring the formation of contemporary South Asia, with a focus on Bangladesh, India, Pakistan, and Sri Lanka. Examines the history of the region, from dawn of the colonial era to present times, seeking to understand the roots of the region's social, cultural, and political development. .

ASNS 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ASNS 2245. The Asian-American Experience. 4 Hours.

Examines the impact of Asian immigrant communities on U.S. political, economic, social, and cultural life and their encounters with racial, political, and economic discrimination from the nineteenth century to the present.

ASNS 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ASNS 3422. Topics in Chinese Studies. 4 Hours.

Covers special topics in Chinese studies. May be repeated without limit.

ASNS 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ASNS 4900. Asian Studies Capstone Directed Study. 4 Hours.

Offers independent intensive reading and writing on key interdisciplinary issues in Asian studies under the direction of faculty members in Asian studies on a topic chosen in consultation with the instructor.

ASNS 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ASNS 4992. Directed Study. 1-4 Hours.

Offers students an opportunity for special readings and research in Asian studies. May be repeated without limit.

Behavioral Neuroscience (BNSC)

Search BNSC Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=BNSC>)

BNSC 1000. Behavioral Neuroscience at Northeastern. 1 Hour.

Introduces first-year and new transfer students to the major and the field of behavioral neuroscience and to the professional and academic resources available to students at Northeastern University. Acquaints students with their faculty, advisors, and fellow students; provides an initial orientation to undergraduate research, cooperative education, study abroad, and other experiential learning options; familiarizes students with academic support resources and leadership opportunities; provides grounding in the culture and values of the university community—in short, familiarizes students with all skills needed to become a successful university student.

BNSC 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

BNSC 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

BNSC 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

BNSC 4950. Seminar. 1-4 Hours.

Offers an in-depth study of selected topics.

BNSC 4970. Junior/Senior Honors Project 1. 4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student's major field. Combined with Junior/Senior Project 2 or college-defined equivalent for 8-credit honors project. May be repeated without limit.

BNSC 4971. Junior/Senior Honors Project 2. 4 Hours.

Focuses on second semester of in-depth project in which a student conducts research or produces a product related to the student's major field. Requires a 3.500 GPA. May be repeated without limit.

BNSC 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

BNSC 4991. Research. 4 Hours.

Offers an opportunity to conduct research under faculty supervision.

BNSC 4993. Independent Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. May be repeated without limit.

BNSC 4994. Internship. 4 Hours.

Offers students an opportunity for internship work. May be repeated without limit.

Biochemistry (BIOC)

Search BIOC Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=BIOC>)

BIOC 1000. Biochemistry at Northeastern. 1 Hour.

Introduces first-year students to the major and the field of biochemistry and to the professional and academic resources available to students at Northeastern University. Acquaints students with their faculty, advisors, and fellow students; provides an initial orientation to undergraduate research, cooperative education, and other experiential learning options; helps develop the academic skills necessary to succeed; provides grounding in the culture and values of the university community; and assists in interpersonal skill development—in short, familiarizes students with the resources and skills needed to become a successful university student.

BIOC 4900. Biochemistry Capstone. 1 Hour.

Designed for students who are also enrolled in approved 4-semester-hour research courses (BIOC 4991, BIOC 4970, BIOC 4971, BIOL 4991, BIOL 4970, or BIOL 4971) where they conduct original experimental work under the direction of a faculty mentor. Requires reflection by students on their various educational experiences, extensive research of scientific questions related to these experiences (with the research itself carried out in the approved 4-semester-hour research course), and development of an original research report. Required components include writing with revision and an oral presentation at a programwide capstone seminar late in the semester. Offers students an opportunity to hone reflection and communication skills through formal and informal presentations, class discussion, and critique. Requires concurrent registration in BIOC 4991, BIOC 4970, BIOC 4971, BIOL 4991, BIOL 4970, or BIOL 4971.

BIOC 4970. Junior/Senior Honors Project 1. 4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student's major field. Combined with Junior/Senior Project 2 or college-defined equivalent for 8-credit honors project. May be repeated without limit.

BIOC 4971. Junior/Senior Honors Project 2. 4 Hours.

Focuses on second semester of in-depth project in which a student conducts research or produces a product related to the student's major field. May be repeated without limit.

BIOC 4991. Research. 4 Hours.

Offers an opportunity to conduct research under faculty supervision.

BIOC 4994. Internship. 4 Hours.

Offers students an opportunity for internship work. May be repeated without limit.

Bioengineering (BIOE)

Search BIOE Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=BIOE>)

BIOE 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

BIOE 2000. Introduction to Engineering Co-op Education. 1 Hour.

Seeks to prepare students for the first co-op experience. Focuses on skills that provide a basis for successful co-op engagement including expectations and requirements, an introduction to professional credentials, resumé construction, self-assessment and goal setting, interviewing, professional and co-op ethics, issues of diversity in the workplace community, academic planning and decision making, and an introduction to career portfolios.

BIOE 2350. Biomechanics. 4 Hours.

Designed to acquaint students with concepts of stress, strain, and constitutive laws as applied to problems in biomechanics. Introduces rigid body and deformable body mechanics. Focuses on basic foundations of solid mechanics using vectors and tensors. Illustrative examples from tissue and cell biomechanics are given where appropriate.

BIOE 2355. Quantitative Physiology for Bioengineers. 4 Hours.

Introduces engineering and science students to core knowledge and understanding of physiological systems and processes. Focuses on quantitative analysis of human physiological systems. Topics include the physical and chemical foundations of physiology; coupled forces and flows; electrical, mechanical, and chemical potentials and their conjugated fluxes; and the physiology of excitable tissue. Examines cell structure, function, and homeostasis with a particular focus on membrane transport, osmotic pressure, cell signaling, and cellular energetics.

BIOE 2365. Bioengineering Measurement, Experimentation, and Statistics. 4 Hours.

Introduces the fundamentals of biomedical data acquisition and statistical analysis. Engineering statistics topics include descriptive statistics, probability distributions, hypothesis testing, analysis of variance, and experiment design. Applies these statistical topics by analyzing data obtained from laboratory exercises in BIOE 2366. Laboratory exercise topics include cell culture, mechanical testing, modeling medical imaging data, 3D printing, and bioprinting. Emphasizes using MATLAB software to analyze data on the computer.

BIOE 2366. Lab for BIOE 2365. 1 Hour.

Offers associated laboratory exercises for BIOE 2365. Requires lab reports from all students.

BIOE 2949. Introductory Directed Research in Bioengineering. 4 Hours.

Offers an opportunity to pursue project and other independent inquiry opportunities under faculty supervision for first- and second-year students. The course is initiated with a student-developed proposal, including expected learning outcomes and research products, which is approved by a faculty member in the department. Permission of instructor required.

BIOE 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

BIOE 3000. Professional Issues in Engineering. 1 Hour.

Offers students an opportunity to reflect on both academic and co-op experiences in the context of planning for the senior year and beyond. Topics include professional and ethical issues; resolving ethical conflicts; awareness of engineers as professionals in a diverse world; strengthening decision-making skills; career portfolios; and lifelong learning needs, goals, and strategies. Students reflect upon issues of diversity from their experience in the university and in their cooperative education placements. Explores the role of different work and learning styles and diverse personal characteristics in the workplace and the classroom. Professional issues include impact of the cultural context, both in the United States and around the world, on the client, government relations, and workplace.

BIOE 3210. Bioelectricity. 4 Hours.

Discusses principles of circuits, signals, and systems in the context of operating principles of bioelectrical systems at multiple physiological scales. Offers students an opportunity to obtain the fundamental background required to interface biological systems with circuits and sensors for measurements. Covers fundamentals of structure and function of electrically active tissue including nerves, brain, and muscle, including heart.

BIOE 3310. Transport and Fluids for Bioengineers. 4 Hours.

Covers the fundamental principles of processes and systems in which mass, energy, and momentum are transported in typical biological problems. Emphasizes momentum transport for incompressible and compressible fluids (fluid flow) and energy transport. The methods taught are relevant to the analysis of physiological systems, processing, and separation of biological materials.

BIOE 3380. Biomolecular Dynamics and Control. 4 Hours.

Focuses on the principles of thermodynamics and kinetics applied to the analysis and design of biomolecular systems. Covers foundational topics—such as mass and energy balances, chemical equilibria, and enzyme kinetics—in a biological context. Introduces the role of feedback and feed-forward control in biomolecular networks, emphasizing basic analytical and computational methods, including the use of MATLAB, for analyzing how these regulatory structures affect the dynamics of small-scale, prototypical networks.

BIOE 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

BIOE 4790. Capstone Design 1. 4 Hours.

Offers the first in a two-course sequence of capstone design. Introduces principles of engineering design and applies them to the design of bioengineered devices. Topics consist of ethics, cost engineering, research methods, intellectual property, technical report writing, and FDA design control—including inputs, outputs, verification, validation, and design history files. Students are formed into teams and paired with a faculty advisor and supporter. Project support can be departmental, industrial, or external. Students defend a preliminary design project proposal in written and oral form before a faculty jury.

BIOE 4792. Capstone Design 2. 4 Hours.

Continues BIOE 4790. Offers students an opportunity to apply design principles to create a device or process to solve a relevant bioengineering problem. Teams develop, construct, and evaluate prototypes under real-world fiscal, regulatory, and safety conditions. Progress is monitored through a series of oral presentations in design gate review meetings. The design process is documented in a design history file that is reviewed throughout the course. Requires students to complete a working prototype or simulation, as appropriate, and a final written report.

BIOE 4970. Junior/Senior Honors Project 1. 4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student's major field. Combined with Junior/Senior Project 2 or college-defined equivalent for 8-credit honors project. May be repeated without limit.

BIOE 4971. Junior/Senior Honors Project 2. 4 Hours.

Focuses on second semester of in-depth project in which a student conducts research or produces a product related to the student's major field. May be repeated without limit.

BIOE 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

BIOE 4991. Research. 4 Hours.

Offers an opportunity to conduct research under faculty supervision. May be repeated without limit.

BIOE 4992. Directed Study. 1-4 Hours.

Offers theoretical or experimental work under the direction of members of the department under a chosen topic. Course content depends on instructor. May be repeated without limit.

BIOE 5060. Special Topics in Bioengineering. 4 Hours.

Focuses on topics of timely interest to students of science and engineering. Topic varies from semester to semester. When appropriate, the course takes advantage of unique opportunities afforded by visiting faculty and guests. May be repeated once.

BIOE 5100. Medical Physiology. 4 Hours.

Designed to provide bioengineering students with a working knowledge of the integrated behavior of organs and systems in the human body. As such, the student is provided with a comprehensive and intense immersion in each physiological subsystem with the expectation that he or she display knowledge of each at the level equivalent to that of a second-year medical student following his or her exposure to physiology. The specific subsystems covered are muscle physiology, cardiovascular physiology with ECG interpretation, pulmonary physiology with gas exchange mechanics and ventilation/perfusion, renal physiology and water balance, regulation of pH, gastrointestinal physiology, temperature regulation and energy balance, endocrine systems, and reproductive systems. The course does not cover neurophysiology. Requires prior completion of BIOL 1117 or equivalent.

BIOE 5115. Dynamical Systems in Biological Engineering. 4 Hours.

Introduces the theoretical analysis and modeling of dynamical systems in biology, ranging from molecular to population applications. Topics include difference and differential equation models, with basic theory including nondimensionalization, steady states, linearization, stability, eigenvalues, global behavior, singular perturbations, multistability, hysteresis, cooperativity, periodic solutions, excitable systems, bifurcations; and an introduction to spatial (PDE) models. Develops all concepts in the context of concrete biological applications, such as gene regulation; chemical reaction networks and stoichiometry; drug models and PK/PD; receptor/ligand interactions; synthetic constructs; action potential generation; enzymatic reactions; population interactions; epidemiology; epigenetic phenomena, including differentiation and transport; chemotaxis; and diffusion.

BIOE 5235. Biomedical Imaging. 4 Hours.

Presents the foundations of modern medical imaging, including imaging principles, imaging mathematics, imaging physics, and image-generation techniques. Includes X-ray, ultrasound, computed tomography, and magnetic resonance imaging.

BIOE 5250. Design, Manufacture, and Evaluation of Medical Devices. 4 Hours.

Covers engineering design challenges intrinsic to the development of biomedical devices, including clinical evaluation, manufacture, and testing of medical devices and the constraints that FDA regulations place on these processes. Topics include quality systems, design control, cybersecurity concerns, the role of standards in global device regulation, and the design process. Students are asked to form teams and to carry out a semester-long conceptual design project to develop a design overview, design plan, design input specifications, and verification test procedures for a novel medical device.

BIOE 5320. Advanced Biomedical Measurements and Instrumentation. 4 Hours.

Offers a comprehensive analysis of the principles underlying biomedical instrumentation, including ECG, EEG, CAT scanning, MRI imaging, and other biomedical laboratory tools. Includes associated laboratory exercises within the course material.

BIOE 5410. Molecular Bioengineering. 4 Hours.

Introduces the fundamentals of molecular structure and function that underpin engineering of biological macromolecules. Builds on this base with the application of design concepts for molecules and methods of structural and functional analyses and strategies for design and redesign of therapeutic molecules. Projects seek to provide students with experience in conceptual design to create strategies to address significant health concerns.

BIOE 5420. Cellular Engineering. 4 Hours.

Analyzes the techniques that form the foundation of molecular cell engineering, including recombinant DNA, cloning and genomics, prokaryotic and eukaryotic gene regulation and single-cell gene expression, structure, dynamics of gene regulatory networks, metabolism and cellular energetics, cell structure, cytoskeleton and cellular motors, synthetic gene circuits, and metabolic engineering.

BIOE 5430. Principles and Applications of Tissue Engineering. 4 Hours.

Applies the principles of biology and biomedical engineering to the creation of artificial organs for transplantation, basic research, or drug development. Requires integration of knowledge of organic chemistry, cell biology, genetics, mechanics, biomaterials, nanotechnology, and transport processes to create functional organs. Reviews basic cell culture techniques, structure function relationships, cellular communication, natural and artificial biomaterials, and the basic equations governing cell survival and tissue organization.

BIOE 5440. The Cell as a Machine. 4 Hours.

Introduces the key roles that physical forces, the extracellular matrix, and cytoskeletal structure play in the development of human diseases. The cell is viewed as an engineering system that is capable of sensing physical cues from its environment, integrating such information from different mechano-sensors, and responding to changes in its external environment in a coherent manner. Uses mathematical and computational models to explain how cells sense and respond to physical cues. .

BIOE 5450. Stem Cell Engineering. 4 Hours.

Covers engineering principles and approaches in stem cell research and their application in tissue engineering and regenerative medicine. Emphasizes recent technology and engineering tools used to understand and manipulate stem cells. Topics covered include embryonic and adult stem cell biology fundamentals; quantitative modeling of stem cell signaling; genetic/biochemical/biophysical/biomechanical/biomaterials tools to control stem cell fate and differentiation; epigenetic editing and cellular reprogramming; engineering biomimetic and bioreactor environments to develop stem-cell-based therapies; and various applications in tissue development, diseases, and regeneration.

BIOE 5630. Physiological Fluid Mechanics. 4 Hours.

Analyzes biofluids and their mechanics, including cardiovascular fluid mechanics. Examples are taken from biotechnology processes and physiologic applications, including the cardiovascular, respiratory, ocular, renal, musculoskeletal, and gastrointestinal systems. Topics include dimensional analysis, particle kinematics in Eulerian and Lagrangian reference frames, constitutive equations and Newtonian/non-Newtonian biofluid models, flow and wave propagation in flexible tubes, and oscillatory and pulsatile flows.

BIOE 5640. Computational Biomechanics. 4 Hours.

Identifies and reviews the fundamental conservation principles that govern structural mechanics and fluid dynamics in biological systems. Discusses the following numerical analysis techniques: parameter estimation, finite difference, numerical integration, and finite element methods. By combining conservation laws with numerical analyses techniques, develops approaches to describe the physiological function of various biological systems, allowing for a system of equations to be used to describe a biological problem and solve this system numerically to predict its behavior.

BIOE 5648. Biomedical Optics. 4 Hours.

Covers biomedical optics and discusses the theory and practice of biological and medical applications of lasers. Topics covered include fundamentals of light propagation in biological tissues; light-matter interactions such as elastic and inelastic scattering; fluorescence and phosphorescence; diagnostic imaging techniques such as confocal fluorescence microscopy, diffuse optical tomography, and optical coherence tomography; and therapeutic interventional techniques, including photodynamic therapy, laser thermal therapies, and fluorescence-guided surgeries. EECE 5648 and BIOE 5648 are cross-listed.

BIOE 5650. Multiscale Biomechanics. 4 Hours.

Seeks to help students develop and apply scaling laws and continuum mechanics to biomechanical phenomena at different length scales starting from a single molecule, moving up to the cellular and tissue levels. Topics include structure of tissues and the molecular basis for macroscopic properties; chemical and electrical effects on mechanical behavior; cell mechanics, motility, and adhesion; biomembranes; biomolecular mechanics and molecular motors; and experimental methods for probing structures at the tissue, cellular, and molecular levels.

BIOE 5656. Fields, Forces, and Flows in Biological Systems. 4 Hours.

Introduces the basic driving forces for electric current, fluid flow, and mass transport, plus their application to a variety of biological systems. Studies basic mathematical and engineering tools in the context of biology and physiology. Considers various electrokinetic phenomena as an example of the coupled nature of chemical-electro-mechanical driving forces. Applications include transport in biological tissues and across membranes, manipulation of cells and biomolecules, and microfluidics.

BIOE 5810. Design of Biomedical Instrumentation. 4 Hours.

Investigates the principles of biology and engineering underlying the design and use of biomedical instrumentation. Topics include design of a broad range of instrumentation and monitoring devices, sensors, and integrated systems. Graduate students interested in taking this course should have completed an equivalent introductory circuits course.

BIOE 5820. Biomaterials. 4 Hours.

Offers a broad overview of the field of biomaterials (materials used in medical devices that interact with living tissues). Introductory lectures cover biomaterials and their translation from the laboratory to the medical marketplace. Discusses important biomaterials terminology and concepts. Emphasizes material structure-property-function-testing relationships and discusses specific materials used in medical devices and drug delivery. Concludes with introductions to topics in the field, such as biomaterials-tissue interactions, tissue engineering, and regulatory requirements. Considers principles of device design as related to the selection and application of biomaterials.

BIOE 5850. Design of Implants. 4 Hours.

Studies the use of cell-matrix control volumes; stress analysis in design processes; anatomical fit, shape, and size of implants; biomaterials; surgical implantation procedures; testing for safety and efficacy; and design of clinical trials. Covers applications to orthopedic devices, soft tissue implants, artificial organs, and dental implants.

BIOE 6000. Principles of Bioengineering. 1 Hour.

Covers the fundamentals of bioengineering research topics and methodology for master's-level bioengineering students. Internal and external speakers discuss general topics in bioengineering, including the medical device qualification and regulatory environment, tissue engineering, cell engineering, mechanobiology, drug delivery, bioimaging, neuromotor control, and effective design of experiments. Each student is expected to read, critically evaluate, and present research in a peer-reviewed bioengineering journal article.

BIOE 6100. Medical Physiology. 4 Hours.

Designed to provide bioengineering students with a working knowledge of the integrated behavior of organs and systems in the human body. As such, the student is provided with a comprehensive and intense immersion in each physiological subsystem with the expectation that he or she display knowledge of each at the level equivalent to that of a second-year medical student following his or her exposure to physiology. The specific subsystems covered are muscle physiology, cardiovascular physiology with ECG interpretation, pulmonary physiology with gas exchange mechanics and ventilation/perfusion, renal physiology and water balance, regulation of pH, gastrointestinal physiology, temperature regulation and energy balance, endocrine systems, and reproductive systems. The course does not cover neurophysiology. Requires prior completion of BIOL 1117 or equivalent. .

BIOE 6200. Mathematical Methods in Bioengineering. 4 Hours.

Offers an overview of quantitative techniques that students will encounter in their research, providing a language and a foundation for more specialized study. Introduces basic concepts from linear algebra, ordinary and partial differential equations, transforms, function approximation, probability, statistics, and numerical computation, illustrated by applications in biology and medicine.

BIOE 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

BIOE 6964. Co-op Work Experience. 0 Hours.

Provides eligible students with an opportunity for work experience. May be repeated without limit.

BIOE 6965. Co-op Work Experience Abroad. 0 Hours.

Provides eligible students with an opportunity for work experience abroad. May be repeated without limit.

BIOE 7000. Principles of Bioengineering. 4 Hours.

Designed to introduce new graduate bioengineering students to the fundamentals of bioengineering research topics and methodology. Includes outside speakers to discuss general topics in bioengineering. Examples of course topics include the medical device qualification and regulatory environment, tissue engineering, cell engineering, mechanobiology, drug delivery, bioimaging, neuromotor control, effective design of experiments, writing research proposals for the National Institutes of Health (NIH) and how to evaluate and write a peer-reviewed journal article, etc. Expects students to read, critically evaluate, and present the research in a bioengineering journal article. Students are then expected to extend their article into a hypothesis-driven proposal in NIH format with an oral defense of the proposal.

BIOE 7100. Special Topics in Biomedical Imaging and Signal Processing. 4 Hours.

Offers various topics of interest in biomedical imaging and signal processing for advanced study depending on the interests of the faculty and students. May be repeated up to two times.

BIOE 7200. Special Topics in Cell and Tissue Engineering. 4 Hours.

Offers various topics of interest in cell and tissue engineering for advanced study depending upon the interests of the faculty and students. May be repeated up to two times.

BIOE 7300. Special Topics in Biomechanics. 4 Hours.

Offers various topics of interest in biomechanics for advanced study depending upon the interests of the faculty and students. May be repeated up to two times.

BIOE 7390. Seminar. 0 Hours.

Presents topics of an advanced nature by staff, outside speakers, and students in the graduate program. This course must be attended every semester by all full-time graduate students. May be repeated without limit.

BIOE 7400. Special Topics in Biomedical Devices. 4 Hours.

Offers various topics of interest in biomedical devices for advanced study depending upon the interests of the faculty and students. May be repeated up to two times.

BIOE 7890. Master's Project. 4 Hours.

Offers analytical and/or experimental work leading to a written report and a final short presentation by the end of the semester.

BIOE 7962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

BIOE 7978. Independent Study. 1-4 Hours.

Offers theoretical or experimental work under individual faculty supervision. May be repeated for up to 16 total credits.

BIOE 7990. Thesis. 4 Hours.

Offers analytical, research, and/or experimental work conducted under the auspices of the department. May be repeated once.

BIOE 7996. Thesis Continuation. 0 Hours.

Continues thesis work conducted under the supervision of a departmental faculty.

BIOE 8960. Exam Preparation—Doctoral. 0 Hours.

Offers students an opportunity to prepare for the PhD qualifying exam under faculty supervision. Intended for students who have completed all required PhD course work and have not yet achieved PhD candidacy; students who have not completed all required PhD course work are not allowed to register for this course. May be repeated once.

BIOE 8986. Research. 0 Hours.

Offers students an opportunity to conduct full-time research under faculty supervision. May be repeated without limit.

BIOE 9000. PhD Candidacy Achieved. 0 Hours.

Indicates successful completion of program requirements for PhD candidacy.

BIOE 9986. Research. 0 Hours.

Offers students an opportunity to conduct full-time research under faculty supervision. May be repeated without limit.

BIOE 9990. Dissertation. 0 Hours.

Offers theoretical and/or experimental work conducted under the auspices of the department. Must be taken in two consecutive semesters. May be repeated once.

BIOE 9996. Dissertation Continuation. 0 Hours.

Offers continued dissertation work conducted under the supervision of a departmental faculty member. May be repeated without limit.

Bioinformatics (BINF)

Search BINF Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=BINF>)

BINF 5964. Experiential Project. 0 Hours.

Offers students an applied project setting in which to apply their curricular learning. Working with a sponsor, students refine an applied research topic, perform research, develop recommendations that are shared with a partner sponsor, and create a plan for implementing their recommendations. Seeks to benefit students with a curriculum that supports the development of key business communication skills, project and client management skills, and frameworks for business analysis. Offers students an opportunity to learn from sponsor feedback, review 'lessons learned,' and incorporate suggestions from this review to improve and further develop their career development and professional plan. May be repeated twice. .

BINF 5976. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated twice. .

BINF 6200. Bioinformatics Programming. 4 Hours.

Focuses on the fundamental programming skills required in the bioinformatics industry. Focuses on Python and R as the main programming language used. Topics include string operations, file manipulation, regular expressions, object-oriented programming, data structures, testing, program design, and implementation. Includes substantial out-of-classroom assignments. .

BINF 6308. Bioinformatics Computational Methods 1. 4 Hours.

Offers the first semester of a two-semester sequence on the use of computers in bioinformatics research. Offers students an opportunity to work with current methods and computational algorithms used in contemporary sequence analysis. Teaches practical skills necessary to manage and mine the vast biological information being generated and housed in public databases. Emphasizes the use of Python as the primary computer language and requires students to learn and understand basic computer logic and syntax, including an introduction to scalars, arrays, hashes, decision statements, loops, subroutines, references, and regular expressions. A focus on fundamental skills, including the command line interface found in the Linux operating system, is designed to prepare students for second-semester applications.

BINF 6309. Bioinformatics Computational Methods 2. 4 Hours.

Designed to build upon the core topics covered in BINF 6308, i.e., use of the computer as a tool for bioinformatics research. Builds upon the Python language fundamentals covered during the first semester but requires students to apply these fundamentals to a semester-long project. The project includes protein family analysis, multiple sequence analysis, phylogeny, and protein structure analysis. Additionally, students have an opportunity to learn to build, load, connect, and query custom MySQL databases, and parse command line flags. .

BINF 6400. Genomics in Bioinformatics. 4 Hours.

Introduces the field of genomics. With the completion of the Human Genome Project several years ago, there has been an explosion of genetic data collected. Focuses on the bioinformatics tools necessary to analyze large-scale genomic data. Covers topics such as phylogenetic trees, molecular evolution, gene expression profiling, heterogeneous genomic data, as well as next-generation sequencing (NGS) data. .

BINF 6410. Proteomics in Bioinformatics. 4 Hours.

Introduces protein mass spectrometry and the state-of-the-art instrumentation used today. Proteomics data has become an integral part of the biopharmaceutical characterization and approval process. Topics include the current bioinformatic tools used to analyze raw data, protein identification, posttranslational modifications, targeted proteomics, and quantitative proteomics. Covers freely available bioinformatics tools, such as NCBI, UniProt, and ExPASy.

BINF 6420. Omics in Bioinformatics. 4 Hours.

Focuses on some of the omics, other than genomics and proteomics, in relation to the bioinformatic tools that exist to analyze data. Provides a brief background on each field of study and then focuses on the current bioinformatics tools used. Topics include transcriptomics (transcription and gene expression), metabolomics (metabolism), glycomics (carbohydrates), lipomics (lipids), and phenomics (phenotypic data). Does not cover genomics and proteomics.

BINF 6954. Co-op Work Experience - Half-Time. 0 Hours.

Provides eligible students with an opportunity for work experience. May be repeated without limit.

BINF 6964. Co-op Work Experience. 0 Hours.

Provides eligible students with an opportunity for work experience. May be repeated without limit.

BINF 6965. Co-op Work Experience Abroad. 0 Hours.

Offers eligible students an opportunity for work experience abroad. May be repeated without limit.

BINF 7385. Bioinformatics Seminar. 2 Hours.

Discusses current issues and research topics in bioinformatics. Requires student presentations. May be repeated without limit.

Biology (BIOL)

Search BIOL Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=BIOL>)

BIOL 1000. Biology at Northeastern. 1 Hour.

Introduces first-year students to the major and the field of biology and to the professional and academic resources available to students at Northeastern University; acquaints students with their faculty, advisors, and fellow students; provides an initial orientation to undergraduate research, cooperative education, and other experiential learning options; helps develop the academic skills necessary to succeed; provides grounding in the culture and values of the university community; and assists in interpersonal skill development—in short, familiarizes students with the resources and skills needed to become a successful university student.

BIOL 1107. Foundations of Biology. 4 Hours.

Introduces evolutionary principles, cellular structure and function, genetic transmission, energy pathways, and physiology. Covers current topics in biology and evaluates and discusses current scientific literature. Explores the interdisciplinary nature of biology. Offers students an opportunity to prepare for the topical inquiries in biology courses.

BIOL 1108. Lab for BIOL 1107. 1 Hour.

Accompanies BIOL1107. Includes various lab experiments that emphasize evolutionary principles, cellular structure and function, genetic transmission, energy pathways, and physiology.

BIOL 1111. General Biology 1. 4 Hours.

Explores basic principles of biology with a focus on those features shared by all living organisms and seen through the lens of evolutionary theory. Through lectures, readings and discussion, offers students an opportunity to understand how the scientific method has been and is used to address biological questions. Central topics include recent advances in cell anatomy and physiology, including the interplay between organelles, membrane transport, and cell-signaling; energy transfer through cells and through the biosphere; cellular reproduction and cancer; heredity and human genetic disorders; and protein synthesis and biotechnology. Explores the societal implications of such topics as biopharmaceuticals, ocean acidification, climate change, human diseases, epigenetics, cancer, and cloning.

BIOL 1112. Lab for BIOL 1111. 1 Hour.

Accompanies BIOL 1111. Offers students an opportunity to collect quantitative data through hands-on experimentation as well as simulations. Data is analyzed statistically and presented in written form.

BIOL 1113. General Biology 2. 4 Hours.

Continues BIOL 1111. Examines the evolution of structural and functional diversity of organisms; the integrative biology of multicellular organisms; and ecological relationships at the population, community, and ecosystem levels.

BIOL 1114. Lab for BIOL 1113. 1 Hour.

Accompanies BIOL 1113. Covers topics from the course through various experiments.

BIOL 1115. General Biology 1 for Engineers. 4 Hours.

Introduces basic molecular and cellular biology principles and concepts. Offers students an opportunity to begin to apply chemical and engineering principles to further an understanding of selected physiological processes and biological systems. Topics include protein structure and function, cellular organization, energetics, information management, molecular transport, signaling, and motility.

BIOL 1116. Lab for BIOL 1115. 1 Hour.

Accompanies BIOL 1115. Covers topics from the course through various experiments.

BIOL 1117. Integrated Anatomy and Physiology 1. 4 Hours.

Introduces students to integrated human anatomy and physiology. Focuses on structure and function of cells and tissues. Presents the anatomy and physiology of skin, bones, muscles, blood, and the nervous system.

BIOL 1118. Lab for BIOL 1117. 1 Hour.

Accompanies BIOL 1117. Covers topics from the course through various experiments.

BIOL 1119. Integrated Anatomy and Physiology 2. 4 Hours.

Continues BIOL 1117. Presents the structure and function of the human endocrine, reproductive, cardiovascular, respiratory, urinary, and digestive systems as well as the regulation of metabolism and body temperature.

BIOL 1120. Lab for BIOL 1119. 1 Hour.

Accompanies BIOL 1119. Covers topics from the course through various experiments.

BIOL 1121. Basic Microbiology. 4 Hours.

Focuses on how to identify, control, and live with bacteria and viruses. Emphasizes the mechanisms of disease production, natural host defense systems, and medical interventions.

BIOL 1122. Lab for BIOL 1121. 1 Hour.

Accompanies BIOL 1121. Covers topics from the course through various experiments.

BIOL 1141. Microbes and Society. 4 Hours.

Introduces the unseen world of microorganisms. Students analyze how the growth and behavior of this diverse group of organisms affect many aspects of human society including agriculture and food preparation; drug development and manufacture; liquid and solid waste management; genetic engineering; geochemical cycles; and health and disease.

BIOL 1143. Biology and Society. 4 Hours.

Offers an overview of how biology weaves its way across a broad spectrum of complex societal issues. Introduces students to the biological mechanisms and processes responsible for genetic inheritance, energy transfer, evolution, and population dynamics, providing a framework within which students may critically interpret and discuss important biological information provided in public forums. Seeks to empower students to make informed choices at the policy and personal levels. Offers students an opportunity to acquire an understanding of the basic principles of biology and apply the scientific process to the analysis of contemporary issues. Using a thematic approach, covers a wide range of issues including the reemergence of plagues, biological weapons and security, the environment, and human health and wellness.

BIOL 1147. The Human Organism. 4 Hours.

Introduces the structure and function of the human body. Emphasizes the principles of biological and physical science as they relate to life processes in health and disease.

BIOL 1149. Biology of Human Reproduction. 4 Hours.

Studies sexual and reproductive function in the human male and female, that is, sexual development, coitus, fertilization, pregnancy, birth, and lactation. Discusses the methods of controlling fertility and sexually transmitted diseases. Analyzes factors affecting reproduction and sexuality in human population.

BIOL 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

BIOL 2299. Inquiries in Biological Sciences. 4 Hours.

Focuses on the latest developments in the field. Offers students an opportunity to explore both scientific practice and progress through readings, discussion, and projects and to expand and deepen their understanding of fundamental biological principles at the cellular and molecular level.

BIOL 2301. Genetics and Molecular Biology. 4 Hours.

Focuses on mechanisms of inheritance, gene-genome structure and function, and developmental genetics and evolution. Examples are drawn from the broad spectrum of plants, animals, fungi, bacteria, and viruses. Topics and analytical approaches include transmission genetics, molecular biology and gene regulation, DNA molecular methods, quantitative and population genetics, bioinformatics, genomics, and proteomics.

BIOL 2302. Lab for BIOL 2301. 1 Hour.

Accompanies BIOL 2301. Reinforces and extends concepts presented and practiced in the accompanying lecture course through the application of scientific investigation methods and data analysis.

BIOL 2309. Biology Project Lab. 4 Hours.

Offers an inquiry-based, intensive laboratory experience in which students have an opportunity to design and conduct independent research projects, applying approaches and techniques used in cell and molecular biology. Offers students an opportunity to present their results in professional formats.

BIOL 2327. Human Parasitology. 4 Hours.

Examines the general biology, life cycles, modes of transmission, and pathogenesis of major parasites on global human health. Explores a number of important diseases, along with the diverse protozoans, worms, and arthropods responsible for them.

BIOL 2329. Bioethics. 4 Hours.

Offers students an opportunity to explore ethical issues arising from biological research and emerging technologies, to learn to identify and critically analyze potential ethical implications of biological research, and to evaluate theory-based arguments while respectfully engaging with a diversity of perspectives. Using their knowledge of basic cellular and molecular science as a foundation, students have an opportunity to gain a deeper understanding of the biology of genome editing and other molecular and cellular biology-based technologies. Examines the history and ethical dialogue around genome editing as an in-depth example of an emerging technology with wide-ranging applications. Studies additional technologies with respect to research progress, international perspectives, and potential implications in the areas of security, environmental protection, and personal health.

BIOL 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

BIOL 3401. Comparative Vertebrate Anatomy. 4 Hours.

Examines the morphology and phylogeny of the vertebrates.

BIOL 3403. Animal Behavior. 4 Hours.

Examines the evolution of animal behavior. Topics include how behaviors have evolved, the adaptive function of behavior, and the relative roles of genes and the environment in the development of behavior. Behaviors from feeding and reproductive strategies to communication and social behavior are considered. Implications for human behavior are considered.

BIOL 3405. Neurobiology. 4 Hours.

Introduces the cellular and molecular functioning of the nervous system, the organization of neurons into circuits, the processing of information, and the generation of motor output.

BIOL 3409. Current Topics in Biology. 4 Hours.

Examines selected topics in biology. Topics vary each semester. May be repeated without limit.

BIOL 3411. Current Topics in Cell and Molecular Biology. 4 Hours.

Examines selected topics in cell and molecular biology. Topics vary each semester. May be repeated without limit.

BIOL 3413. Current Topics in Organismal and Population Biology. 4 Hours.

Examines selected topics in organismal and population biology. Topics vary each semester. May be repeated without limit.

BIOL 3415. Current Topics in Behavioral Neuroscience. 4 Hours.

Examines selected topics in behavioral neuroscience. Topics vary each semester.

BIOL 3421. Microbiology. 4 Hours.

Introduces morphological, ecological, and biochemical consideration of representative groups of bacteria. Introduces virology and microbial genetics; host-parasite relationships, prokaryotes of medical significance; and physical and chemical controls of microbial growth. .

BIOL 3422. Lab for BIOL 3421. 1 Hour.

Accompanies BIOL 3421. Covers topics from the course through various experiments. .

BIOL 3601. Neural Systems and Behavior. 4 Hours.

Reviews major experimental approaches and key concepts used in behavioral neurobiology. Begins with a look at its history. Topics covered include spatial orientation and sensory guidance, neuronal control of motor output, neuronal processing of sensory information, sensorimotor integration, neuromodulation, circadian rhythms and biological clocks, behavioral physiology of large-scale navigation, neurobiology of communication, and cellular mechanisms of learning and memory.

BIOL 3603. Mammalian Systems Physiology. 4 Hours.

Designed to familiarize students with fundamental principles in mammalian physiology. Emphasizes major organ systems integration. Where applicable, explores and uses human physiology to reinforce principles in physiology and build upon these principles by analyzing how major organ systems effectively network for proper organismal function. Initially covers the physiological principles of energy and metabolism in mammals, including human adaptation for basic energy requirements, and then delves into basics of membrane transport. Evaluates roles for organ systems integration in the respiratory, cardiovascular, gastrointestinal, hemopoietic, renal, and reproductive systems.

BIOL 3605. Developmental Neurobiology. 4 Hours.

Covers the cellular, molecular, and genetic processes that guide neural development. Focuses on how nerve cells are generated, patterned, and connected with one another to regulate animal behavior. Topics include cell differentiation, tissue patterning, neural plasticity, and cognitive development.

BIOL 3607. Current Trends in Reproductive Sciences. 4 Hours.

Introduces current trends in the field of reproductive sciences, spanning basic human reproduction, infertility, and potential horizons in medicine. Surveys topics in basic research that have the most promise to make an impact in the field of women's health. Emphasizes human health but includes animal models in the analysis.

BIOL 3609. Developmental Biology. 4 Hours.

Focuses on organismal development at cellular, molecular, and anatomical levels. Topics include gametogenesis, fertilization, cleavage, gastrulation, organogenesis, and metamorphosis. Invertebrates and vertebrates provide descriptive and experimental models. Laboratory work emphasizes echinoderms, amphibians, birds, and mammals.

BIOL 3611. Biochemistry. 4 Hours.

Covers structure and function of biomolecules, central concepts of bioenergetics and thermodynamics, enzyme kinetics and regulation, and metabolic pathways.

BIOL 3612. Lab for BIOL 3611. 1 Hour.

Accompanies BIOL 3611. Covers topics from the course through various experiments.

BIOL 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

BIOL 4701. Biology Capstone. 4 Hours.

Integrates and assesses the concepts and skills obtained from the entire biology curriculum, including experiential and classroom-based components. Requires reflection by students on their various educational experiences, extensive research of scientific questions related to these experiences, and development of an original research proposal. Offers students an opportunity to hone communication skills through formal and informal presentations, class discussion, and critique.

BIOL 4705. Neurobiology of Cognitive Decline. 4 Hours.

Introduces the neuroanatomical and cognitive sequelae of brain aging and neurodegenerative disease. Covers molecular and cellular processes that damage neurons, animal models, and brain imaging. Explores higher-level manifestations of damage to, for example, memory, language, and reward systems.

BIOL 4707. Cell and Molecular Biology. 4 Hours.

Integrates molecular biology and biochemistry in the cellular context. Focuses on the organization and function of eukaryotic cells, including the regulation of nuclear structure and gene expression, signal transduction, protein synthesis and growth, cellular energetics, the cytoskeleton and cell motility, cell division, and cell death. Emphasizes the scientific methodologies and approaches that underlie discovery in cell biology.

BIOL 4709. Neurobiology of Learning and Memory. 4 Hours.

Explores the neurobiology of learning and memory from the level of the synapse up to the neural systems underlying emergent mnemonic function. Topics include the synaptic mechanisms underlying neural plasticity; the molecular basis of mnemonic processes; and the neural circuits serving distinct memory systems. In addition to lecture-based material, students utilize primary research and review articles from the current scientific literature to evaluate data and develop hypotheses via oral presentations and active discussions in the classroom. The overarching goal of the course is to provide a neurobiological perspective on how information is encoded, consolidated, and later retrieved and the significance of dysfunction in these processes associated with neurologic deficits and disease.

BIOL 4970. Junior/Senior Honors Project 1. 4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student's major field. Combined with Junior/Senior Project 2 or college-defined equivalent for 8 credit honors project. May be repeated without limit.

BIOL 4971. Junior/Senior Honors Project 2. 4 Hours.

Focuses on second semester of in-depth project in which a student conducts research or produces a product related to the student's major field. .

BIOL 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

BIOL 4991. Research. 4 Hours.

Offers independent laboratory research work on a chosen topic under the direction of members of the department. Course content depends on instructor. May be repeated without limit.

BIOL 4994. Internship. 4 Hours.

Offers students an opportunity for internship work. May be repeated without limit.

BIOL 5100. Biology Colloquium. 1 Hour.

Offers a series of colloquia in biological research by invited experts on current topics. May be repeated without limit.

BIOL 5306. Biological Clocks. 4 Hours.

Examines the expression of endogenously generated twenty-four-hour (circadian) rhythms in eukaryotic life, emphasizing theoretical foundations as well as current research strategies for understanding how biological clocks work. Presents analytic principles essential for understanding biological rhythmicity in any organism at any level of organization. Emphasizes strategies used to understand the concrete mechanisms underlying biological rhythmicity.

BIOL 5307. Biological Electron Microscopy. 4 Hours.

Presents techniques of electron microscopy applied to biological materials. Discusses specimen preparation, fixation, thin-sectioning, staining, operation of the microscopes, photographic techniques, and interpretation of electron micrographs. Requires student seminars and project.

BIOL 5308. Lab for BIOL 5307. 1 Hour.

Designed for graduate and advanced undergraduate students with no formal training in electron microscopy. Offers students an opportunity to acquire a thorough working knowledge of transmission and scanning electron microscopy by having each student process specimens from living tissue through the production of electron micrographs. This involves standard specimen preparation protocols including fixation, embedding, ultramicrotomy, staining, critical point drying, and sputter coating, as well as the independent operation of state-of-the-art electron microscopy equipment.

BIOL 5499. Plant Biotechnology. 4 Hours.

Designed as an introductory course on plant biotechnology for upper-level undergraduates and first-year graduate students. Using examples from current research, offers students an opportunity to review the technology used to modify and improve economically important plants for sustainable agriculture as well as for the production of pharmaceutical and medicinal products. Specific topics include principles of plant heredity and genetics (molecular biology), plant breeding and improvement, hormones and growth regulators, gene isolation, plant tissue culture and transformation, plant-based pharmaceutical production, and stress tolerance and improvement. The course consists of weekly lectures, laboratory demonstrations, and review sessions of recent literature.

BIOL 5541. Endocrinology. 4 Hours.

Explores the endocrine regulation of physiological systems, emphasizing current research. Lectures provide background, followed by analysis of primary literature and case studies. Topics include growth, reproduction, nutrient utilization, stress, and environmental endocrine disruption. Emphasizes humans but includes material on other animals, including invertebrates.

BIOL 5543. Stem Cells and Regeneration. 4 Hours.

Explores the biological basis of embryonic, adult, and induced pluripotent stem cells toward an understanding of their roles in development, homeostasis, and regeneration, as well as their therapeutic potential. The study of stem cells is a rapidly advancing area in biology and biomedicine. Although the biological basis of stem cells is a major focus, the course aims to put this knowledge into a biomedical context.

BIOL 5549. Inventions in Microbial Biotechnology. 4 Hours.

Offers readings and seminar-style discussion from the current literature on important inventions and practical applications in biotechnology, with a focus on drug discovery.

BIOL 5569. Advanced Microbiology. 4 Hours.

Focuses on how microorganisms develop, exchange, and regulate genes, and survive in various environments. Emphasizes experimental design and proof, particularly as related to genetic exchange, gene regulation, single and multicellular development, and cell-cell communication.

BIOL 5573. Medical Microbiology. 4 Hours.

Emphasizes host-parasite interactions: virulence, toxins, natural flora, and immunological responses; characteristics of the common bacterial, rickettsial, and protozoal infections in humans; and epidemiology, pathology, vaccines, and chemotherapy.

BIOL 5581. Biological Imaging. 4 Hours.

Illustrates imaging principles and techniques and their application to biological problems. Topics vary and may include microscopic and macroscopic approaches in areas such as cellular and neurobiology, ecology, and biochemistry.

BIOL 5583. Immunology. 4 Hours.

Provides an overview of the structure and function of genes, proteins, and cells involved in the generation of the immune response. Emphasis is on molecular immunology and immunogenetics.

BIOL 5585. Evolution. 4 Hours.

Discusses history of evolutionary theory and lines of evidence. Emphasis is on mechanisms of speciation. Introduces and discusses current evolutionary topics.

BIOL 5587. Comparative Neurobiology. 4 Hours.

Presents a cellular approach to structure and function of the nervous system. Topics include neuronal anatomy, phylogeny of nervous systems, electrophysiology of membrane conductances, synaptic transmission, integration in nerve cells, neuronal networks, sensory systems, motor systems, sensory-motor integration, development and regeneration of neuronal connectivity, and fundamentals of neurotechnology for biomedics. Focuses on the development of these concepts from the primary research literature. A term project involves the design of a simple nervous system for a hypothetical animal.

BIOL 5591. Advanced Genomics. 4 Hours.

Intended for those familiar with the basics of genetics, molecular and cellular biology, and biochemistry, all of which are required to appreciate the beauty, power, and importance of modern genomic approaches. Introduces the latest sequencing methods, array technology, genomic databases, whole genome analysis, functional genomics, and more.

BIOL 5593. Cell and Molecular Biology of Aging. 4 Hours.

Covers the recent scientific discoveries that have transformed our understanding of the process of aging. Examines in-depth the current understanding of the molecular mechanisms that control life span in model organisms, including yeast, worms, flies, and mice. Discusses dietary interventions and pharmacological approaches that extend the life span and delay the onset of age-related diseases. Covers potential applications of the new science of aging to improve human health. Requires students to read, discuss, present, and report on primary research papers from the literature.

BIOL 5595. Cell and Molecular Neuroscience. 4 Hours.

Combines molecular biology, cell biology, pharmacology, and genetics to address the fundamental molecular properties of neurons and neuronal networks. At its core, the principles that govern the communication between cells of the nervous system are determined by their molecular components. The molecular landscape defines the individual properties of a neuron and the function of neuronal networks as a whole. Focuses on neuronal signaling through the function of ion channels and receptors, supramolecular mechanisms like synaptic transmission and axonal transport, and the molecular mechanisms that underlie biological networks and neural coding of information. Uses the fundamental understanding of molecular networks as a framework to explore the mechanisms that underlie neurological diseases and disorders. Discusses current treatments and therapies that rely on modulating neuronal signaling through molecular interactions.

BIOL 5597. Immunotherapies of Cancer and Infectious Disease. 4 Hours.

Describes the basic principles and the current promises and disappointments with immunotherapies of cancer. Provides a historical overview of the main barriers between tumors and antitumor killer cells. The unifying focus of the lectures is the role of immunological and physiological negative regulators, i.e., “brakes” of anti-tumor immune response. A significant part of the course is dedicated to the retrospective evaluation of the last three decades of the immunological and biochemical studies that culminated in identification of the “chief of tumor defense operations,” i.e., a hypoxia-adenosinergic pathway in the tumor microenvironment.

BIOL 5599. Principles of Data Management and Peer Review in Biology. 4 Hours.

Designed to familiarize students with the fundamentals of all aspects of data management within an academic setting. Topics include data acquisition, documentation and storage, intellectual property and patents, assignment of ownership, identification of conflicts of interest, and the peer review process for manuscript and grant submission. Responsible conduct of research (RCR) training is an important part of this course. Offers students an opportunity to become familiar with, and complete, fundamental training using nationally accepted standard certifications, including RCR training, pertaining to data management. Students analyze patent preparation and manuscript and grant peer review. Additionally, students participate in a study section review panel.

BIOL 5601. Multidisciplinary Approaches in Motor Control. 4 Hours.

Studies the field of human motor control, or motor neuroscience. Offers students an opportunity to obtain a fundamental understanding of the processes underlying the acquisition and control of sensorimotor behavior. The systems approach connects a variety of disciplines ranging from neurophysiology, to engineering, to neurorehabilitation. Reviews a selection of approaches with emphasis on motor learning. Focuses on early behavioral approaches, more recent neurophysiological and imaging approaches, and rehabilitation. Discusses selected representative papers, including seminal historical papers and more recent studies reflecting the current discussion in the field.

BIOL 5603. Computational Neuroscience. 4 Hours.

Covers applications of computational methods to current problems in cellular and systems neuroscience. Draws examples from such biological domains as sensory encoding, motor control, cortical information processing, memory storage and retrieval, neuronal decision making, animal learning paradigms and cognitive architectures. Emphasizes neuronal computation, realistic network modeling, and associated analytical techniques. Students who do not meet course prerequisites may seek permission of instructor.

BIOL 6299. Molecular Cell Biology for Biotechnology. 3 Hours.

Integrates biochemistry and molecular biology in the cellular context. Includes the organization and replication of genomes, principles and methods for genetic manipulation, the regulation of gene expression, and the structure and function of organelles. Emphasizes protein synthesis, including translation, post-translational modifications, and translocations of proteins within the cells and secretion.

BIOL 6300. Biochemistry. 4 Hours.

Studies the structure and function of biomolecules, with an emphasis on proteins; enzyme catalysis; and cellular metabolism, with an emphasis on bioenergetics and carbohydrate/lipid.

BIOL 6301. Molecular Cell Biology. 4 Hours.

Integrates biochemistry and molecular biology in the cellular context. Emphasizes the organization and replication of genomes, the regulation of gene expression, the structure and function of organelles, and the mechanisms of signal transduction.

BIOL 6303. Neurobiology and Behavior. 4 Hours.

Offers a lecture course that aims to provide a comprehensive overview of behavioral neurobiology, with special emphasis on a neuroethological approach. At the end of the course, the successful student should have a contemporary understanding of the historical development of the behavioral sciences, the major ethological and neurobiological concepts, and the principal mechanisms that govern behavior in animals and humans. Requires permission of instructor for those students not enrolled in bioinformatics, biology, or marine biology.

BIOL 6381. Ethics in Biological Research. 2 Hours.

Discusses ethical issues relevant to research in the biological sciences. Requires student presentations.

BIOL 6399. Dynamics of Microbial Ecology. 4 Hours.

Explores state-of-the-art research on microbial biology of the environment and human body. Focuses on molecular diversity of microbial species and microbial discovery, microbial dynamics across time and space, microbiology of extreme environments, microbial ecology in the genomics age, host-microbe interactions in the human body, and translation of basic microbiology into practice. Emphasizes how new concepts in microbial biology, such as signal-based regulation and cell individuality, may change the current views on organization and function of microbial communities in nature. Requires permission of instructor for those students not enrolled in bioinformatics, biology, or marine biology.

BIOL 6401. Research Methods and Critical Analysis in Molecular Cell Biology. 4 Hours.

Encompasses biochemical and cell biological approaches to understanding cell structure and function, including membranes, organelles, vesicle trafficking, cytoskeleton, cell cycle, and signaling. Structured activities integrate critical analysis of recently published literature and methods. Offers students an opportunity to prepare for the professional practice of molecular cell biology. Permission of instructor required for those students not enrolled in biology.

BIOL 6405. Prokaryotic Cell and Molecular Biology. 4 Hours.

Provides in-depth discussion about fundamentally important cellular processes in prokaryotic systems—such as replication, transcription, and translation—and the corresponding regulatory mechanisms. Also discusses molecular mechanisms of gene regulation and bacterial pathogenesis, using selected examples and mechanisms of prokaryotic cell signaling, and advanced and high-throughput techniques used in prokaryotic molecular and cell biology.

BIOL 6407. Biochemistry for Molecular Biologists. 4 Hours.

Focuses on the interface between molecular biology, molecular genetics, and biochemistry. Concentrates on biochemical problems that molecular biologists are likely to find in their research. Includes examples of prokaryotic and eukaryotic (whenever available) systems. Experimental approaches are discussed for all topics. Seeks to enable students to develop a deep understanding of concepts in biological systems through reading and discussion of the primary literature.

BIOL 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

BIOL 7399. Research Problem Solving, Ethics, and Communication Skills. 4 Hours.

Focuses on research problem-solving skills, including formulation of hypotheses; experimental design, execution, and analysis; and research ethics. Offers instruction in scientific writing, including daily record keeping, grants and papers, and oral communication skills. Discusses the use and misuse of statistics and discusses responsibility to the public. Requires permission of instructor for those students not enrolled in biology.

BIOL 7962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

BIOL 7990. Thesis. 1-4 Hours.

Offers thesis supervision by members of the department. May be repeated without limit.

BIOL 7996. Thesis Continuation. 0 Hours.

Offers continuing thesis supervision by members of the department.

BIOL 8420. Biological Lab Rotation 1. 4 Hours.

Offers experience in biology research in a faculty research laboratory. Intended only for students who have not yet chosen a lab in which to carry out dissertation/thesis work.

BIOL 8421. Biological Lab Rotation 2. 4 Hours.

Offers a second semester of research experience in a different laboratory than that for BIOL 8420. Intended only for students who have not yet chosen a lab in which to carry out thesis work.

BIOL 8960. Exam Preparation—Doctoral. 0 Hours.

Offers the student the opportunity to prepare for the PhD qualifying exam under faculty supervision.

BIOL 8982. Readings. 1-4 Hours.

Offers readings from current literature on an area of interest to students and faculty. May be repeated without limit.

BIOL 8984. Research. 1-4 Hours.

Focuses on research methods and their application to a specific problem under the direction of a graduate faculty member. May be repeated without limit.

BIOL 8986. Research. 0 Hours.

Offers the student the opportunity to conduct full-time research. May be repeated without limit.

BIOL 9000. PhD Candidacy Achieved. 0 Hours.

Indicates successful completion of the doctoral comprehensive exam.

BIOL 9984. Research. 1-4 Hours.

Focuses on research methods and their application to a specific problem under the direction of a graduate faculty member. May be repeated without limit.

BIOL 9990. Dissertation. 0 Hours.

Offers theoretical and experimental research for the PhD degree. May be repeated once.

BIOL 9996. Dissertation Continuation. 0 Hours.

Offers dissertation supervision by members of the department. May be repeated without limit.

Biology - CPS (BIO)

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BIO 1050. Medical Terminology. 3 Hours.

Offers students an opportunity to explore the language of medicine, learning about the importance of word structure in medical fields. A command of medical terminology is fundamental for anyone who aspires to work in the healthcare field. Examines the fundamentals of word analysis and construction, including root words, prefixes, and suffixes, all in the context of the anatomy and physiology of human body systems and healthcare systems. Seeks to provide the fundamentals of science and medicine through reading, writing, listening, and speaking exercises focusing on technical terms used in medical terminology.

BIO 1100. Principles of Biology 1. 3 Hours.

Introduces a variety of biological concepts. Surveys plant and animal characteristics by comparing cell structure and function. Examines specific elements of structure, function, and natural history. Specific topics include cytology, histology, physiology, genetics, cellular respiration, and botany.

BIO 1101. Lab for BIO 1100. 1 Hour.

Accompanies BIO 1100. Studies the specialization of animal cells and ecological succession. Offers students an opportunity to learn about proper experimental design and the limits of experimentation. Includes observing the structure and function of unicellular organisms and the characteristics of biological molecules, measuring aerobic and anaerobic respiration rates, observing cellular reproduction, and genetic analysis of plants and animals.

BIO 1200. Principles of Biology 2. 3 Hours.

Covers the major evolutionary trends leading to complex life forms. Surveys organisms beginning with unicellular algae and leading to basic animal structure and function. Describes the anatomy of each body system as well as physiological processes such as hormonal control, nerve impulse transmission, muscular contraction, and the immune response.

BIO 1201. Lab for BIO 1200. 1 Hour.

Accompanies BIO 1200. Uses prepared slides and preserved specimens to study the Protista and animal kingdoms. Studies the appendicular and axial bones, muscles, blood vessels, urogenital anatomy, and the nervous system.

BIO 1600. Human Anatomy and Physiology 1. 3 Hours.

Provides an overview of anatomic terminology and organization of the body. Presents the structure and function of cells and tissues. Includes the anatomy and physiology of the integumentary and musculoskeletal systems, joint structure and function, and the nervous and endocrine systems, including special senses.

BIO 1601. Lab for BIO 1600. 1 Hour.

Accompanies BIO 1600. Covers a range of topics from the course.

BIO 1700. Human Anatomy and Physiology 2. 3 Hours.

Covers the structure and function of the cardiovascular system (including the properties of blood, the lymphatic system, and immunity) and the respiratory, digestive, and urogenital systems.

BIO 1701. Lab for BIO 1700. 1 Hour.

Accompanies BIO 1700. Covers a range of topics from the course.

BIO 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

BIO 2100. Microbiology. 3 Hours.

Emphasizes the close relationship between the development of technology and science. Compares prokaryotic and eukaryotic cellular morphology and physiology, including bioenergetics, carbohydrate metabolism, and cellular nutrition and growth. Studies viral replication, microbial genetics, bacterial taxonomy, and evolution. Discusses the principles of epidemiology and public health related to food, water, and sewage microbiology and the role of microbes in fermentation and industrial and environmental microbiology.

BIO 2101. Lab for BIO 2100. 1 Hour.

Accompanies BIO 2100.

BIO 2300. Cell Biology. 3 Hours.

Introduces the chemical composition and structure of cells and organelles. Focuses on transport processes, cell cycle and cell death, and cytoskeleton and matrix. Includes cellular control systems, including cellular energy supply, action of chemical messengers and regulators, cellular principles of respiration, and photosynthesis.

BIO 2500. Genetics and Molecular Biology. 3 Hours.

Covers a detailed analysis of the biochemical mechanisms that control the maintenance, expression, and evolution of prokaryotic and eukaryotic genomes. Topics covered in lectures and readings of relevant literature include gene regulation, DNA replication, genetic recombination, and mRNA translation. Emphasizes the logic of experimental design and data analysis.

BIO 2501. Lab for BIO 2500. 1 Hour.

Accompanies BIO 2500.

BIO 2700. Cell and Tissue Culture Techniques. 4 Hours.

Seeks to provide students with an understanding of mammalian cell culture. Introduces modern cell culture techniques that are used in research labs and in biopharmaceutical companies. Offers students an opportunity to learn the theoretical background and basic lab math via a short lecture at the beginning of each class. Topics include aseptic technique, cell passaging, cell counting, thawing cells, freezing cells, plating cells, and mammalian cell transfection. Covers these techniques for both adherent and suspension mammalian cells.

BIO 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

BIO 3100. Biochemistry. 3 Hours.

Covers the fundamental chemistry of biomolecules such as proteins, enzymes, lipids, carbohydrates, and nucleotides. Studies important molecular structures and their role in metabolic cycles. Introduces metabolism and catabolic and anabolic pathways of carbohydrates, lipids, proteins, and nucleotide metabolism. Discusses the importance of nutrition and how it affects metabolic pathways, genetic disorders, and mechanisms of action of various drugs that affect these pathways.

BIO 3101. Lab for BIO 3100. 1 Hour.

Accompanies BIO 3100. Introduces modern research techniques used in biochemistry. Topics include purification and characterization of proteins, kinetic properties of enzymes, isolation of high-molecular-weight DNA, and protein separation; DNA mapping; spectrophotometry; peptide mapping and sequencing; enzyme kinetics; and extraction, separation, and isolation techniques.

BIO 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

BIO 4215. Human Parasitology. 3 Hours.

Examines the general biology, life cycles, modes of transmission, and pathogenesis of major parasites on global human health. Explores a number of important diseases, along with the diverse protozoans, worms, and arthropods responsible for them.

BIO 4850. Biological Sciences Senior Project. 3 Hours.

Focuses on an in-depth project in which a student conducts research or produces a product related to the student's major field.

BIO 4983. Topics. 1-4 Hours.

Covers special topics in biology. May be repeated without limit.

BIO 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

BIO 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

BIO 7962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions.

Biotechnology (BIOT)

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BIOT 5040. Fundamentals of Biochemistry for Biotechnology. 4 Hours.

Covers the fundamentals of biochemistry for biotechnology applications, including protein structure and function, DNA technologies, bioenergetics, and biosynthesis. Requires permission of instructor for those students not majoring in biotechnology.

BIOT 5050. Organic Chemistry for Biotechnology. 4 Hours.

Offers an introduction to organic chemistry that seeks to prepare students for the MS in biotechnology program. Explores the nature of and the biological aspects of organic compounds. Covers the fundamentals of the structure, nomenclature, properties, and reactions of carbon compounds. Also introduces the chemistry of biological molecules, including amino acids, proteins, carbohydrates, and lipids, as well as spectroscopic structure determination known as nuclear magnetic resonance (NMR). Requires prior completion of chemical principles 2/ general chemistry 2 with lab; restricted to biotechnology students or by permission of instructor.

BIOT 5120. Introduction to Biotechnology. 3 Hours.

Provides an interdisciplinary, state-of-the-art introduction to biotechnology to students of the Master of Science in Biotechnology program. Covers the molecular foundations of biotechnology, molecular microbiology, receptor pharmacology, drug development processes, biotech process development and scale-up, drug approval and regulatory affairs, genomics, microarray analysis, proteomics, computational biology, molecular modeling, analytical biotechnology, and bioterrorism and biotechnology.

BIOT 5130. Team Skills in Biotechnology. 2 Hours.

Focuses on project management and leadership skills in the biotechnology industry. Emphasizes professional etiquette, teamwork, and team leadership in a diverse, multidisciplinary workplace. Also offers students an opportunity to develop their technical communication skills (scientific writing, public speaking, and technical presentations).

BIOT 5145. Basic Biotechnology Lab Skills. 1 Hour.

Introduces selected key skills and techniques central to life sciences research. Combines hands-on training in basic laboratory skills with lecture and live demonstration. Laboratory exercises highlight the importance of precision/accuracy in dispensation of liquids and in the preparation of solutions and standards, documentation and record keeping, and maintaining a safe and sterile work environment while performing scientific research.

BIOT 5219. The Biotechnology Enterprise. 2 Hours.

Exposes students to a broad spectrum of concepts and issues that are common to biotechnology companies. Provides an overview of innovation, intellectual property, planning, government regulation, and strategic alliances. Introduces biotechnology entrepreneurship; management; and the legal aspects of science, technology, and research in the biotechnology context.

BIOT 5220. The Role of Patents in the Biotechnology Industry, Past and Future. 1 Hour.

Covers the basics of patenting and the application of patents to the biotechnology industry, including the controversial area of gene patents.

BIOT 5225. Managing and Leading a Biotechnology Company. 3 Hours.

Covers managing projects and personnel in a technology-based organization. Such activities are best carried out by those who combine the technical knowledge of their industry with the insight into the best practices for working with groups of highly educated, and often very experienced people. The biotechnology industry is strongly dependent on the concept that knowledge is always shared and ownership is collective. As the fundamental organizational mantra is teamwork, the principles of managing in this environment are key to achieving important goals. How to accomplish this and make decisions that drive innovation and success have common threads with other technology based industries, but with the added complexity of the scientific challenges facing the biotechnology industry. Restricted to students in the Bouvé College of Health Sciences and in the College of Science or by permission of the program office.

BIOT 5226. Biotechnology Entrepreneurship. 3 Hours.

Biotechnology by its very nature is an innovative multidisciplinary industry. This is especially true for the biopharmaceutical industry in which the process of discovering new drugs and new drug targets requires novel approaches to solving difficult questions about disease processes and human health. This course focuses on the essential nature of innovation in the biotech industry, exposes students to the basics of creating startup organizations, explains the key role of business planning in enterprise creation, describes means for assessing risks, making choices from available options and how to measure success. Various business models, outsourcing work and establishing strategic partnerships are examined. Restricted to students in the Bouvé College of Health Sciences and in the College of Science or by permission of the program office.

BIOT 5227. Economics and Marketing for Biotechnology Managers. 3 Hours.

Provides a foundation for making financial decisions in the biotechnology industry. Examines accounting methods, forecasting, corporate valuation, exit strategies and drug pipeline economics. Introduces concepts for marketing pharmaceutical products. Restricted to students in the Bouvé College of Health Sciences and in the College of Science or by permission of the program office.

BIOT 5330. Drug Safety and Immunogenicity. 3 Hours.

Introduces the fundamental molecular interactions involved in immunological responses as well as in measuring and testing in a research and regulated environment. Other drug-safety-related topics include adventitious agents (viruses, microorganisms, mycoplasma) and risk factors such as product-related substances (aggregates and post-translationally modified variants), endotoxins, DNA, host-cell proteins, process contaminants such as antibiotics, and the means of testing and removing these through validated processes.

BIOT 5340. Introduction to Biotherapeutic Approvals. 3 Hours.

Introduces students to biologics. The class of drugs referred to as biologics or biotherapeutics, protein drugs, makes up a large portion of the drugs in development and on the market today. Focuses on considerations for approval for such drugs. Offers students an opportunity to learn how to be able to describe and explain both biologics and biosimilars.

BIOT 5360. Drug Stability. 2 Hours.

Focuses on stability testing of both small molecule and protein drugs. Studies the difference between small molecule and protein drug stability testing. Offers students an opportunity to learn how to explain the International Council on Harmonisation (ICH)-Quality (Q1) guidelines and how they are applied to drug development and approvals.

BIOT 5400. Scientific Information Management for Biotechnology Managers. 3 Hours.

Introduces biotechnology students to scientific information management specifically related to the biotechnology field. Covers an introduction to data sciences, its history, and how it is relevant to biotech today. Offers students an opportunity to obtain the background needed to assess and use modern data management capabilities such as "the cloud," big data, etc. Covers recent developments in origination of data, metadata, data models, data management, and organization and storage of data in biotechnology.

BIOT 5500. Introduction to Regulatory Science. 3 Hours.

Introduces the science that supports regulatory affairs in the biopharmaceutical industry. Focuses on the methods and instruments used to characterize the processes and products of biotechnology including the production, separation, purification, characterization, and formulation of biologics; the pharmacokinetics of proteins; chemical and biological equivalencies of biogenerics; stability testing; high throughput assays; cell system expression; variants; method validation; and quality control.

BIOT 5560. Bioprocess Fundamentals. 3 Hours.

Focuses on the fundamental principles and elements in the process of manufacturing biopharmaceuticals. Covers kinetics of enzymatic reactions; selected microbial and cell metabolism and relevant control mechanisms; kinetics of cell growth, cell death, substrate consumption, and product formation; mathematical modeling and representation of bioprocesses; examples of industrial bioprocesses to illustrate types and operations of upstream and downstream unit operations and mass transfers in fermentation systems—the affecting factors and the impact on process development and scale-up. Also includes an overview of economic considerations. Emphasizes bioprocesses for recombinant protein production.

BIOT 5631. Cell Culture Processes for Biopharmaceutical Production. 3 Hours.

Covers the principles and concepts involved in the development of mammalian and other types of cell culture processes for the manufacturing of biopharmaceutical products such as monoclonal antibodies and recombinant proteins. Topics include protein expression and clone generation, batch and perfusion processes and media development, bioreactor operations and scale-up, and innovations in cell culture processes. Regulatory concepts include quality assurance in a cGMP environment.

BIOT 5635. Downstream Processes for Biopharmaceutical Production. 3 Hours.

Addresses the development of recombinant protein purification processes in biotechnology. Provides an overview of the scientific principles, engineering strategies, and unit operations facilities involved in scalable protein purification processes. Also discusses viral clearance and inactivation strategies; cGMP considerations; and technological advances to improve effectiveness and efficiency, such as membrane-based disposable systems.

BIOT 5640. Drug Product Processes for Biopharmaceuticals. 3 Hours.

Covers the development and implementation of the drug product manufacturing process for biopharmaceuticals. Focuses on biologic products, specifically proteins. Covers the workflow required for the development and implementation of the production process with the scientific and engineering principles highlighted. Topics include the preformulation process for early stage product development, the selection of formulation compatible with the targeted product presentation, optimization of formulations to meet stability and usage objectives, the design of a scalable process for production, large-scale process equipment and operations, process scale-up considerations, and regulatory compliance issues for drug product manufacturing facilities and operations. Students who do not meet course prerequisites may seek permission of instructor.

BIOT 5700. Molecular Interactions of Proteins in Biopharmaceutical Formulations. 3 Hours.

Offers an up-to-date survey and review of the research and understanding of the molecular interactions of proteins in biopharmaceutical formulations, including both liquid and solid formats, during the process of drug product manufacturing. Focuses on protein-protein interactions, protein-excipients (e.g., stabilizers, surfactants) interactions, and protein at interface surfaces interactions that are critical and impactful on the stability and integrity of therapeutic proteins of interest. Emphasizes understanding the mechanistic aspect of the interactions; the approaches, methods, and techniques employed to study these phenomena; and measures considered to modulate such interactions to enhance the performance of the biopharmaceutical formulations. Students who do not meet course prerequisites may seek permission of instructor.

BIOT 5810. Cutting-Edge Applications in Molecular Biotechnology. 3 Hours.

Introduces the uses of molecular biology in a biotechnology setting. Includes a brief review of the basics and then dives into state-of-the-art molecular biology applications used in biotechnology today. These applications include stability and expression of cloned gene products, gene cloning strategies, transgenic species, mutation creation and analysis, DNA fingerprinting, PCR technology, microarray technology, gene probes, gene targeting, gene therapy, stem cell technology, antisense RNA, CAR T-cell therapy, RNA interference, and CRISPR/Cas9.

BIOT 5820. Cellular Therapies. 2 Hours.

The ever-changing landscape of the biotechnology field requires constant training. This course is designed to familiarize participants with some of the most cutting-edge topics available in molecular biology today: stem cells, RNA interference, CRISPR/CAS9, CAR T-cells, gene therapy, and more. Offers participants an opportunity to learn the theory behind these new technologies, how they are done, and their power in scientific discovery and treatment.

BIOT 5821. Introduction to Biopharmaceutical Technologies. 1 Hour.

Covers the basic techniques used to develop a modern-day biopharmaceutical product. Topics include DNA fingerprinting, PCR technology, microarrays, gene probes and targeting, expression of cloned gene products, gene cloning strategies, transgenic species, and mutation creation and analysis. Offers students an opportunity to learn the theory and practical application behind these technologies—how they are done and their power in scientific discovery and treatment. Emphasizes the latest advances in these classic technologies.

BIOT 5850. Higher-Order Structure Analytics. 3 Hours.

Offers a comprehensive look at various aspects of higher-order protein structures in biotherapeutics and their implications on biological drug design. Focuses heavily on protein aggregation, a type of HOS, and analysis of those aggregates including functional implications. Topics include a review of protein structure, protein aggregation, functional aspects, and techniques to reduce HOS using protein expression and purification strategies, protein folding in disease, macromolecular crystallography, nuclear magnetic resonance, analytical ultracentrifugation, circular dichroism, light scattering, electron spin labelling, cryo-EM, WAXS, and HDX-MS. Highlights experimental design and application to the biotechnology industry in identifying and reducing HOS.

BIOT 5964. Experiential Project. 0 Hours.

Offers students an applied project setting in which to apply their curricular learning. Working with a sponsor, students refine an applied research topic, perform research, develop recommendations that are shared with a partner sponsor, and create a plan for implementing their recommendations. Seeks to benefit students with a curriculum that supports the development of key business communication skills, project and client management skills, and frameworks for business analysis. Offers students an opportunity to learn from sponsor feedback, review 'lessons learned,' and incorporate suggestions from this review to improve and further develop their career development and professional plan. May be repeated twice.

BIOT 5976. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on chosen topics. May be repeated without limit.

BIOT 6100. Agricultural Biotechnology. 3 Hours.

Explores the key agricultural biotechnology (agritech) principles and methods that are used in industry today; serves as a foundational course exposing students, briefly, to all aspects of agritech. Topics covered include gene transfer and genetic modification; cloning; plant biotechnology, animal science, food and ecological biotechnology; consumer concerns; safety testing; and other issues related to agritech.

BIOT 6214. Experimental Design and Biostatistics. 2 Hours.

Explores the principles of experimental design and statistical analysis. Emphasizes research in the molecular and biological sciences and biotechnology. Topics include probability theory, sampling hypothesis formulation and testing, and parametric and nonparametric statistical methods.

BIOT 6300. Pharmaceutical Microbiology. 3 Hours.

Studies those microorganisms associated with the manufacture of pharmaceuticals, including biopharmaceuticals. Focuses on how to exclude microorganisms, such as exotoxins and endotoxins, from pharmaceutical processes to produce a sterile product. Considers how products react to microorganism contamination and methods of disinfection. Discusses pharmaceutical microbiology as related to clean rooms and controlled environments and methods and specifications related to microorganisms based on the United States Pharmacopeia guidelines. Lastly, discusses facility monitoring, specifically EM/critical utility testing, process monitoring, and maintenance throughout with an emphasis on what regulators expect to see in terms of data.

BIOT 6310. CGMP Statutes and Regulation. 3 Hours.

Focuses on the laws and regulations related to pharmaceutical manufacture and administration. Discusses an overview of laws and regulations and provides guidance in the context of why they exist, their evolution, and implementation. Specifically focuses on the laws and regulations around good manufacturing practices (GMP), postapproval safety concerns, regulation of manufacture, violations and enforcement, and what to expect during an inspection from a regulatory body. Surveys the laws and regulations on a global level focusing on specific examples related to the United States, Europe, Asia, and other regulatory agencies.

BIOT 6320. Quality Management Systems and Validation. 3 Hours.

Emphasizes quality management systems (QSM) and validation as it relates to the production and processes related to pharmaceuticals, including biopharmaceuticals. Discusses the implementation of a QMS plan, to include document processes, procedures, metrics, reporting, and responsibilities, aligned with pharmaceutical and biotechnology companies' business objectives. Emphasizes implementation, signaling problems (continual improvement), transparency, validation, and team cooperation/dynamics. Specifically discusses the International Council on Harmonisation (ICH) Q10 guidelines. Topics related to QSM may include objectives, manual, organization structural responsibilities, data management, processes, product quality, continuous improvement plans, quality instruments, and document control.

BIOT 6330. Plant Design and Facilities. 3 Hours.

Studies plant design and facilities for the manufacture of both biopharmaceuticals and traditional pharmaceuticals. Covers design-relevant topics related to manufacturing plant design (safety, operations, environmental, and other key considerations), including good manufacturing practice (GMP). Focuses on understanding the links that need to be considered when designing a manufacturing plant to ensure quality of the products produced.

BIOT 6340. Sterile Manufacturing Operations. 3 Hours.

Discusses the importance of sterile operations in producing drug products, as part of good manufacturing practice (GMP). Emphasizes sterile manufacturing operations for all drugs.

BIOT 6400. Pre-co-op Experience. 0 Hours.

Offers students an opportunity to gain necessary skills and practical experience in order to prepare for graduate co-op.

BIOT 6500. Professional Development for Co-op. 0 Hours.

Introduces the cooperative education program. Offers students an opportunity to develop job-search and career-management skills; to assess their workplace skills, interests, and values and to discuss how they impact personal career choices; to prepare a professional resumé; and to learn proper interviewing techniques. Explores career paths, choices, professional behaviors, work culture, and career decision making.

BIOT 6954. Co-op Work Experience - Half-Time. 0 Hours.

Provides eligible students with an opportunity for work experience. May be repeated without limit.

BIOT 6955. Co-op Work Experience Abroad - Half-Time. 0 Hours.

Provides eligible students with an opportunity for work experience. May be repeated without limit.

BIOT 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

BIOT 6964. Co-op Work Experience. 0 Hours.

Provides eligible students with an opportunity for work experience. May be repeated without limit.

BIOT 7245. Biotechnology Applications Laboratory. 3 Hours.

Presents a laboratory course in biotechnology with a focus on cutting-edge instrumentation that is currently used in the field. Directs special attention at the practical aspects of laboratory work in this field, for example, techniques in sample preparation, procedures for protein analysis, and new bioinformatic approaches. Focuses on the emerging field of chemoproteomics, which is the study of the interaction of small molecules with the proteome, that is, the full complement of proteins expressed in an individual cell or organism. Exposes the student to hands-on experience with modern instrumentation, such as mass spectrometry and high performance liquid chromatography.

Biotechnology - CPS (BTC)

Search BTC Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=BTC>)

BTC 1300. Introduction to Biotechnology. 3 Hours.

Introduces the integrated science of genomics, proteomics, and bioinformatics using a case study, hands-on, problem-solving approach. Offers students an opportunity to practice accessing and using online databases to engage in real-time discoveries using the same approach current scientists use in their own research. Focuses on the process of doing genomic analysis and thinking from a genomics perspective. Uses integrated multimedia and web resources to introduce new technologies and to allow students to research and analyze real genomics data.

BTC 1301. Lab for BTC 1300. 1 Hour.

Accompanies BTC 1300. Designed to introduce cutting-edge skills and techniques used in research labs and biopharmaceutical companies. Offers students an opportunity to learn the theoretical background of a technique in the lecture portion of the course and to be able to practice the techniques in the lab—to learn to read and write protocols; to accurately and precisely measure liquids and solids; to prepare solutions and media; to keep a virtual lab notebook, all while working in a safe and aseptic lab setting; and to learn how to perform electrophoresis, protein quantification, DNA extraction, and the basic use of a bioreactor.

BTC 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

BTC 2700. Cell and Tissue Culture Techniques. 3 Hours.

Seeks to provide students with an understanding of mammalian cell culture. Introduces modern cell culture techniques that are used in research labs and in biopharmaceutical companies. Offers students an opportunity to learn the theoretical background and basic lab math via a short lecture at the beginning of each class. Topics include aseptic technique, cell passaging, cell counting, thawing cells, freezing cells, plating cells, and mammalian cell transfection. Studies these techniques for both adherent and suspension mammalian cells.

BTC 2701. Lab for BTC 2700. 1 Hour.

Accompanies BTC 2700. Provides a hands-on understanding of mammalian cell culture. Explores aseptic technique, cell passaging, cell counting, thawing cells, freezing cells, plating cells, and mammalian cell transfection. Offers students an opportunity to practice reading protocols, writing protocols, and critical thinking in the laboratory.

BTC 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

BTC 3300. Technology of Biomaterials. 3 Hours.

Covers the analysis and design at a molecular scale of materials used in contact with biological systems, including biotechnology and biomedical engineering. Topics include molecular interactions between biological and synthetic molecules and surfaces; design, synthesis, and processing approaches for materials that control cell functions; and application of state-of-the-art materials science to problems in tissue engineering, drug delivery, vaccines, and cell-guiding surfaces.

BTC 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

BTC 4200. Genomics, Proteomics, and Bioinformatics. 3 Hours.

Focuses on bioinformatics and its importance in the sciences. Seeks to apply and understand bioinformatics tools as they pertain to analyses of genomes, protein structure/function, gene families, and molecular evolution. Uses bioinformatics tools to mine databases for information relevant to answering questions relating to molecular structure, function, and evolution. Analyzes relationships between known protein structure and model protein structures. Illustrates how multiple alignments and database searching are used to gather data about gene sequences. Describes how to identify genes and infer gene structure. Differentiates between the types of phylogenetic analyses available and appropriate programs for specific questions. Applies students' existing content knowledge toward practical bioinformatic applications. Offers students an opportunity to develop skills in analysis, problem solving, and communication as applied to bioinformatics. .

BTC 4300. Biotechnology and Pharmaceutical Processing. 3 Hours.

Focuses on the fundamental principles and elements in the process of manufacturing biopharmaceuticals using current good manufacturing practices (CGMPs). Covers kinetics of enzymatic reactions; selected microbial and cell metabolism and relevant control mechanisms; kinetics of cell growth, cell death, substrate consumption, and product formation; mathematical modeling and representation of bioprocesses; and examples of industrial bioprocesses to illustrate types and operations of upstream and downstream unit operations and mass transfers in fermentation systems. Emphasizes bioprocesses for recombinant protein production. Explores in-depth selected methods, techniques, and instruments used in biotechnology. Covers up-to-date CGMPs used in biotech/biopharmaceutical industries and how those practices influence quality control/management of downstream products.

BTC 4301. Lab for BTC 4300. 1 Hour.

Provides students with up-to-date good manufacturing practices (CGMPs) used in biotech/biopharmaceutical industries and how those practices influence quality control/management of products. Covers kinetics of cell growth, cell death, substrate consumption, and product formation; selected microbial and cell metabolism and relevant control mechanisms; examples of industrial bioprocesses for the production of proteins, enzymes, and vaccines. Explores selected methods, techniques, and instruments used in biotechnology. Designed to refine and build upon cutting-edge lab skills and techniques. Offers students an opportunity to learn the theoretical background of a technique in the lecture portion of the course and be able to practice the techniques in this lab course; to read and write protocols; to accurately and precisely measure liquids and solids; to prepare solutions and media; to keep a virtual lab notebook; to use a bioreactor, plate-reader, purification machine, etc.; all while working in a safe and aseptic lab setting.

BTC 4450. Quality Control and Validation Issues. 3 Hours.

Introduces the regulations and guidelines affecting the development, production, registration, and sale of medical devices, diagnostics, pharmaceuticals, and biotechnology products worldwide. Focuses on why regulations are necessary, ethical considerations, and international standards. Offers practical instruction in the basics of quality control and process/facility validation for the biotechnology industry. Reviews appropriate regulations, including personnel and process flow, environmental and water testing, sterility testing, and incoming material and in-process testing. Other topics include the establishment of a master validation plan; description of facility, equipment, and process validations; and cleaning validations.

BTC 4850. Biotechnology Senior Project. 3 Hours.

Focuses on an in-depth project in which a student conducts research or produces a product related to the student's major field.

BTC 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

BTC 6210. Human Experimentation: Methodological Issues Fundamentals. 4 Hours.

Explores issues related to human experimentation, including methodological issues and the ethical, clinical, and financial repercussions of clinical trial studies. Covers how effective study designs can mitigate the common limitations and problems of clinical trials. Considers ethical issues, such as selective reporting of clinical research, informed consent, and protection of research participants in domestic and international clinical trials.

BTC 6211. Validation and Auditing of Clinical Trial Information. 4 Hours.

Presents a comprehensive overview of the management of quality assurance in clinical trials, Good Clinical Practices (GCP), and management of audit outcomes, as well as current issues and trends in the validation and auditing of clinical studies.

BTC 6213. Clinical Trial Design Optimization and Problem Solving. 4 Hours.

Discusses quantitative data analysis in creating dynamic drug-disease models, strategic market models, trial simulation models, and integrated financial models, which enable key variable analysis in clinical trial developments in real time. This integrated approach allows all decisions in the design to optimize value against both scientific and business criteria simultaneously and continuously. Offers students an opportunity to learn to take a complete view of the development process at the outset – across time, across the portfolio, and at all levels in the organization. This allows for greater insight into a drug's potential early in the process and leads to a more focused program for promising compounds, including an optimized clinical trial design. It also allows for earlier cessation of unpromising clinical trials, saving time and funds.

BTC 6260. The Business of Medicine and Biotechnology. 4 Hours.

Considers current case studies in order to understand how and why certain medical products succeed while others do not. Understanding how integrating cost, reimbursement, intellectual property, product liability, and FDA issues into an overall product development strategy is vital in bringing a new medical product to the U.S. market. And in light of high-profile product failures such as VIOXX and others, reimportation of drugs, reuse of single-use medical devices, and the impact of generic biologics, keeping your medical product on the market can be as much of a challenge as getting it there. The course concludes with a group debate where students recreate an FDA panel meeting to try and understand the FDA approval process.

BTC 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

Business Administration (BUSN)

Search BUSN Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=BUSN>)

BUSN 1100. Introduction to Planning for Business Co-op and Careers. 1 Hour.

Offers students an opportunity to develop the skills and knowledge necessary to be successful in the professional world of work and to navigate their career. It is the first step in preparing for co-op job search in the D'Amore-McKim School of Business (DMSB). Offers students an opportunity to complete a self-assessment to determine their skills and interests within business; to learn about the various concentrations, career paths, and co-ops within DMSB; to learn to use myNEUCOOL, the search tool for finding available co-op positions; to develop a draft résumé for review; and to select a concentration for the upcoming semester's co-op placement search.

BUSN 1101. Introduction to Business. 4 Hours.

Blends theoretical principles with real-life application. Introduces the fundamentals of launching, growing, and managing a business venture in today's dynamic and increasingly global environment. Examines concepts within multiple academic disciplines and from multiple perspectives—including marketing, technology, finance, accounting, information systems, people, and culture—and then applies them to new ventures within varied types of organizations. Offers students an opportunity to develop an entrepreneurial skill set and mind-set through the development of the critical thinking, innovative decision making, problem solving, and team building needed for any business, large or small.

BUSN 1102. Personal Skill Development for Business. 1 Hour.

Offers first-year students in the D'Amore-McKim School of Business (DMSB) an opportunity to achieve a better understanding of themselves as students and as future professionals. Explores self-analysis, leadership traits and styles, diversity and cultural awareness, professionalism, emotional intelligence, and ethics. Encourages students to draw connections among classroom education, extracurricular activities, and practical experiences and to identify how each component fits into the pursuit of their individual goals.

BUSN 1103. Professional Development for Business Co-op. 1 Hour.

Introduces students to the Cooperative Education Program and provides them with an opportunity to develop job-search and career-management skills. Offers students an opportunity to perform assessments of their workplace skills, interests, and values and discuss how they impact personal career choices. Students also have an opportunity to prepare a professional-style résumé, learn proper interviewing techniques, and gain an understanding of the opportunities available to them for co-op. Introduces career paths, choices, professional behaviors, work culture, and career decision making. Familiarizes students with workplace issues relative to their field of study and teaches them to use myNEU in the job-search and referral process. Presents co-op policies, procedures, and expectations of the Department of Cooperative Education and co-op employers.

BUSN 1110. Fundamentals of Business. 4 Hours.

Designed to familiarize students with the contemporary world of business. Introduces legal, political, ethical, and social citizenship foundations and theories that businesses and nonprofit organizations are built upon. Exposes students to the various business disciplines and the role these disciplines play in an organization. Covers several quantitative fundamentals and tools for ethical and socially responsible business decision making. Integrates critical issues affecting the world of business from both a national and international perspective. Offers nonbusiness students an opportunity to develop basic business literacy within an ethical context. Also functions as a foundational, "cornerstone" course for those considering minoring in business.

BUSN 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

BUSN 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

BUSN 2992. Research. 0 Hours.

Offers an opportunity to document student contributions to research projects or creative endeavors.

BUSN 3110. The Consulting Environment. 4 Hours.

Seeks to provide students with a framework and the fundamentals that allow them to understand the field of consulting in addition to a way of thinking for jobs in the consulting and other highly competitive careers. Focuses on the analysis of complex business situations using caselets and cases and provides frameworks as the basis for analysis and critical thinking in pressure situations. In addition, various articles, white papers, business case studies, and other consulting practices are shared with the students enrolled in the course as well as professionals with industry experience providing insights as visiting guest speakers.

BUSN 3944. Junior/Senior Internship. 1 Hour.

Offers students an opportunity for internship work. May be repeated up to two times.

BUSN 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

BUSN 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

BUSN 4993. Independent Study. 1-4 Hours.

Allows students who have received approval to undertake independent study in lieu of any course required in the various concentrations. Students present proposals to an Independent Studies Committee for evaluation and approval. Every proposal requires a detailed outline of the objectives and plan of study and must be accompanied by a supporting statement from the supervising faculty member under whose direction the study takes place. A copy of the final report prepared by the student is presented to the appropriate Independent Studies Committee. Further information about the Independent Studies Program can be obtained from concentration coordinators. May be repeated without limit.

BUSN 5001. Data-Driven and Technology-Enabled Value Creation in Digital Economy. 4 Hours.

Designed to prepare students for careers that demand an understanding of the intersection between the growing data-driven and technology-enabled possibilities and various ways in which they can be creatively leveraged for designing better digital products and markets. Rapidly emerging new digital ecosystems, platforms, products, and services have been fundamentally transforming business practices and market landscapes in almost every industry. Using real-life case studies and projects, students examine and apply fundamental economic principles and conceptual business frameworks that are essential for understanding how emerging data opportunities and new computing technologies can be used for value creation. Considers various approaches for establishing fair and appropriate rules, regulations, and policies to mitigate potential biases, ethical challenges, and discrimination arising due to the digital transformation.

BUSN 6200. Career Management. 0 Hours.

Required for the Co-op MBA program. Begins with an introduction to the career planning process and to the services of the MBA Career Center. Topics include résumé writing, videotaped practice interviewing, job search strategies, interview preparation, salary negotiation, marketing communication, and visa issues for international students seeking employment in the United States. May include additional topics depending on student interest. Requires admission to co-op MBA program. May be repeated once.

BUSN 6204. Persuasive Communication with B2B Customers. 1 Hour.

Introduces concepts in the field of personal selling in a business-to-business (B2B) environment. Exposes students to a process developed to help them better understand personal selling by providing solutions and understanding the role of relationship development. Seeks to provide students with a better understanding of the visual, verbal, and nonverbal communication involved in B2B sales presentations. Identifying and qualifying prospects, use of persuasive communication, and the role of ethics in the selling process are also introduced.

BUSN 6263. Working Capital Management. 1 Hour.

Highlights the critical areas in the management of the “current” portion of the balance sheet, Current Assets and Current Liabilities. Includes discussion of cash balances and cash flows, accounts receivable and credit management, inventory management, accounts payable and vendor relations, short-term financing, and cash conversion cycles in today’s market environment.

BUSN 6274. Social Media Marketing. 1 Hour.

Examines social media marketing (SMM) strategies across business-to-business (B2B) and business-to-consumer (B2C) environments from both the company as well as the consumer perspective. Discusses the elements of online social media “ecosystems,” successful SMM strategies from both large and small companies, the importance of integrating SMM with other forms of marketing communications, and ways to measure results and return on SMM.

BUSN 6280. How Executives Shape and Lead Innovation and Enterprise Growth. 3 Hours.

Focuses on different types of innovation (technical, market, business model, and organizational), the role of executive leadership, and enterprise growth in technology-intensive industries. Offers students an opportunity to apply a strategic management framework to industry leaders through case studies. Students are then asked to apply the framework to the future growth of their own organizations and the career path they seek in that growth.

BUSN 6295. Mindful Leadership in Global Strategy. 3 Hours.

Aims to provide the insight and tools needed to manage global strategy effectively and to become a catalyst for successful change. Organized on the Western conception of mindfulness, or active thinking, which focuses on contextual understanding, perspective taking, and process awareness as applied to translating strategy into action, leveraging team performance, and catalyzing successful change. Today’s global organizations need skilled and mindful executives. Although cultural understanding and skills are important competencies, global leaders also need to be aware of how their organizations’ administrative heritage that evolved in their home countries influences global operations.

BUSN 6304. Career Management for Working Professionals. 1 Hour.

Seeks to provide working professional students with the tools and strategies they need to advance their careers. Job search techniques are critical skills, and this course addresses key tools needed to support job searches: résumés, cover letters, networking profiles, etc. Offers students an opportunity to learn about successful networking, job search strategy, and interviewing. Includes interactive exercises and individual feedback.

BUSN 6319. Power and Politics: Getting Things Done in Organizations. 1 Hour.

Addresses two interrelated forms of politics: (1) organizational—focused on achieving business goals—and (2) office politics—focused on achieving individual career goals. Offers students an opportunity to learn concrete ideas and strategies for enhancing their ability to achieve their organization’s business objectives while also advancing their own personal career aspirations.

BUSN 6320. Business Analytics Fundamentals. 1 Hour.

Introduces the key concepts of data science and data analytics as applied to solving data-centered business problems. Emphasizes principles and methods covering the process from envisioning the problem; applying data science techniques; deploying results; and improving financial performance, strategic management, and operational efficiency. Includes an introduction to data-analytic thinking, application of data science solutions to business problems, and some fundamental data science tools for data analysis.

BUSN 6322. U.S. Healthcare Reform—Past, Present, and Future. 1 Hour.

Focuses on the current state of healthcare reform in the United States, with an examination of the historical factors that led to the current legislation. Analyzes evolving issues around implementation; state responses; provider, payer, and employer strategies; and the impact on employees, as well as possible unintended consequences. Evaluates the impact on the Triple Aim initiative (cost, quality, and access).

BUSN 6324. Predictive Analytics for Managers. 1 Hour.

Presents the concepts of correlation and simple linear regression analysis as well as multiple regression analysis. Offers students an opportunity to build multiple regression models and use them in forecasting and analyzing data. Exposes students to nonlinear regression models, reading and analyzing output tables, and using statistical software tools.

BUSN 6325. The Moral and Social Dimensions of Business Leadership and Decision Making. 1 Hour.

Offers students a different context in which to examine the ideas of corporate social responsibility and business ethics. Course objectives include understanding how strategic business decisions are made within public and private governance structures, considering the impact of growing wealth and income inequality, and evaluating alternative decision-making models that elevate moral ideals. Examines morally courageous business and civic leaders and their hallmark decisions in order to consider the challenges and opportunities in transferring best practices from the civic arena to the business sector.

BUSN 6327. Managing and Working in a Virtual World. 1 Hour.

Introduces students to the significant base of knowledge that already exists about the effects of virtuality on work. Presents a framework of virtual work skills that, while solidly grounded in academic research, are delivered using a practical, experiential approach. The framework includes two categories: individual work skills for all virtual workers and managerial skills and processes for those who are managing/leading virtual workers.

BUSN 6335. Promoting Sustainable Practices at Work. 1 Hour.

Studies climate change and the depletion and degradation of the earth's resources. Analyzes the scope of the issues and explores how companies are responding in the workplace and with their suppliers and customers. Discusses the economic, technological, political, social, psychological, and moral/ethical dimensions as well as solutions. Offers students an opportunity to utilize tools for being the change within their workplace as well as participate in online case discussions of companies engaging in sustainability best practices. Includes exposure to two dozen Australian organizations engaged in exemplary sustainability practices and to guest speakers who are experts in climate change, carbon dioxide, and water sustainability.

BUSN 6337. Crime? Punishment? Ethics?. 1 Hour.

Investigates ethical theory and decision making in practice, including blind spots that cause many managers to believe they are ethical when their decisions contradict their beliefs. Publicly traded companies are required to comply with Securities and Exchange Commission (SEC) regulations. The formal requirements are imperative for efficient capital markets. However, the informal tone at the top establishes the culture that is necessary for compliance and ethical decisions. Explores the legal ramifications for noncompliance and individual ethical decision making to mitigate the risk of noncompliance.

BUSN 6338. Blockchain and Bitcoin—Radical Innovation and Strategic Response. 1 Hour.

Introduces blockchains and their impact on a wide variety of industries, including finance, healthcare, commodities trading, supply chain and logistics, and foreign currency markets. Banks are among the earliest industries to attempt to adopt this technology, seeing benefits from lowered costs, reduced risk, and speedier transactions—getting rid of the middleman or central clearinghouse—with estimated savings of \$10 billion annually from initial deployment. Studies strategic issues centered around the threat of obsoleting incumbents and industries, developing standards, and dominant consortia. These issues may include deciding between private or public networks, developing smart contracts, responding to fears over data security and data privacy, obtaining top management buy-in, deploying blockchains in industrial and consumer markets, and overcoming resistance to change.

BUSN 6339. International Business in a Semiglobalized World. 1 Hour.

Examines the underlying dynamics of changes in the global market and how they are affecting international business. With increasing movement of capital, goods, services, and labor, we are now seeing an increase in the antiglobalization and anti-immigration sentiment across the world. Pressure for increased protectionism and economic liberalization are occurring across several parts of the world. This has led to a world that is semiglobalized, where forces of integration and localization occur simultaneously. Focuses on the international strategic decisions that companies are making in order to remain competitive and viable in this changing landscape. Studies the role local and multinational companies have in shaping the globalization conversation going forward.

BUSN 6340. Modeling for Business Analytics for Managers. 1 Hour.

Introduces and offers students an opportunity to apply modeling concepts for everyday business management problems. Advanced analytics does not produce business insights without models. Models are the statistical methods and algorithms that look for patterns and relationships from data and express them as mathematical equations. Data scientists are oftentimes needed to create the models and then tweak them to fit changing business needs and conditions. Students use online activities to apply and practice various modeling concepts.

BUSN 6341. Digital Financial Models—How to Value an e-Business. 1 Hour.

Exposes students to the dynamics of the online market space and provides an opportunity to utilize digital analytics tools that provide insight into online customer segments, site visitor behavior, digital marketing strategy and tactics, and historical conversion rates. The valuation of an online business can be difficult if it is not a typical e-commerce business. Explores factors that affect cash flows and cost of capital for such businesses in detail and analyzes the various channels of funding. Offers students an opportunity to conduct an in-class valuation of an e-commerce and lead generation business. Challenges students to build future revenue projections. As a final analysis, class participants are asked to value an online business and submit a paper.

BUSN 6342. Design Value with Creative Problem Solving. 1 Hour.

Covers qualities required for leadership to support and promote innovation, minimize risk of falling behind, and maximize organizational agility, as well as solving problems in creative ways. Exposes students to strategies that help organizations address the following aspects of problem solving, identified as crucial to the success of the enterprise: developing creative, innovative solutions; showing independence and initiative in identifying problems and solving them; solving problems in teams; applying a range of strategies to problem solving; etc.

BUSN 6343. Sharing Economy, Crowdsourcing, and Digital Business Transformation. 1 Hour.

Explores how a highly connected world driven by technological advances fuels a digital transformation centered around networks, crowds, and markets. Covers network effects and 'rich-get-richer' phenomena; business models and strategies for multisided markets and platforms; crowdsourcing and online labor markets; sharing economy; and new ways organizations become innovative by tapping into expertise outside firms' boundaries. Discusses business cases from industries including Uber/Lyft, Airbnb, Kickstarter, Amazon's Mechanical Turk, Upwork, Etsy, eBay, InnoCentive, and TopCoder. Explicitly addresses possible negative consequences. Explores critical risks such as bias and inequality due to deregulation, social and algorithm-based discrimination, and an overall critique of growth-based business models. Offers students an opportunity to hone their skills to spearhead game-changing digital initiatives to learn how to manage others in the wake of disruptive changes.

BUSN 6344. The Fintech Revolution. 1 Hour.

Uses case studies and illustrations to explore the key major innovations that are revolutionizing and driving opportunities in fintech. Topics may include payments: payment processing, transfers, rewards; blockchain: digital currency, smart contracts, DLT, trading; investments: Robo Advisors, investment management; planning: retirement planning, education planning; lending: crowdfunding, P-2-P lending, alternative money-raising platforms; insurance: underwriting, comparison platforms; big data and analytics: AI and big data solutions, alternative data; security: cybersecurity, authentication, encryption. Also discusses business models and opportunities in fintech, including the evolution of fintech and the current state of the art; case studies of successful business models in fintech startups; key things that differentiate a successful fintech company; and best practices and tips when working on a fintech idea.

BUSN 6345. Business Information Visualization. 1 Hour.

Introduces visualization concepts, techniques, and strategies used to support the effective presentation and manipulation of business information. Methods to critique visualizations (both good and bad) are introduced along with ways to identify design principles that make good visualizations effective. Discusses challenges present in making data understandable across a wide range of potential audiences. Introduces the practice of data visualization, key principles and techniques for visualizing data, and the fundamentals of communication required for effective data presentation in a business context. Emphasizes the use of these concepts to create effective information displays and dashboards for different business scenarios. Offers students an opportunity to use Tableau to prepare and present a variety of visualizations in business-related contexts.

BUSN 6346. Digital Fluency in the AI-enabled Enterprise. 1 Hour.

Offers students an opportunity to improve their digital fluency in the context of enhancing critical thinking, design thinking, and systems thinking within the enterprise. Course topics are oriented around the use of artificial intelligence within information systems deployed at the operational, tactical, and strategic levels. Using a case-based approach, the particular domain areas of human-computer interaction includes recommendation engines, voice-activated transaction processing, and information assurance (i.e., cybersecurity). This is a business-oriented course focused on design and deployment (not development/coding). The online, experiential element includes practice scenarios to help enable learners to understand the value, pitfalls, and possibilities of AI by seeking to enhance the learner's digital fluency.

BUSN 6347. Change in the Digital Era. 1 Hour.

Explores the meaning of "digital transformation" in the 21st century. Introduces students to current best practices regarding organizational change, talent development, leadership, and organizational design. Analyzes the effectiveness of current best practices in light of digitalization. Offers students an opportunity to explore "next practices" regarding organizational change, talent development, leadership, and organizational design with a goal of understanding how to enhance personal resilience in the face of ongoing change.

BUSN 6348. Strategic Valuation: Fintech and Beating the Marketing. 1 Hour.

Offers a unique perspective into the investment process and methods of the top-performing equity investors of the last 100 years. Begins with Graham/Buffett/Klarman value-based investing, then tasks students with employing practical methodologies of top investment managers today. Provides students with a fintech online company performance and valuation database of 8,500-plus companies with traditional Uniform (UAFRS) analytics used by the world's largest money managers and professionals. Students conduct independent and group study and finalize their work in a stock pitch mirroring how fundamental analytics conduct investment research in the current tech and data-rich environment.

BUSN 6349. Digital Globalization. 1 Hour.

Exposes students to the globalization of the digital platform economy and how it differs from the old, analog economy. Offers students an opportunity to gain a deeper understanding of the sharing economy in emerging markets and how it differs from that in advanced economies; understand the gains and challenges from competing through and against digital platforms globally; and analyze the internationalization strategies of digital platform companies. Companies are transforming their products, services, and processes into internet-enabled bits and bytes that can be stored and transferred globally through online platforms. As such, digitalization affects people, firms, industries, and countries. New digital technologies have dramatically shifted the nature of business into faster and more efficient global value chains that are instantaneously connected through digital platforms.

BUSN 6350. Managerial Coaching. 1 Hour.

Introduces students to managerial coaching and why it facilitates heightened performance through learning. Students engage in discussions about the elements required for successful coaching, as well as common barriers to successful coaching. Also introduces students to a model for effective managerial coaching. Offers students an opportunity to develop a mindset to receive and provide coaching to achieve higher performance and career success, as well as to put into action and practice the lessons through experiential coaching role-playing scenarios.

BUSN 6351. Experiential Education. 1-3 Hours.

Consists of various experiential learning opportunities that are approved by the faculty of the D'Amore-McKim School of Business for full-time MBA students.

BUSN 6363. Social Impact of Business. 2 Hours.

Explores how business practices affect society and how society affects business practices. Addresses topics such as social impact investing, sustainable supply chains, corporate social responsibility, social entrepreneurship, and global perspectives on corporate citizenship. Business and society have never been more intertwined. Executives are increasingly called upon to consider the larger societal impacts of their decisions and at the same time find themselves subject to demands from multiple societal stakeholders that include customers, suppliers, employees, governments, and interest groups, among others.

BUSN 6365. Business Analytics. 3 Hours.

Provides an overview of data collection, organization, analysis, interpretation, and presentation techniques used by contemporary organizations. Students use multiple software tools to collect, prepare, manage, analyze, evaluate, understand, critique, visualize, and present data sets of various types. Offers students an opportunity to obtain essential skills, tools, and techniques required to understand data sets, both large and small, from sources internal and external to an organization. This understanding can then be used to support datacentric decision making and create a measurable improvement in business performance. Businesses run on data, and employees at all levels must know how to properly use and interpret data to support their roles within a company.

BUSN 6864. Experiential Study. 0 Hours.

Offers eligible MSF students an opportunity for experiential study.

BUSN 6945. Washington Campus Seminar. 2,3 Hours.

Offers a weeklong educational residency in Washington, D.C., where students meet with members of Congress, current and former executive branch officials, senior civil servants, business executives, lobbyists, representatives of the media, and special-interest groups. Offers students an opportunity to understand how Washington works, how legislative and regulatory changes impact their business futures, and what new business opportunities may evolve as the result of federal policy priorities and decisions. The residency seeks to offer unparalleled insight into the process of government, with the goal of enabling top business leaders to contribute ethically and effectively to the policy debate, influence policy outcomes, and leverage their understanding of policy trends to developing new business opportunities.

BUSN 6950. MBA Skills Workshop. 0 Hours.

Continues the full-time MBA orientation program. Offers students an opportunity to develop the management skills necessary to become effective managers, including communication skills, qualitative and quantitative business analysis, and ethics and values.

BUSN 6954. Co-op Work Experience - Half-Time. 0 Hours.

Provides eligible students with an opportunity for work experience. May be repeated without limit.

BUSN 6955. Co-op Work Experience Abroad - Half-Time. 0 Hours.

Provides eligible students with an opportunity for work experience. May be repeated without limit.

BUSN 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

BUSN 6964. Co-op Work Experience. 0 Hours.

Provides eligible students with an opportunity for work experience. May be repeated up to five times.

BUSN 7976. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on chosen topics. May be repeated without limit.

EXSC 1120. Introduction to Exercise, Fitness, and Health. 4 Hours.

Explores the fundamental role of exercise and fitness in health. Introduces principles of exercise and various components of fitness and wellness. Discusses the development of basic exercise prescription for cardiorespiratory endurance, muscular strength, and endurance and flexibility. Includes discussions on a wide range of research topics, including advances and innovations in health and fitness and practices that lead to more healthful living.

EXSC 2991. Research in Exercise Science. 1-4 Hours.

Offers an opportunity to conduct introductory-level research or creative endeavors under faculty supervision.

EXSC 4500. Exercise Physiology 1. 4 Hours.

Introduces exercise physiology. Covers the muscular, neuromuscular, cardiovascular, ventilatory, endocrine, and metabolic responses to acute exercise and the physiological adaptations to chronic exercise and physical activity. Basic concepts related to physical fitness, body composition, weight control, and training principles are discussed.

EXSC 4501. Lab for EXSC 4500. 1 Hour.

Accompanies EXSC 4500. Offers experiments in the exercise physiology laboratory that introduce concepts related to the lecture content of the course and include techniques such as strength testing, ergometry, graded exercise testing, indirect calorimetry, and body composition assessment.

EXSC 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

EXSC 5200. Cardiopulmonary Physiology. 3 Hours.

Offers students an opportunity to gain an understanding of physiological principles of the cardiopulmonary system. This advanced course covers (1) the structure and functional operation and regulation of the cardiopulmonary system; (2) disease-associated physiological changes and cardiopulmonary dysfunction; (3) exercise-induced acute responses and physiological adaptations of the system and their applications to chronic cardiopulmonary diseases. Encourages students to integrate their knowledge of exercise and physical activity with cardiopulmonary health and fitness, as well as cardiopulmonary disease prevention and treatment. Restricted to graduate students in exercise science and undergraduate students minoring in exercise science.

EXSC 5210. Physical Activity and Exercise: Prescription, Measurement, and Testing. 3 Hours.

Studies the general principles of physical activity and exercise prescription, measurement, and testing. Offers students an opportunity to learn the fundamental concepts and techniques to measure physical activity, exercise, and related testing procedures through a hands-on approach. Topics include the use of questionnaires and activity monitors to measure physical activity; measurement of body composition, fitness, muscular strength, and endurance; and clinical exercise testing. The fundamental concepts of exercise prescription and use of measurement techniques taught in this course are applicable to careers in physical therapy, exercise physiology, and as a physician assistant. Requires prior completion of EXSC 4500 or equivalent undergraduate course or permission of instructor.

EXSC 5220. Advanced Exercise Physiology. 3 Hours.

Covers the advanced study of concepts, principles, and research in the field of exercise physiology. Discusses advanced concepts in the muscular/neuromuscular, cardiovascular, ventilatory, endocrine, and metabolic responses to exercise and exercise training. Specific study of the physiological control mechanisms regulating these systems are also addressed during periods of rest, acute exercise, and following chronic exercise training.

Cardiopulmonary and Exercise Science (EXSC)

Search EXSC Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=EXSC>)

EXSC 5230. Physical Activity and Exercise: Effects on Musculoskeletal Health and Disease. 3 Hours.

Seeks to provide a foundation for understanding the benefits of physical activity and exercise and the detrimental effects of physical inactivity and sedentary behavior on musculoskeletal health. Studies the function/dysfunction of the musculoskeletal systems resulting in common/uncommon disorders and the prevalence, etiology, and benefits of physical activity/exercise. Students apply previously learned exercise physiology principles, such as exercise prescription and neural and motor control adaptations, to physical activity and exercise. Discusses key physiological mechanisms underlying common/uncommon musculoskeletal disorders. Examines the preventive and beneficial effects of physical activity and exercise endorsed by the American College of Sports Medicine. Restricted to graduate students in exercise science and to undergraduate students minoring in exercise science.

EXSC 5976. Directed Study. 1-4 Hours.

Offers independent course work under the direction of members of the department on chosen topics. Requires submission of a written proposal to the program adviser prior to the intended semester. May be repeated without limit.

EXSC 5978. Independent Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

EXSC 6202. Electrocardiography, Clinical Assessment, and Prescription. 3 Hours.

Focuses on the identification and management of chronic diseases. Offers students an opportunity to learn skills to interpret EKGs. Topics include cardiac electrophysiology, lead systems, dysrhythmia recognition and treatment, axis, infarction, ischemia, hypertrophy, and the effects of cardiovascular drugs and exercise on the EKG. Through case studies, students interpret exercise test results, prescribe exercise, and evaluate exercise programs for clinical conditions such as cardiovascular disease, pulmonary conditions, and metabolic diseases.

EXSC 6300. Internship in Exercise Science. 3 Hours.

Offers students an opportunity to obtain practical experience and to synthesize, integrate, and apply skills and knowledge learned in the exercise science curriculum in a professional environment. Field experiences are an important part of graduate education programs in exercise science. The student is expected to complete a minimum of 300 hours of supervised experience in a research or practice setting. May be repeated once.

EXSC 6400. Applied Research Methods. 3 Hours.

Studies how to conduct scientific research in exercise science. Offers students an opportunity to propose a research project and design appropriate methodology to complete the project. Includes discussions on developing research hypotheses, comparing study designs, selecting appropriate statistical analyses, and managing data collection. Incorporates interpretation of published research to support the proposed research. Students present their own research plans through scientific writing.

EXSC 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

EXSC 7990. Thesis 1. 3 Hours.

Provides initiation to scholarly investigation. Requires students to submit a written research proposal, which includes the first three chapters of the thesis (introduction, review of literature, and methods and procedures) for approval by a thesis committee and to present an oral proposal at a seminar. May be repeated once.

Chemical Engineering (CHME)

Search CHME Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=CHME>)

CHME 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CHME 2000. Introduction to Engineering Co-op Education. 1 Hour.

Offers students an opportunity to prepare for their first co-op experience. Focuses on preparation skills including resumé construction, interviewing techniques, networking, and job selection using the Northeastern online database. Facilitates a basis for successful co-op engagement including expectations and requirements, self-assessment and goal setting, professional behaviors and values, and decision making during the job search process and while on the job. .

CHME 2308. Conservation Principles in Chemical Engineering. 4 Hours.

Examines the applications of fundamental laws of mass and energy conservation to chemical and physical processes. Emphasizes material and energy balances on chemical processes. Offers students an opportunity to develop skills in applying chemistry, physics, and mathematics to identify and solve chemical engineering problems.

CHME 2310. Transport Processes 1. 4 Hours.

Covers the fundamentals of transport of incompressible and compressible fluids (fluid flow) along with energy transport. Concepts are continued in CHME 3312 with emphasis on heat transport. The methods taught are relevant to the analysis of engineering processes in a number of industries, including chemical, pharmaceutical, food, energy, biotechnology, and materials. .

CHME 2311. Lab for CHME 2310. 2 Hours.

Accompanies CHME 2310. Uses experiment to explore the principles of momentum and energy transport. Offers students an opportunity to obtain practical laboratory experience and to develop technical writing and oral presentation skills. Students are asked to both design and perform experiments in the context of current fields of chemical engineering, to discover fundamental transport principles, and to develop engineering solutions through experiments using the fundamental transport principles.

CHME 2320. Chemical Engineering Thermodynamics 1. 4 Hours.

Covers the first and second laws of thermodynamics and their application to batch and flow systems, heat effects in chemicals, and physical properties/real fluids. Applies basic principles and mathematical relations to the analysis and solution of engineering problems.

CHME 2322. Chemical Engineering Thermodynamics 1 Abroad. 4 Hours.

Covers the first and second laws of thermodynamics and their application to batch and flow systems, heat effects in chemicals, and physical properties/real fluids. Applies basic principles and mathematical relations to the analysis and solution of engineering problems. Taught abroad. May be repeated without limit.

CHME 2949. Introductory Directed Research in Chemical Engineering. 4 Hours.

Offers first- and second-year students an opportunity to pursue project and other independent inquiry opportunities under faculty supervision. The course is initiated with a student-developed proposal, including expected learning outcomes and research products, which is approved by a faculty member in the department. Requires permission of instructor.

CHME 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CHME 3000. Professional Issues in Engineering. 1 Hour.

Offers students an opportunity to reflect on both academic and co-op experiences in the context of planning for their senior year and beyond. Focuses on developing advanced skills in preparation for graduation including job searches, professional resumés, cover letter writing, career portfolios, negotiations, and corporate culture. Reviews the prospect of graduate school training. Discusses issues around safety and ethical challenges; resolving ethical conflicts; awareness of engineers as professionals in a diverse world; strengthening decision-making skills; and lifelong learning needs, goals, and strategies. Explores leading-edge chemical engineering topics through presentation and case studies. Examines the role of different work and learning styles and diverse personal characteristics in the workplace and the classroom.

CHME 3312. Transport Processes 2 and Separations. 4 Hours.

Continues CHME 2310. Presents the fundamentals and applications of energy transport, mass transport, and simultaneous energy/mass transport. Emphasizes separation processes using these principles. The methods taught are relevant to the analysis of engineering processes in a number of industries, including chemical, pharmaceutical, food, energy, biotechnology, and materials. .

CHME 3313. Lab for CHME 3312. 2 Hours.

Accompanies CHME 3312. Uses experiment to explore the principles of mass and energy transport as well as separation processes. Offers students an opportunity to obtain practical laboratory experience and to develop technical writing and oral presentation skills. Students are asked to both design and perform experiments in the context of current fields of chemical engineering, to discover fundamental transport principles, and to develop engineering solutions through experiments using the fundamental transport principles. .

CHME 3315. Chemical Engineering Experimental Design 1. 4 Hours.

Offers students an opportunity to obtain hands-on laboratory experience and to develop safety, teamwork, problem-solving, organizational, technical writing, and oral presentation skills. Focuses on fundamental momentum transport principles and skills to develop and design engineering solutions through experiments in the context of the current fields of chemical engineering. Emphasizes the hazards associated with those chemical engineering experiments.

CHME 3316. Recitation for CHME 3315. 0 Hours.

Accompanies CHME 3315. Presents discussions related to laboratory safety, experimental design, data analysis, data presentation, and report writing strategies. .

CHME 3322. Chemical Engineering Thermodynamics 2. 4 Hours.

Continues CHME 2320. Covers thermodynamic properties of mixtures; fugacity and the fugacity coefficients from equations of state for gaseous mixtures; liquid phase fugacities and activity coefficients for liquid mixtures; phase equilibriums; the equilibrium constant for homogeneous gas-phase reactions; and extension of theory to handle simultaneous, heterogeneous, and solution reactions.

CHME 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CHME 4315. Chemical Engineering Experimental Design 2. 4 Hours.

Offers students an opportunity to obtain hands-on laboratory experience and to develop safety, teamwork, problem-solving, organizational, technical writing, and oral presentation skills. Focuses on the discovery of fundamental heat and mass transport principles. Those fundamentals are used to develop and design engineering solutions through experiments in the context of the current fields of chemical engineering. Focuses on the hazards associated with these chemical engineering experiments and the materials handled during laboratory.

CHME 4316. Recitation for CHME 4315. 0 Hours.

Accompanies CHME 4315. Presents discussions related to laboratory safety, experimental design, data analysis, data presentation, and report writing strategies.

CHME 4510. Chemical Engineering Kinetics. 4 Hours.

Covers fundamental theories of the rate of chemical change in homogeneous reacting systems, integral and differential analysis of kinetic data; design of batch and continuous-flow chemical reactors; and an introduction to heterogeneous reactions and reactor design.

CHME 4512. Chemical Engineering Process Control. 4 Hours.

Covers Laplace transform and its use in solving ordinary differential equations; modeling liquid-level, temperature, and composition dynamics; linearization of nonlinear systems; first- and second-order system transfer functions; and PID control; computer simulation of open- and closed-loop systems; control system stability; and feed-forward and cascade control.

CHME 4624. Chemical Process Safety. 4 Hours.

Introduces students to important technical fundamentals as applied to chemical process safety. Demonstrates good chemical process safety practice through chemical plant trips, visiting experts, and video presentations.

CHME 4625. Chemical Process Safety Abroad. 4 Hours.

Introduces important technical fundamentals as applied to chemical process safety internationally. Demonstrates good chemical process safety practice through chemical plant visits, visiting experts, and video presentations in the international setting in which the course is offered. May be repeated without limit.

CHME 4701. Capstone Design 1: Process Analysis. 4 Hours.

Focuses on the design of a chemical process with a particular emphasis on separation technologies. Topics include computer simulation of steady-state processing conditions, selecting process operations, reactor design, preparing flow sheets and stream tables, and evaluating the economics of a chemical process design.

CHME 4703. Capstone Design 2: Chemical Process Design. 4 Hours.

Continues CHME 4701. Requires each student to solve a comprehensive chemical process design problem. Topics include heat and power integration in chemical processing, design and scheduling of batch processes, sequencing separation operations, and safety considerations in process design.

CHME 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CHME 4991. Research. 4 Hours.

Offers an opportunity to conduct research under faculty supervision. May be repeated up to two times.

CHME 4992. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

CHME 5101. Fundamentals of Chemical Engineering Analysis. 4 Hours.

Offers graduate students from undergraduate studies outside of traditional chemical engineering an opportunity to obtain a practical understanding of the core principles behind the chemical engineering discipline. Topics include vector and tensor calculus, continuum mechanics and thermodynamics, macroscopic and microscopic analyses of mass, momentum, and energy conservation; the fundamental principles of processes in which mass, energy, and momentum are transported; consequences of the Second Law of Thermodynamics, the principles governing phase and chemical reaction equilibrium; the fundamental theories of chemical reaction kinetics and reactor design; and the mathematical formulation and solution of the underlying equations involved in all these topics.

CHME 5105. Materials Characterization Techniques. 4 Hours.

Covers the fundamentals and applications of materials characterization techniques. Major techniques include electron microscopy imaging, microbeam analysis, diffraction techniques, and near-field scanning probe techniques. Offers students an opportunity to learn transmission electron microscopy, scanning electron microscopy, electron and X-ray beam analysis, scanning tunneling microscopy, atomic force microscopy, and scanning near-field optical microscopy. Covers the applications of these techniques on both solid-state materials, such as metal and ceramics, and soft materials and biomaterials, such as polymers and nanostructured materials. Incorporates lab sessions on scanning electron microscopy and microanalysis.

CHME 5137. Computational Modeling in Chemical Engineering. 4 Hours.

Builds on chemical engineering fundamentals to introduce computer programming to allow simulation of physical, chemical, and biological systems. Covers numerical experiments (e.g., Monte Carlo, global sensitivity analysis) to analyze the significance of parameters and model assumptions. Offers students an opportunity to work on a research or design project throughout the course.

CHME 5160. Drug Delivery: Engineering Analysis. 4 Hours.

Focuses on engineering analysis of drug delivery systems, demonstrating the application of classic engineering principles to a nontraditional field for chemical engineers. Presents quantitative analysis of transport of a drug through the body and its control by physical and chemical drug and drug delivery device properties. Emphasizes the influence of biological tissue composition and structure on these processes.

CHME 5185. Design of Experiments and Ethical Research (DOEER). 4 Hours.

Designed to provide a comprehensive approach to introducing interdisciplinary biochemical engineering research and design of experiments. Through immersion in a collaborative classroom, offers students an opportunity to develop the thought processes, skills, and strategies required for originating and performing high-impact research that broadens scientific knowledge. Emphasizes design of experiments, statistics, and considerations in conducting ethical research. Topics include case studies in conflict of interest, bioethics, laboratory safety, scientific misconduct, authorship and publication, literature and peer review, data visualization and integrity, statistical analysis, and contemporary issues. Students complete online and training modules in laboratory safety and apply their knowledge as they study applications for experiments, including power analysis and rigor, to design scientific aims with peer review. Meets NIH for RCR.

CHME 5510. Fundamentals in Process Safety Engineering. 4 Hours.

Introduces the basic concepts in process safety engineering as applied to the process industries as well as various terms and lexicon. Reviews the fundamentals involved in the prediction of scenarios and covers the assumptions involved as well as the range of these predictions. Emphasizes toxicology, industrial hygiene, sources models, toxic releases, and dispersion models, as well as fire and explosion prevention.

CHME 5520. Process Safety Engineering—Chemical Reactivity, Reliefs, and Hazards Analysis. 4 Hours.

Reviews chemical reactivity hazards. Introduces relief methods and sizing estimation to prevent overpressurization vessel damage. Covers methods of hazards identification and risk assessment. Offers students an opportunity to obtain the ability to lead hazards analysis in any organization at any level.

CHME 5621. Electrochemical Engineering. 4 Hours.

Introduces fundamental concepts of electrochemical thermodynamics, kinetics, and mass transport and places them in context for applications such as batteries, fuel cells, and electrochemical sensors. Additional topics include porous electrode theory, cyclic voltammetry, Pourbaix diagrams, and the structure of the electrochemical double layer.

CHME 5630. Biochemical Engineering. 4 Hours.

Focuses on topics relevant to the design of cell culture processes for the production of pharmaceuticals. Topics include an overview of prokaryotic vs. eukaryotic cells; enzyme kinetics; overview of cellular processes (DNA replication, transcription, translation, primary metabolism, and regulation of protein synthesis at the transcriptional, posttranslational, and metabolic levels); overview of genetic engineering methods (for bacteria, mammalian, and plant cells); kinetics of cell growth (growth models, growth kinetic parameters); kinetics of product formation; bioreactor design and optimum operating conditions; scale-up; and overview of product recovery and purification methods.

CHME 5631. Biomaterials Principles and Applications. 4 Hours.

Offers a broad overview of the field of biomaterials (materials used in medical devices that interact with living tissues). Begins with introductory lectures on biomaterials and their translation from the laboratory to the medical marketplace and progresses to discussions of important biomaterials terminology and concepts. Basic materials science lectures then emphasize material structure-property-function-testing relationships. Concludes with introductions to topics in the field such as biomaterials-tissue interactions, tissue engineering, regulatory requirements, etc. Considers principles of device design as related to the selection and application of biomaterials throughout this course.

CHME 5632. Advanced Topics in Biomaterials. 4 Hours.

Addresses several important topics in biomaterials, specifically, materials used in medical devices that communicate with living tissues. Topics that may be addressed include biomaterials: past, present, and future; tissue engineering: scope, status, promise, challenges; biomaterials-tissue interactions; regulated medical device design, fabrication, and testing; strategies for translating medical products from concept to the marketplace; and medical device disasters. Some topics are covered in more depth than others depending on their value and interest to the students.

CHME 5683. Introduction to Polymer Science. 4 Hours.

Introduces basic concepts of polymers and polymer properties. Covers macromolecular structure from both theoretical and experimental viewpoints, polymerization processes and kinetics, polymer/solvent thermodynamics, crosslinking and network dynamics, thermal and phase behavior of polymers, viscoelasticity and mechanical behavior, diffusion in polymers, and selected advanced topics. Designed for both undergraduate and graduate students. No prior knowledge of polymers is required.

CHME 5699. Special Topics in Chemical Engineering. 4 Hours.

Focuses on topics related to chemical engineering to be selected by the instructor. May be repeated up to two times.

CHME 5984. Research. 1-4 Hours.

Offers an opportunity to conduct research under faculty supervision. May be repeated without limit.

CHME 6610. Computational Programs in Process Safety for Relief and Scenario Modeling. 4 Hours.

Focuses on the use of process safety software that is available to perform hazard analysis, relief and flare system evaluation, and scenario analysis. The software may include use of Process Safety Office (ioMosaic), Aspen Process Simulator (Aspen Technologies), and FLACS (Flame Acceleration Simulator by GexCon). These programs are dedicated to predicting relief sizing for vessels and processes; flare system sizing; chemical reactivity analysis; and dispersion modeling, should a release occur, and its damage potential either as an explosive or toxic cloud.

CHME 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CHME 6964. Co-op Work Experience. 0 Hours.

Provides eligible students with an opportunity for work experience. May be repeated without limit.

CHME 6965. Co-op Work Experience Abroad. 0 Hours.

Provides eligible students with an opportunity for work experience abroad. May be repeated without limit.

CHME 7235. Introduction to Statistical Thermodynamics. 4 Hours.

Covers the introductory concepts used to predict molecular, bulk, and mixture properties from molecular structure. Topics include nonideal solutions, high-pressure systems, complex reaction equilibria, phase equilibria, and molecular modeling. Student projects are self-selected to focus on specific applications of individual interest. The material is appropriate for graduate students who have taken classical thermodynamics in either an undergraduate chemical engineering course or similar content in a physical chemistry course.

CHME 7240. Polymer Science. 4 Hours.

Covers basic concepts of polymers, thermodynamics of polymer solutions, and measurement of molecular weight. Topics include physical and chemical testing of polymers, crystallinity in polymers and rheology of polymers, physical and chemical properties of polymers, and mechanisms and conditions for polymerization of polymers including step reaction, addition, and copolymerization. Discusses carbon-chain polymers, fibers, and fiber technology. Requires BS in chemical engineering or chemistry.

CHME 7260. Special Topics in Chemical Engineering. 4 Hours.

Covers topics of interest to the staff member conducting this class for advanced study. A student may not take more than one Special Topics course with any one instructor. May be repeated without limit.

CHME 7262. Special Topics in Process Safety. 4 Hours.

Covers topics of interest to the staff member conducting this class for advanced study. Current topics relevant in process safety are considered, such as a focus on layers of protection analysis, qualitative risk analysis, and specific process safety challenges. Process safety challenges from industrial settings may also serve as problems tackled in the course. A student may not take more than one special topics course with any one instructor.

CHME 7320. Chemical Engineering Mathematics. 4 Hours.

Focuses on the formulation and solutions of problems involving advanced calculus as they arise in chemical engineering systems. Covers ordinary differential equations, series solutions, and complex variables. Also studies applications involving Laplace transforms, partial differential equations, matrix operations, vectors and tensors, and optimization methods. Emphasis is on methods for formulating the problems.

CHME 7330. Chemical Engineering Thermodynamics. 4 Hours.

Designed as an introductory course to graduate-level, classical thermodynamics. Covers the first and second laws, and their applications to problems of interest to the chemical engineer. Introduces Legendre transformation, multicomponent phase equilibrium, and stability as well as reaction equilibrium in an engineering context.

CHME 7340. Chemical Engineering Kinetics. 4 Hours.

Covers fundamental theories of the rate of chemical change in homogeneous reacting systems, integral and differential analysis of kinetic data. Examines the theoretical foundations for the analysis of elementary chemical reaction rates. Comprises analysis and modeling of batch and ideal flow reactors, axial and radial dispersion in flow tubular reactors, and design principles of gas solid catalytic reactors. Builds on undergraduate chemical engineering kinetics concepts. Requires proficiency in calculus and differential equations.

CHME 7350. Transport Phenomena. 4 Hours.

Explores analytical and approximate solutions of equations of momentum, energy, and mass transport and their analogies. Covers heat and mass transfer at a fluid-solid interface. Introduces creeping, potential, and boundary layer flows. Examines macroscopic balances for isothermal systems and interphase transport of multicomponent systems.

CHME 7390. Seminar. 0 Hours.

Presents topics of an advanced nature by staff, outside speakers, and students in the graduate program. All seminars by outside speakers must be attended by all full-time graduate students; all other seminars must be attended when required by the instructor. May be repeated without limit.

CHME 7391. Professional Development and Communication in Chemical Engineering 1. 1 Hour.

Focuses on communication and integrates tightly with the graduate seminar series (CHME 7390). Offers students an opportunity to learn how to articulate scientific accomplishments to the scientific community, write high-quality manuscript outlines, develop proposals for graduate fellowships, give high-quality short and long seminar presentations, and critique and peer-review research manuscripts and proposals. Students also have an opportunity to learn about ongoing research projects in the Department of Chemical Engineering, professional workplace behaviors, and ethical conduct in a research environment. This is the first of four required courses (CHME 7392, 7393, and 7394).

CHME 7392. Professional Development and Communication in Chemical Engineering 2. 1 Hour.

Builds upon the learning objectives acquired in CHME 7391. Focuses on communication and integrates tightly with the graduate seminar series (CHME 7390). Offers students an opportunity to learn how to give high-quality short and long seminar presentations, write a high-quality research proposal, assemble all the components of a research proposal, and develop research strategies to realize their own research projects. This is the second of four required courses (CHME 7391, 7393, and 7394).

CHME 7393. Professional Development and Communication in Chemical Engineering 3. 1 Hour.

Focuses on communication and integrates tightly with the graduate seminar series (CHME 7390). Builds upon the learning objectives acquired in CHME 7391 and CHME 7392. Offers students an opportunity to write and submit high-quality graduate fellowship proposals, develop high-quality outlines of research proposals related to their dissertation proposal, critique and peer-review publications and proposals, and learn about the latest development in ongoing research in the Department of Chemical Engineering. This is the third of four required courses (CHME 7391, 7392, and 7394).

CHME 7394. Professional Development and Communication in Chemical Engineering 4. 1 Hour.

Focuses on communication and integrates tightly with the graduate seminar series (CHME 7390). Builds upon the learning objectives acquired in CHME 7391, 7392, and 7393. All PhD students that have successfully completed their closed-door proposal defense give a 25-minute public podium presentation of their research. Students prepare a two-page detailed abstract and a presentation, attend and critique presentations given by their peers, and also submit the final version of a research or review article. This is the last of four required courses (CHME 7391, 7392, and 7393).

CHME 7395. Mentoring in Chemical Engineering. 1 Hour.

Offers graduate students an opportunity to connect theoretical concepts learned in the classroom to real-life innovations, identify the conceptual framework of existing technological innovations, identify the conceptual aspects of their own research activities, propose innovative strategies to connect them to real-life applications, and to learn the basics of mentoring to be able to transfer their knowledge and expertise to their peers or to undergraduate students. Students may attend workshops on effective teaching and mentoring and mentor undergraduate students under the supervision of experienced academic and/or industrial mentors.

CHME 7962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CHME 7978. Independent Study. 1-4 Hours.

Offers theoretical or experimental work under individual faculty supervision. May be repeated without limit.

CHME 7990. Thesis. 1-4 Hours.

Offers analytical and/or experimental work conducted under the direction of the faculty in fulfillment of the requirements for the degree. First-year students must attend a graduate seminar program that introduces the students to the methods of choosing a research topic, conducting research, and preparing a thesis. Successful completion of the seminar program is required. May be repeated without limit.

CHME 7994. Thesis Continuation—Part Time. 0 Hours.

Continues thesis work conducted under the supervision of a departmental faculty member. May be repeated without limit.

CHME 7996. Thesis Continuation. 0 Hours.

Continues thesis work conducted under the supervision of a departmental faculty.

CHME 8960. Candidacy Preparation—Doctoral. 0 Hours.

Offers students an opportunity to prepare for the PhD qualifying exam under faculty supervision. Intended for students who have completed all required PhD course work and have not yet achieved PhD candidacy; students who have not completed all required PhD course work are not allowed to register for this course. May be repeated once.

CHME 8984. Research. 1-4 Hours.

Offers an opportunity to conduct research under faculty supervision. May be repeated without limit.

CHME 8986. Research. 0 Hours.

Offers an opportunity to conduct full-time research under faculty supervision. May be repeated without limit.

CHME 9000. PhD Candidacy Achieved. 0 Hours.

Indicates successful completion of program requirements for PhD candidacy.

CHME 9984. Research. 1-4 Hours.

Offers an opportunity to conduct research under faculty supervision. May be repeated without limit.

CHME 9986. Research. 0 Hours.

Offers an opportunity to conduct full-time research under faculty supervision. May be repeated without limit.

CHME 9990. Dissertation. 0 Hours.

Offers theoretical and experimental work conducted under the supervision of a departmental faculty. May be repeated once.

CHME 9996. Dissertation Continuation. 0 Hours.

Continues thesis work conducted under the supervision of a departmental faculty. CHME 9990 completed twice. May be repeated without limit.

Chemistry - CPS (CHM)

Search CHM Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=CHM>)

CHM 1100. General Chemistry 1. 3 Hours.

Introduces the principles of chemistry. Topics include basic principles and definitions, stoichiometry, chemical equilibrium, moles, gas laws, atomic structure, periodic relationships, and chemical bonding.

CHM 1101. Lab for CHM 1100. 1 Hour.

Accompanies CHM 1100. Covers a range of topics from the course.

CHM 1200. General Chemistry 2. 3 Hours.

Studies the principles of chemical equilibrium and the rates and mechanisms of chemical reactions. Covers solutions, chemical kinetics, chemical equilibria, chemical thermodynamics, and electrochemistry.

CHM 1201. Lab for CHM 1200. 1 Hour.

Accompanies CHM 1200. Covers a range of topics from the course, such as measurements of heat transfer, rate and equilibrium constants, acid-base reactions, the properties and uses of buffer systems, and the effects of temperature and catalysts.

CHM 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CHM 2110. Organic Chemistry 1. 3 Hours.

Introduces nomenclature, synthesis, molecular structure and bonding, and reaction mechanisms. Includes chemistry of hydrocarbons and their functional derivatives, stereochemical relationships and nucleophilic substitutions, and elimination reactions.

CHM 2111. Lab for CHM 2110. 1 Hour.

Accompanies CHM 2110. Introduces basic laboratory techniques, such as distillation, crystallization, extraction, chromatography, characterization by physical methods, and measurement of optical rotation, which serve as the foundation for the synthesis, purification, and characterization of products from microscale syntheses.

CHM 2200. Organic Chemistry 2. 3 Hours.

Continues CHM 2110. Focuses on additional functional group chemistry, including alcohols, ethers, carbonyl compounds, amines, and the molecules of nature. Introduces spectroscopic methods for structural identification.

CHM 2201. Lab for CHM 2200. 1 Hour.

Accompanies CHM 2200. Applies basic laboratory techniques from CHM 2111 to chemical reactions of alcohols, ethers, carbonyl compounds, carbohydrates, and amines. Introduces basic laboratory techniques and instruments for the structural analysis of organic molecules.

CHM 2300. Analytical Chemistry. 3 Hours.

Introduces the principles and practices in the field of analytical chemistry. Focuses on development of a quantitative understanding of homogeneous and heterogeneous equilibria phenomena as applied to acid-base and complexometric titrations, rudimentary separations, optical spectroscopy, electrochemistry, and statistics.

CHM 2301. Lab for CHM 2300. 1 Hour.

Accompanies CHM 2300. Offers students an opportunity to obtain hands-on experience in lab experiments in analytical methods, such as silver chloride gravimetry, complexometric titrations, acid-base titrations, UV-Vis spectroscopy, cyclic voltammetry, Karl Fischer coulometry, and modern chromatography.

CHM 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CHM 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CHM 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CHM 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

Chemistry - CPS Specialty (CHMY)

Search CHMY Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=CHMY>)

CHMY 1211. General Chemistry 1. 3,4 Hours.

Introduces the principles of chemistry, focusing on the states and structure of matter and chemical stoichiometry. Presents basic concepts and definitions, moles, gas laws, atomic structure, periodic properties and chemical bonding, all within a contextual framework.

CHMY 1212. Lab for CHMY 1211. 1 Hour.

Accompanies CHMY 1211. Covers a range of topics from the lecture course, including qualitative and quantitative analysis and the characteristics of chemical and physical processes.

Chemistry and Chemical Biology (CHEM)

Search CHEM Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=CHEM>)

CHEM 1000. Chemistry/Chemical Biology at Northeastern. 1 Hour.

Intended for freshmen in the College of Science. Introduces students to liberal arts; familiarizes them with their major; develops the academic skills necessary to succeed (analytical ability and critical thinking); provides grounding in the culture and values of the University community; and helps to develop interpersonal skills—in short, familiarizes students with all skills needed to become a successful university student.

CHEM 1101. General Chemistry for Health Sciences. 4 Hours.

Provides a one-semester introduction to general chemistry for the health sciences. Covers the fundamentals of elements and atoms; ionic and molecular structure; chemical reactions and their stoichiometry, energetics, rates, and equilibria; and the properties of matter as gases, liquids, solids, and solutions. Other topics include acids and bases, and nuclear chemistry. Applications to the health sciences are included throughout.

CHEM 1102. Lab for CHEM 1101. 1 Hour.

Accompanies CHEM 1101. Covers a range of topics from the course, such as qualitative and quantitative analysis and the characteristics of chemical and physical processes. Includes measurements of heat transfer, rate and equilibrium constants, and the effects of temperature and catalysts. Emphasis is on aqueous acid-base reactions and the properties and uses of buffer systems.

CHEM 1103. Recitation for CHEM 1101. 0 Hours.

Accompanies CHEM 1101. Covers various topics from the course.

CHEM 1104. Organic Chemistry for Health Sciences. 4 Hours.

Provides a one-semester introduction to organic chemistry for the health sciences. Covers the fundamentals of the structure, nomenclature, properties, and reactions of the compounds of carbon. Also introduces biological chemistry including amino acids, proteins, carbohydrates, lipids, nucleic acids, hormones, neurotransmitters, and drugs. Applications to the health sciences are included throughout.

CHEM 1105. Lab for CHEM 1104. 1 Hour.

Accompanies CHEM 1104. Covers a range of topics from the course, such as the properties and elementary reactions of hydrocarbons, alcohols, ethers, carbonyl compounds, carbohydrates, and amines.

CHEM 1106. Recitation for CHEM 1104. 0 Hours.

Accompanies CHEM 1104. Covers various topics from the course.

CHEM 1107. Introduction to Forensic Science. 4 Hours.

Introduces students to the field of forensic science from both a scientific and a legal perspective. Examines the challenges and methodologies of crime scene investigation, forensic biology, and forensic chemistry. Provides real-world case studies and examines some misrepresentations of forensics by television dramas. Emphasizes scientific evidence associated with topics such as DNA analysis, drug abuse, and explosion investigations, as well as other relevant topics.

CHEM 1109. The Chemistry of Food and Cooking. 4 Hours.

Introduces a number of basic scientific principles in the methodology of cooking, food preparation, and the enjoyment of food. Focuses on the chemistry and molecular bases of food, reactivity under various conditions, molecular gastronomy, geographic and cultural influences on food, and food as preventative medicine. Class demonstrations of various cooking techniques illustrate different chemical principles between food and cooking. Designed for students who do not plan to major in the natural sciences.

CHEM 1117. Chemical Perspectives on Green Energy: Emerging Technologies and Opportunities. 4 Hours.

Introduces the chemical principles behind everyday energy sources in the 21st century, including both classic and emergent sources. Examines critical questions concerning the demand for energy and the environmental impact of fuel consumption. Emphasizes the role that chemistry plays in the search for, and emergence of, renewable energy sources, such as biofuels, wind energy, and advanced battery technology. Offers students an opportunity to develop knowledge concerning evaluation of the efficiency of technologies and their impact on current global climate and to gain an appreciation of the sociopolitical debates surrounding traditional and emergent energy technologies. High school chemistry strongly recommended.

CHEM 1151. General Chemistry for Engineers. 4 Hours.

Corresponds to one semester of study in important areas of modern chemistry, such as details of the gaseous, liquid, and solid states of matter; intra- and intermolecular forces; and phase diagrams. Presents the energetics and spontaneity of chemical reactions in the context of chemical thermodynamics, while their extent and speed is discussed through topics in chemical equilibria and kinetics. Aspects of electrochemical energy storage and work are considered in relation to batteries, fuel, and electrolytic cells.

CHEM 1152. Lab for CHEM 1151. 1 Hour.

Accompanies CHEM 1151. Complements and reinforces the material in CHEM 1151 with emphasis on examples of interest in the context of modern materials, energy storage, and conversion.

CHEM 1153. Recitation for CHEM 1151. 0 Hours.

Accompanies CHEM 1151. Offers a weekly sixty-five-minute drill/discussion session conducted by chemistry faculty or graduate teaching assistants. Discusses the homework assignments of CHEM 1151 in detail with emphasis on student participation.

CHEM 1161. General Chemistry for Science Majors. 4 Hours.

Introduces the principles of chemistry, focusing on the particulate nature of matter and its interactions and reactions that form the basis for the underlying molecular dynamics of living systems. Presents basic concepts of chemical bonding and intermolecular interactions for molecules and molecules' behavior in aqueous solutions with examples from biologically relevant molecules. Introduces kinetics and chemical thermodynamics with examples from biological systems. Offers students an opportunity to obtain a framework for understanding the chemical basis for different methods for separating and purifying biological compounds.

CHEM 1162. Lab for CHEM 1161. 1 Hour.

Accompanies CHEM 1161. Introduces basic laboratory techniques. Covers a range of topics including qualitative and quantitative analysis and the characteristics of chemical and physical processes.

CHEM 1163. Recitation for CHEM 1161. 0 Hours.

Accompanies CHEM 1161. Covers various topics from the course. Offers students an opportunity to work interactively with instructors and other students to learn and apply the knowledge acquired in lecture.

CHEM 1211. General Chemistry 1. 4 Hours.

Introduces the principles of chemistry, focusing on the states and structure of matter and chemical stoichiometry. Presents basic concepts and definitions, moles, gas laws, atomic structure, periodic properties and chemical bonding, all within a contextual framework.

CHEM 1212. Lab for CHEM 1211. 1 Hour.

Accompanies CHEM 1211. Covers a range of topics from the course including qualitative and quantitative analysis and the characteristics of chemical and physical processes.

CHEM 1213. Recitation for CHEM 1211. 0 Hours.

Accompanies CHEM 1211. Covers various topics from the course.

CHEM 1214. General Chemistry 2. 4 Hours.

Continues CHEM 1211. Introduces the principles of chemical equilibrium, the rates and mechanisms of chemical reactions, and energy considerations in chemical transformations. Covers solutions, chemical kinetics, chemical equilibria, chemical thermodynamics, electrochemistry, and chemistry of the representative elements. Such contextual themes as energy resources, smog formation, and acid rain illustrate the principles discussed.

CHEM 1215. Lab for CHEM 1214. 1 Hour.

Accompanies CHEM 1214. Covers a range of topics from the course, such as measurements of heat transfer, rate and equilibrium constants, and the effects of temperature and catalysts. Particular attention is paid to aqueous acid-base reactions and to the properties and uses of buffer systems. Quantitative analysis of chemical and physical systems is emphasized throughout.

CHEM 1216. Recitation for CHEM 1214. 0 Hours.

Accompanies CHEM 1214. Covers various topics from the course.

CHEM 1217. General Chemistry 1 for Chemical Science Majors. 4 Hours.

Offers the first of a two-semester sequence (with CHEM 1220) that introduces students majoring or intending to major in chemistry to the principles of chemistry with an emphasis on relating the macroscale physical and chemical properties of substances to the structure and behavior of the particles (atomic particles, ions, and molecules) of which they are composed. Explores the connections between chemistry and the other sciences, particularly the life and environmental sciences. Topics include atomic and molecular structure, bonding theories, intermolecular interactions, reactions in the gas phase and in aqueous solutions, the energetics of chemical change, and the properties of gases and solutions.

CHEM 1218. Lab for CHEM 1217. 2 Hours.

Accompanies CHEM 1217. Explores nuclear chemistry, atomic structure, chemical reactions in the gas phase and in solutions, chemical bonding, intermolecular forces, and the properties of gases. The results of experiments form the basis for problem-solving sessions in CHEM 1217.

CHEM 1219. Recitation for CHEM 1217. 0 Hours.

Accompanies CHEM 1217. Provides students with opportunities to work interactively with instructors and other students to learn and apply the scientific method.

CHEM 1220. General Chemistry 2 for Chemical Science Majors. 4 Hours.

Continues CHEM 1217. Offers the second of a two-semester sequence (following CHEM 1217) of guided inquiries into the principles of chemistry including the structure of solids, thermochemistry, thermodynamics, chemical kinetics, chemical equilibrium, acids and bases, and electrochemistry and materials chemistry.

CHEM 1221. Lab for CHEM 1220. 2 Hours.

Accompanies CHEM 1220. Explores the structure of solids, thermochemistry, thermodynamics, chemical kinetics, chemical equilibrium, acids and bases, and electrochemistry and materials chemistry. The results of experiments form the basis for problem-solving sessions in CHEM 1220.

CHEM 1222. Recitation for CHEM 1220. 0 Hours.

Accompanies CHEM 1220. Provides students with opportunities to work interactively with instructors and other students to learn and apply the understandings acquired in lab and lecture.

CHEM 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CHEM 2161. Concepts in Chemistry. 4 Hours.

Explores basic concepts of thermodynamics; electrochemistry; and nuclear, supramolecular, and solid-state chemistry in the context of modern materials. Emphasizes connecting the particulate nature of matter to the properties of substances and patterns of chemical reactivity.

CHEM 2162. Lab for CHEM 2161. 1 Hour.

Accompanies CHEM 2161. Offers hands-on exploration of the basic concepts of electrochemistry and of nuclear, supramolecular, and solid-state chemistry.

CHEM 2163. Recitation for CHEM 2161. 0 Hours.

Accompanies CHEM 2161. Covers various topics from the course. Offers students an opportunity to work interactively with instructors and other students to learn and apply the knowledge acquired in lecture.

CHEM 2311. Organic Chemistry 1. 4 Hours.

Introduces nomenclature, preparation, properties, stereochemistry, and reactions of common organic compounds. Presents correlations between the structure of organic compounds and their physical and chemical properties, and mechanistic interpretation of organic reactions. Includes chemistry of hydrocarbons and their functional derivatives.

CHEM 2312. Lab for CHEM 2311. 1 Hour.

Accompanies CHEM 2311. Introduces basic laboratory techniques, such as distillation, crystallization, extraction, chromatography, characterization by physical methods, and measurement of optical rotation. These techniques serve as the foundation for the synthesis, purification, and characterization of products from microscale syntheses integrated with CHEM 2311.

CHEM 2313. Organic Chemistry 2. 4 Hours.

Continues CHEM 2311. Focuses on additional functional group chemistry including alcohols, ethers, carbonyl compounds, and amines, and also examines chemistry relevant to molecules of nature. Introduces spectroscopic methods for structural identification.

CHEM 2314. Lab for CHEM 2313. 1 Hour.

Accompanies CHEM 2313. Basic laboratory techniques from CHEM 2312 are applied to chemical reactions of alcohols, ethers, carbonyl compounds, carbohydrates, and amines. Introduces basic laboratory techniques including infrared (IR) spectroscopy and nuclear magnetic resonance (NMR) spectrometry as analytical methods for characterization of organic molecules.

CHEM 2315. Organic Chemistry 1 for Chemistry Majors. 4 Hours.

Reviews the basics of bonding and thermodynamics of organic compounds as well as conformational and stereochemical considerations. Presents the structure, nomenclature, and reactivity of hydrocarbons and their functional derivatives. Highlights key reaction mechanisms, providing an introduction to the methodology of organic synthesis.

CHEM 2316. Lab for CHEM 2315. 2 Hours.

Accompanies CHEM 2315. Introduces basic laboratory techniques, such as distillation, crystallization, extraction, chromatography, characterization by physical methods, and measurement of optical rotation. These techniques serve as the foundation for the synthesis, purification, and characterization of products from microscale syntheses integrated with CHEM 2315.

CHEM 2317. Organic Chemistry 2 for Chemistry Majors. 4 Hours.

Continues CHEM 2315. Extends the study of functional groups commonly found in organic compounds, further emphasizing conceptual mastery of the relationship between structure and reactivity. Introduces structural identification of organic compounds using contemporary spectroscopic methods such as IR, MS, and NMR. Other topics include structure and reactivity of conjugated and aromatic systems, the chemistry of ethers and epoxides, and the chemistry of carbonyl-containing compounds including aldehydes, ketones, carboxylic acids, and carboxylic acid derivatives. Offers students an opportunity to develop skills in planning multistep syntheses using the retrosynthesis approach and proposing mechanisms for chemical transformations.

CHEM 2318. Lab for CHEM 2317. 2 Hours.

Accompanies CHEM 2317. Introduces basic laboratory techniques including infrared (IR) spectroscopy and nuclear magnetic resonance (NMR) spectrometry as analytical methods for characterization of organic molecules. These methods serve as the basis for characterization of products from microscale syntheses.

CHEM 2319. Recitation for CHEM 2311. 0 Hours.

Offers students opportunities to work interactively with instructors and other students to learn and apply the understandings acquired in lab and lecture.

CHEM 2320. Recitation for CHEM 2313. 0 Hours.

Offers students opportunities to work interactively with instructors and other students to learn and apply the understandings acquired in lab and lecture.

CHEM 2321. Analytical Chemistry. 4 Hours.

Introduces the principles and practices in the field of analytical chemistry. Focuses on development of a quantitative understanding of homogeneous and heterogeneous equilibria phenomena as applied to acid-base and complexometric titrations, rudimentary separations, optical spectroscopy, electrochemistry, and statistics.

CHEM 2322. Lab for CHEM 2321. 1 Hour.

Accompanies CHEM 2321. Lab experiments provide hands-on experience in the analytical methods introduced in CHEM 2321, specifically, silver chloride gravimetry, complexometric titrations, acid-base titrations, UV-vis spectroscopy, cyclic voltammetry, Karl Fischer coulometry, and modern chromatographic methods.

CHEM 2324. Recitation for CHEM 2315. 0 Hours.

Accompanies CHEM 2315 and CHEM 2316. Offers students an opportunity to work interactively with instructors and other students to learn and apply the knowledge acquired in lab and lecture.

CHEM 2325. Recitation for CHEM 2317. 0 Hours.

Accompanies CHEM 2317 and CHEM 2318. Offers students an opportunity to work interactively with instructors and other students to learn and apply the knowledge acquired in lab and lecture.

CHEM 2331. Bioanalytical Chemistry. 4 Hours.

Develops good critical thinking and problem-solving skills through the exploration of open-ended group projects in a laboratory-based course centered on the analytical chemistry of biomolecules. Develops an understanding of the practice and business aspects of analytical chemistry as they relate to research and development labs in the biotechnology/pharmaceutical industry.

CHEM 2332. Lab for CHEM 2331. 1 Hour.

Accompanies CHEM 2331. Working in teams, students investigate real-world, open-ended research problems in the field of bioanalytical chemistry, broadly defined using modern analytical instrumentation.

CHEM 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CHEM 3401. Chemical Thermodynamics and Kinetics. 4 Hours.

Traces the development of chemical thermodynamics through the three major laws of thermodynamics. These are applied to thermochemistry, chemical reaction and phase equilibria, and the physical behavior of multicomponent systems. Emphasizes quantitative interpretation of physical measurements.

CHEM 3402. Lab for CHEM 3401. 1 Hour.

Accompanies CHEM 3401. Demonstrates the measurement of selected physical chemical phenomena presented in CHEM 3401, introducing experimental protocol and methods of data analysis. Experiments include investigations of gas nonideality and critical phenomena, electrochemical measurement of equilibrium, construction of phase diagrams, and bomb and differential scanning calorimetry.

CHEM 3403. Quantum Chemistry and Spectroscopy. 4 Hours.

Studies the theory of quantum chemistry with applications to spectroscopy. Presents some simple quantum mechanical (QM) models, including the particle in a box, rigid rotor, and harmonic oscillator, followed by treatments of electrons in atoms and molecules. Microwave, infrared, Raman, NMR, ESR, atomic absorption, atomic emission, and UV-Vis spectroscopy are discussed in detail.

CHEM 3404. Lab for CHEM 3403. 1 Hour.

Accompanies CHEM 3403. Explores the principles covered in CHEM 3403 by laboratory experimentation. Experiments include measurement of reaction kinetics, such as excited state dynamics, measurement of gas transport properties, atomic and molecular absorption and emission spectroscopy, infrared spectroscopy of molecular vibrations, and selected applications of fluorimetry.

CHEM 3410. Environmental Geochemistry. 4 Hours.

Offers students who wish to work in the geosciences or environmental science and engineering fields, including on the land, in freshwater, or the oceans, an opportunity to understand the geochemical principles that shape the natural and managed environment. Seeks to provide a context for understanding the natural elemental cycles and environmental problems through studies in atmospheric, terrestrial, freshwater, and marine geochemistry. Topics include fundamental geochemical principles; environmental mineralogy; organic and isotope geochemistry; the global carbon, nitrogen, and phosphorous cycles; atmospheric pollution; environmental photochemistry; and human-natural climate change feedbacks. ENVR 3410 and CHEM 3410 are cross-listed. .

CHEM 3431. Physical Chemistry. 4 Hours.

Offers an in-depth survey of physical chemistry. Emphasizes applications in modern research, including examples from biochemistry. Topics include the laws of thermodynamics and their molecular interpretation; equilibrium in chemical and biochemical systems; molecular transport; kinetics, including complex enzyme mechanisms; and an introduction to spectroscopy and the underlying concepts of quantum chemistry.

CHEM 3432. Lab for CHEM 3431. 1 Hour.

Accompanies CHEM 3431. Covers practical skills in physical chemistry with an emphasis on current practice in chemistry, biochemistry, and pharmaceutical science. Introduces both ab initio and biological molecular modeling, differential scanning calorimetry, polymer characterization, protein unfolding and protein/ligand binding, electronic absorption spectroscopy, and synthesis of nanoparticles or quantum dots.

CHEM 3501. Inorganic Chemistry. 4 Hours.

Presents the following topics: basic concepts of molecular topologies, coordination compounds, coordination chemistry, isomerism, electron-transfer reactions, substitution reactions, molecular rearrangements and reactions at ligands, and biochemical applications.

CHEM 3502. Lab for CHEM 3501. 1 Hour.

Offers a laboratory course in inorganic chemistry with experiments and projects that track with the topics discussed in CHEM 3501. Designed to provide laboratory experience with the synthesis of coordination compounds and with the instrumental methods used to characterize them.

CHEM 3503. Recitation for CHEM 3501. 0 Hours.

Offers students additional opportunities to work interactively with instructors and other students to learn and apply the concepts presented in CHEM 3501.

CHEM 3505. Introduction to Bioinorganic Chemistry. 4 Hours.

Explores basic concepts of molecular topologies, coordination compounds, coordination chemistry, isomerism, electron-transfer reactions, substitution reactions, molecular rearrangements, and reactions at ligands in the context of metal-based drugs, imaging agents, and metalloenzymes.

CHEM 3506. Lab for CHEM 3505. 1 Hour.

Offers a laboratory course in inorganic chemistry with experiments and projects that track with the topics discussed in CHEM 3505. Designed for students who have mastered basic laboratory techniques in general and organic chemistry. Introduces new synthetic techniques and applies modern analytical characterization tools not previously used in other laboratory courses (such as CHEM 3522 and CHEM 3532).

CHEM 3507. Recitation for CHEM 3505. 0 Hours.

Offers students additional opportunities to work interactively with instructors and other students to learn and apply the concepts presented in CHEM 3505.

CHEM 3521. Instrumental Methods of Analysis. 1 Hour.

Introduces the instrumental methods of analysis used in all fields of chemistry, with an emphasis on understanding not only the fundamental principles of each method but also the basics of the design and operation of the relevant instrumentation.

CHEM 3522. Instrumental Methods of Analysis Lab. 4 Hours.

Accompanies CHEM 3521. Lab experiments provide hands-on experience in the instrumental methods of analysis discussed in CHEM 3521, such as high-performance liquid chromatography, gas chromatography, mass spectrometry, capillary electrophoresis, atomic absorption, cyclic voltammetry, and UV-vis spectroscopy.

CHEM 3531. Chemical Synthesis Characterization. 1 Hour.

Introduces advanced techniques in chemical synthesis and characterization applicable to organic, inorganic, and organometallic compounds. Techniques used include working under inert atmosphere, working with liquefied gases, and handling moisture-sensitive reagents, NMR, IR, and UV-vis spectroscopy.

CHEM 3532. Chemical Synthesis Characterization Lab. 4 Hours.

Accompanies CHEM 3531. Covers topics from the course through various experiments.

CHEM 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CHEM 4456. Organic Chemistry 3: Organic Chemistry of Drug Design and Development. 4 Hours.

Offers students majoring in chemistry an opportunity to apply the principles gained in two semesters of organic chemistry and chemical biology to a relevant disciplinary context. The discovery, design, and development of biologically active compounds for medical purposes uses knowledge and techniques gained in both organic synthesis and chemical biology. It directs those skills to incorporate specific chemical features into organic compounds to meet biological criteria. As such, it seeks to develop problem-solving skills that are valuable across a range of chemical disciplines and not confined to synthetic organic chemistry alone.

CHEM 4457. Lab for CHEM 4456. 1 Hour.

Accompanies CHEM 4456. Includes literature research activities, field trips, case studies, and presentations. Offers students an opportunity to prepare for a wider range of career options.

CHEM 4460. Enzymes: Chemistry and Chemical Biology. 4 Hours.

Focuses on enzymes: their chemistry, mechanisms, and applications. Examines the underlying chemical and mechanistic principles. Introduces the techniques and approaches in enzymology. Bridges the gap between classroom learning and real-world practice in the related fields, e.g., medicinal chemistry, chemical biology, engineering, and pharmaceutical research.

CHEM 4620. Introduction to Protein Chemistry. 4 Hours.

Introduces protein chemistry in the context of molecular medicine. Discusses analytical methods used to elucidate the origin, structure, function, and purification of proteins. Surveys the synthesis and chemical properties of structurally and functionally diverse proteins, including globular, membrane, and fibrous proteins. Discusses the role of intra- and intermolecular interactions in determining protein conformation, protein folding, and in their enzymatic activity. Intended for undergraduate students without prior experience in protein chemistry.

CHEM 4621. Introduction to Chemical Biology. 4 Hours.

Probes the structure and function of biological macromolecules and the chemical reactions carried out in living systems, including biological energetics. Discusses techniques to measure macromolecular interactions and the principles and forces governing such interactions. Offers students an opportunity to gain experience in reading and evaluating primary literature. Intended for undergraduate students with no prior knowledge of the field.

CHEM 4622. Lab for CHEM 4621. 1 Hour.

Accompanies CHEM 4621. Complements and reinforces the concepts from CHEM 4621 with an emphasis on fundamental techniques. Offers students an opportunity to complete independent projects in modern chemical biology research.

CHEM 4628. Introduction to Spectroscopy of Organic Compounds. 4 Hours.

Examines the application of modern spectroscopic techniques to the structural elucidation of small organic molecules. Emphasizes the use of H and C NMR spectroscopy supplemented with information from infrared spectroscopy and mass spectrometry. Explores both the practical and nonmathematical theoretical aspects of 1D and 2D NMR experiments. Topics include the chemical shift, coupling constants, the nuclear Overhauser effect and relaxation, and 2D homonuclear and heteronuclear correlation. Designed for chemists who do not have an extensive math or physics background; no prior knowledge of NMR spectroscopy is assumed.

CHEM 4629. Identification of Organic Compounds. 2 Hours.

Introduces the use of the nuclear magnetic resonance (NMR) spectrometer and basic NMR experiments. Determines the identity of unknown organic compounds by the use of mass spectrometry, infrared spectroscopy, and 1D and 2D nuclear magnetic resonance spectroscopy.

CHEM 4700. Topics in Organic Chemistry. 4 Hours.

Offers various topics within the breadth of organic chemistry. Intended to meet the needs and interests of students. Topics could range from the physical and material aspects of organic chemistry to the biochemical and biomedical aspects of organic chemistry. May be repeated once.

CHEM 4750. Senior Research. 4 Hours.

Conducts original experimental work under the direction of members of the department on a project. Introduces experimental design based on literature and a variety of techniques depending upon the individual project.

CHEM 4770. Chemistry Capstone. 4 Hours.

Integrates and assesses both curricular and experiential aspects of undergraduate chemical education. Requires written and oral presentations related to cooperative education or other experiential activities, and to the senior research project. Reporting on the research project requires extensive library and Internet research of background and scientific principles, and organization and interpretation of results. Includes class discussion and critiquing of materials presented.

CHEM 4901. Undergraduate Research. 4 Hours.

Conducts original research under the direction of members of the department. May be repeated without limit.

CHEM 4970. Junior/Senior Honors Project 1. 4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student's major field. Combined with Junior/Senior Project 2 or college-defined equivalent for 8 credit honors project. May be repeated without limit.

CHEM 4971. Junior/Senior Honors Project 2. 4 Hours.

Focuses on second semester of in-depth project in which a student conducts research or produces a product related to the student's major field. May be repeated without limit.

CHEM 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CHEM 4991. Research. 4 Hours.

Offers an opportunity to conduct research under faculty supervision. May be repeated without limit.

CHEM 4992. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

CHEM 4993. Independent Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

CHEM 4994. Internship. 4 Hours.

Offers students an opportunity for internship work. May be repeated without limit.

CHEM 5460. Enzymes: Chemistry and Chemical Biology. 3 Hours.

Focuses on enzymes: their chemistry, mechanisms, and applications. Examines the underlying chemical and mechanistic principles. Introduces the techniques and approaches in enzymology. Bridges the gap between classroom learning and real-world practice in the related fields, e.g., medicinal chemistry, chemical biology, engineering, and pharmaceutical research.

CHEM 5501. Chemical Safety in the Research Laboratory. 1 Hour.

Covers the material needed to complete successfully all the online safety training that is required for our graduate students, best practices for the safe execution of common chemical laboratory procedures, advanced procedures, as well as incidents from the recent literature. Includes discussions of case studies on topics relevant for the safe and effective use of chemicals and other materials in a research laboratory environment. Undergraduates may enroll with permission of the instructor.

CHEM 5550. Introduction to Glycobiology and Glycoprotein Analysis. 3 Hours.

Covers the background and methods used for glycoprotein characterization. Offers students an opportunity to obtain the background needed to assess the analytical steps necessary for development of glycoprotein drugs. Analyzes regulatory issues behind glycoprotein drug development. Covers recent developments in analytical and regulatory sciences.

CHEM 5599. Introduction to Research Skills and Ethics in Chemistry. 0 Hours.

Seeks to prepare students for success in CHEM 5600 and in CHEM 7730. May be repeated once. Must be taken in consecutive semesters before registration into CHEM 5600 and CHEM 7730. .

CHEM 5600. Research Skills and Ethics in Chemistry. 3 Hours.

Discusses ethics in science. Topics include documentation of work in your laboratory notebook, safety in a chemistry research laboratory, principles of experimental design, online computer searching to access chemical literature, reading and writing technical journal articles, preparation and delivery of an effective oral presentation, and preparation of a competitive research proposal.

CHEM 5610. Polymer Chemistry. 3 Hours.

Discusses the synthesis and analysis of polymer materials. Covers mechanisms and kinetics of condensation/chain-growth polymerization reactions and strategies leading to well-defined polymer architectures and compositions, including living polymerizations (free radical, cationic, anionic), catalytic approaches, and postpolymerization functionalization. Discusses correlation of chemical composition and structure to physical properties and applications.

CHEM 5611. Analytical Separations. 3 Hours.

Describes the theory and practice of separating the components of complex mixtures in the gas and liquid phase. Also includes methods to enhance separation efficiency and detection sensitivity. Covers thin-layer, gas, and high-performance liquid chromatography (HPLC) and recently developed techniques based on HPLC including capillary and membrane-based separation, and capillary electrophoresis.

CHEM 5612. Principles of Mass Spectrometry. 3 Hours.

Describes the theory and practice of ion separation in electrostatic and magnetic fields and their subsequent detection. Topics include basic principles of ion trajectories in electrostatic and magnetic fields, design and operation of inlet systems and electron impact ionization, and mass spectra of organic compounds.

CHEM 5613. Optical Methods of Analysis. 3 Hours.

Describes the application of optical spectroscopy to qualitative and quantitative analysis. Includes the principles and application of emission, absorption, scattering and fluorescence spectroscopies, spectrometer design, elementary optics, and modern detection technologies.

CHEM 5614. Electroanalytical Chemistry. 3 Hours.

Describes the theory of electrode processes and modern electroanalytical experiments. Topics include the nature of the electrode-solution interface (double layer models), mass transfer (diffusion, migration, and convection), types of electrodes, reference electrodes, junction potentials, kinetics of electrode reactions, controlled potential methods (cyclic voltammetry, chronoamperometry), chronocoulometry and square wave voltammetry, and controlled current methods (chronopotentiometry).

CHEM 5616. Protein Mass Spectrometry. 3 Hours.

Offers students an opportunity to obtain a fundamental understanding of modern mass spectrometers, the ability to operate these instruments, and the ability to prepare biological samples. Undoubtedly the most popular analytical method in science, mass spectrometry is utilized in fields ranging from subatomic physics to biology. Focuses on the analysis of proteins, with applications including biomarker discovery, tissue characterization, detection of blood doping, drug discovery, and the characterization of protein-based therapeutics. By the end of the course, the student is expected to be able to solve a particular chemistry- or biology-related problem by choosing the appropriate sample preparation methods and mass spectrometer.

CHEM 5617. Protein Mass Spectrometry Laboratory. 3 Hours.

Offers students an opportunity to develop an appreciation of the appropriate choice of mass spectrometer for a particular application.

CHEM 5620. Protein Chemistry. 3 Hours.

Describes proteins (what they are, where they come from, and how they work) in the context of analytical analysis and molecular medicine. Discusses the chemical properties of proteins, protein synthesis, and the genetic origins of globular proteins in solution, membrane proteins, and fibrous proteins. Covers the physical intra- and intermolecular interactions that proteins undergo along with descriptions of protein conformation and methods of structural determination. Explores protein folding as well as protein degradation and enzymatic activity. Highlights protein purification and biophysical characterization in relation to protein analysis, drug design, and optimization.

CHEM 5621. Principles of Chemical Biology for Chemists. 3 Hours.

Explores the use of natural and unnatural small-molecule chemical tools to probe macromolecules, including affinity labeling and click chemistry. Covers nucleic acid sequencing technologies and solid-phase synthesis of nucleic acids and peptides. Discusses in-vitro selection techniques, aptamers, and quantitative issues in library construction. Uses molecular visualization software tools to investigate structures of macromolecules. Intended for graduate and advanced undergraduate students.

CHEM 5622. Lab for CHEM 5621. 1 Hour.

Accompanies CHEM 5621. Complements and reinforces the concepts from CHEM 5621 with emphasis on fundamental techniques. Offers an opportunity to complete independent projects in modern chemical biology research.

CHEM 5625. Chemistry and Design of Protein Pharmaceuticals. 3 Hours.

Covers the chemical transformations and protein engineering approaches to protein pharmaceuticals. Describes protein posttranslational modifications, such as oxidation, glycosylation, formation of isoaspartic acid, and disulfide. Then discusses bioconjugate chemistry, including those involved in antibody-drug conjugate and PEGylation. Finally, explores various protein engineering approaches, such as quality by design (QbD), to optimize the stability, immunogenicity, activity, and production of protein pharmaceuticals. Discusses the underlying chemical principles and enzymatic mechanisms as well.

CHEM 5626. Organic Synthesis 1. 3 Hours.

Surveys types of organic reactions including stereochemistry, influence of structure and medium, mechanistic aspects, and synthetic applications.

CHEM 5627. Mechanistic and Physical Organic Chemistry. 3 Hours.

Surveys tools used for elucidating mechanisms including thermodynamics, kinetics, solvent and isotope effects, and structure/reactivity relationships. Topics include molecular orbital theory, aromaticity, and orbital symmetry. Studies reactive intermediates including carbenes, carbonium ions, radicals, biradicals and carbanions, acidity, and photochemistry.

CHEM 5628. Principles of Spectroscopy of Organic Compounds. 3 Hours.

Studies how to determine organic structure based on proton and carbon nuclear magnetic resonance spectra, with additional information from mass and infrared spectra and elemental analysis. Presents descriptive theory of nuclear magnetic resonance experiments and applications of advanced techniques to structure determination. Includes relaxation, nuclear Overhauser effect, polarization transfer, and correlation in various one- and two- dimensional experiments. Requires graduate students to have one year of organic chemistry or equivalent.

CHEM 5636. Statistical Thermodynamics. 3 Hours.

Briefly reviews classical thermodynamics before undertaking detailed coverage of statistical thermodynamics, including probability theory, the Boltzmann distribution, partition functions, ensembles, and statistically derived thermodynamic functions. Reconsiders the basic concepts of statistical thermodynamics from the modern viewpoint of information theory. Presents practical applications of the theory to problems of contemporary interest, including polymers and biopolymers, nanoscale systems, molecular modeling, and bioinformatics.

CHEM 5638. Molecular Modeling. 3 Hours.

Introduces molecular modeling methods that are basic tools in the study of macromolecules. Is structured partly as a practical laboratory using a popular molecular modeling suite, and also aims to elucidate the underlying physical principles upon which molecular mechanics is based. These principles are presented in supplemental lectures or in laboratory workshops.

CHEM 5651. Materials Chemistry of Renewable Energy. 3 Hours.

Studies renewable energy in terms of photovoltaics, photoelectrochemistry, fuel cells, batteries, and capacitors. Focuses on the aspects of each component and their relationships to one another.

CHEM 5660. Analytical Biochemistry. 3 Hours.

Focuses on the analysis of biological molecules, which include nucleic acids, proteins, carbohydrates, lipids, and metabolites. Methods used for isolation, purification, and characterization of these molecules are discussed.

CHEM 5672. Organic Synthesis 2. 3 Hours.

Continues CHEM 5626. Surveys types of organic reactions including stereochemistry, influence of structure and medium, mechanistic aspects, and synthetic applications.

CHEM 5676. Bioorganic Chemistry. 3 Hours.

Covers host guest complexation by crown ethers, cryptands, podands, spherands, and so forth; molecular recognition including self-replication; peptide and protein structure; coenzymes and metals in bioorganic chemistry; nucleic acid structure; interaction of DNA with proteins and small molecules including DNA-targeted drug design; catalytic RNA; and catalytic antibodies.

CHEM 5700. Topics in Organic Chemistry. 3 Hours.

Offers various topics within the breadth of organic chemistry. Intended to meet the needs and interests of students. Topics could range from the physical and material aspects of organic chemistry to the biochemical and biomedical aspects of organic chemistry. Undergraduate students who have completed a second semester of organic chemistry with a grade of at least C- may be admitted with permission of instructor. May be repeated once.

CHEM 5904. Seminar. 1 Hour.

Focuses on oral reports by master of science and PlusOne participants on current research topics in chemistry and chemical biology. May be repeated up to two times.

CHEM 5976. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

CHEM 5984. Research. 1-6 Hours.

Offers an opportunity to conduct research under faculty supervision. May be repeated up to three times for up to 6 total credits.

CHEM 6500. Cheminformatics. 3 Hours.

Introduces the subject of cheminformatics. Focuses on informatic, or computer, methods to solve chemical problems. Focuses on the approaches to mine data, looking at structural similarities, and evaluating compound designs and libraries for diversity and other characteristics. In addition, briefly discusses molecular modelling of proteins.

CHEM 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CHEM 7247. Advances in Nanomaterials. 3 Hours.

Designed to provide an entry-level perspective of solid-state chemistry both from a fundamental and applied perspective. Discusses the basic aspects of materials science encompassing broad areas of structure, physical properties, and classification in the context of both bulk and surface (thin films, interfaces) properties.

CHEM 7305. Special Topics in Inorganic and Materials Chemistry. 3 Hours.

Presents selected topics of current importance in inorganic and materials chemistry. May be repeated without limit.

CHEM 7317. Analytical Biotechnology. 3 Hours.

Focuses on the analytical methods used for the characterization of recombinant DNA-derived proteins for human therapeutic use. Combines the description of advanced analytical methods, in particular HPLC and mass spectrometry, with protein chemistry. An important aspect is the development of a method that can identify protein modifications that are present in a product as a result of biosynthetic modifications, contaminants, or degradative reactions. Provides an integrative overview of the role of analytical methods at the different stages of development and production of protein therapeutics including upstream (cell line development, cell culture), downstream (recovery and purifications), formulation development, stability studies, and clinical assay.

CHEM 7710. Laboratory Rotations in Chemistry and Chemical Biology. 0 Hours.

Offers an opportunity for students to gain exposure to research laboratories in the department to help them choose a thesis advisor and project.

CHEM 7730. Advanced Laboratory Methods. 4 Hours.

Seeks to provide intensive practical laboratory training in a chosen thematic area. Students select from organic and medicinal chemistry, physical and materials chemistry, or analytical and biological chemistry. The course involves a common practical training module followed by specialized modules in the chosen concentration area. The practical training features a combination of formal laboratory instruction coupled with rotation through selected research laboratories. Full-time PhD students only.

CHEM 7750. Advanced Problem Solving. 3 Hours.

Designed to provide skills necessary to lead advanced problem-solving case studies. Faculty mentors in one of three thematic areas chosen from organic and medicinal chemistry, physical and materials chemistry, or analytical and biological chemistry assign casework to students for presentation and analysis in group sessions. Students are required to provide rational solutions to complex problems derived from the contemporary literature and engage in dialogue with faculty mentors to justify their analysis. The faculty mentors assign grades to reflect intellectual maturity and ability of the students to display creative, independent thinking. Full-time PhD students who have successfully completed qualifying examinations only.

CHEM 7962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CHEM 7990. Thesis. 1-4 Hours.

Offers thesis supervision by members of the department. May be repeated without limit.

CHEM 7996. Thesis Continuation. 0 Hours.

Offers continuing thesis supervision by members of the department.

CHEM 8504. Graduate Seminar. 1 Hour.

Focuses on oral reports by the participants on current research topics in chemistry and chemical biology. May be repeated without limit.

CHEM 8960. Exam Preparation—Doctoral. 0 Hours.

Offers the student the opportunity to prepare for and take the PhD qualifying exams (cumulative exams).

CHEM 8984. Research. 1-6 Hours.

Offers the chance to conduct original research, written thesis thereon, or to the establishment of doctoral candidacy. May be repeated without limit.

CHEM 8986. Research. 0 Hours.

Offers the student the opportunity to conduct full-time research for the master's degree. May be repeated without limit.

CHEM 9000. PhD Candidacy Achieved. 0 Hours.

Indicates successful completion of the doctoral comprehensive exam.

CHEM 9984. Research. 1-4 Hours.

Offers an opportunity to conduct research under faculty supervision. May be repeated without limit.

CHEM 9986. Research. 0 Hours.

Offers the student the opportunity to conduct full-time research for the PhD. May be repeated without limit.

CHEM 9990. Dissertation. 0 Hours.

Offers the student the opportunity to conduct theoretical and experimental research for the PhD degree. Open to chemical biology students. May be repeated once.

CHEM 9996. Dissertation Continuation. 0 Hours.

Offers dissertation supervision by members of the department. Open to chemical biology students. May be repeated without limit.

Chinese (CHNS)

Search CHNS Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=CHNS>)

CHNS 1101. Elementary Chinese 1. 4 Hours.

Designed for students who have very little or no prior knowledge of Chinese. Provides a lively introduction to basic oral expression, listening comprehension, and elementary reading and writing. Each lesson incorporates helpful information about daily life in China and the varied cultures within the world of Chinese speakers. Laboratory practice complements class work, enables students to work aloud at their own speed, reinforces their acquisition of essential structures, and acquaints them with a vast library of audio-visual resources. Focuses on Mandarin Chinese; students who wish to speak another dialect of Chinese should consult instructor for proper placement.

CHNS 1102. Elementary Chinese 2. 4 Hours.

Continues CHNS 1101. Reviews and continues the study of grammar and basic language skills. Offers progressively more intensive practice in oral and written communication. Laboratory practice complements class work, enables students to work aloud at their own speed, reinforces their acquisition of essential structures, and acquaints them with a vast library of audio-visual resources.

CHNS 1301. Elementary Chinese Immersion 1. 4 Hours.

Designed for students who are in a Chinese-speaking country, this is an off-campus immersion course. Focuses on standard Chinese. Offers students an opportunity to develop grammatical and conversational competence. Focuses on oral and aural skills that are enhanced by the immersion environment.

CHNS 1302. Elementary Chinese Immersion 2. 4 Hours.

Designed for students who are in a Chinese-speaking country, this is an off-campus immersion course. Focuses on standard Chinese. Offers students an opportunity to continue to develop grammatical and conversational competence. Focuses on oral and aural skills that are enhanced by the immersion environment.

CHNS 1502. Elementary Chinese 2 for Heritage Speakers. 4 Hours.

Designed for those students who have finished CHNS 1501 or equivalent and who have learned basic Chinese reading and writing techniques. Seeks to help them to move on a fast track beyond the beginner level to the intermediate university level. Strongly focuses on Chinese reading and writing skills, with more sophisticated sentences and paragraphs. Offers students an opportunity to develop writing skills to a functional literacy level, allowing them to carry out a number of practical writing tasks. Also aims to prepare students for CHNS 2102. Students who do not meet course prerequisites may seek permission of instructor.

CHNS 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CHNS 2101. Intermediate Chinese 1. 4 Hours.

Emphasizes further vocabulary building and mastery of fine points of grammar through written composition, prepared oral reports, and reading and discussion from current Chinese periodicals. Allows students to engage actively in communication within various contexts and reviews the more subtle problems of grammar and writing style. This communicative class is for intermediate or advanced learners. It is especially suitable for Asian-American students who have some knowledge of certain Chinese dialects (that is, Cantonese and a level of language competence equal to two semesters of college Chinese) and want to learn Mandarin Chinese through reading, writing, and discussion.

CHNS 2102. Intermediate Chinese 2. 4 Hours.

Continues CHNS 2101. Emphasizes further vocabulary building and mastery of fine points of grammar through written composition, prepared oral reports, and reading and discussion from current Chinese periodicals.

CHNS 2301. Intermediate Chinese Immersion 1. 4 Hours.

Designed for students who are in a Chinese-speaking country, this is an off-campus immersion course. Offers students an opportunity to continue to develop grammatical and conversational competence. Focuses on oral and aural skills that are enhanced by the immersion environment.

CHNS 2302. Intermediate Chinese Immersion 2. 4 Hours.

Designed for students who are in a Chinese-speaking country, this is an off-campus immersion course. Offers students an opportunity to continue to develop grammatical and conversational competence. Focuses on oral and aural skills that are enhanced by the immersion environment.

CHNS 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CHNS 3101. Advanced Chinese 1. 4 Hours.

Stresses the fundamentals of Chinese to promote effective self-expression through speaking and writing and to explore the idiomatic aspects of the language. Through progressive class discussions and oral and written commentaries, students analyze a contemporary Chinese novel or a Chinese cultural reader, screenplay, or collection of short stories. The course strives, first, to help students read and comprehend modern Chinese writing with confidence and to be able to talk and write about it in good Chinese; and second, to provide preparation for advanced courses.

CHNS 3102. Advanced Chinese 2. 4 Hours.

Continues CHNS 3101. Enhances and reinforces those practical language and communication skills students encounter when they are abroad.

CHNS 3301. Advanced Chinese Immersion 1. 4 Hours.

Designed for students who are in a Chinese-speaking country, this is an off-campus immersion course. Offers students an opportunity to continue to develop grammatical and conversational competence.

CHNS 3302. Advanced Chinese Immersion 2. 4 Hours.

Designed for students who are in a Chinese-speaking country, this is an off-campus immersion course. Offers students an opportunity to continue to develop grammatical and conversational competence.

CHNS 3800. Special Topics in Chinese. 1-4 Hours.

Focuses on a unique aspect of the Chinese language. The specific topics are chosen to reflect current developments in the language and expressed student interests. Focuses on the use of the language for specific purposes or its use in specialized settings (e.g., media, business, health). Requires at least an intermediate level of skill in the language. May be repeated up to three times.

CHNS 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CHNS 4101. Advanced Proficiency Chinese 1. 4 Hours.

Designed mainly for students of Chinese as a foreign language at a high intermediate or beginning advanced level of proficiency as designated by the American Council on Teaching of Foreign Languages (ACTFL) standards (or third-year Chinese language at universities). Seeks to help students perform most informal and formal language tasks with ease, confidence, and competence. Also seeks to strengthen understanding of contemporary Chinese culture and social environment, such as changing social values and contemporary popular culture. Offers students an opportunity to develop advanced language skills through integrated activities in listening, speaking, reading, and writing and to express complicated and abstract ideas. Students who do not meet course prerequisites may seek permission of instructor.

CHNS 4102. Advanced Proficiency Chinese 2. 4 Hours.

Builds upon the skills developed in previous Chinese courses. Seeks to enable students to accurately communicate detailed narratives and opinions in both spoken and written form. Offers students an opportunity to learn to provide structured arguments to support their opinions, to correctly use quantifiers and hypotheticals, and to develop good control of a full range of grammatical structures and a fairly wide general vocabulary. Students who do not meet course prerequisites may seek permission of instructor.

CHNS 4202. Advanced Proficiency Chinese 2—BSIB. 4 Hours.

Designed to meet the special needs of international business students. Builds on CHNS 4201. Offers students an opportunity to continue to build vocabulary and master fine points of grammar through written composition, prepared oral reports, and reading and discussion based on assigned material. International business majors only.

CHNS 4800. Special Topics in Chinese. 1-4 Hours.

Focuses on a unique aspect of the Chinese language. The specific topics are chosen to reflect current developments in the language and expressed student interests. Topics focus on the use of the language for specific purposes or its use in specialized settings (e.g., media, business, health). Requires at least an advanced level of skill in the language. May be repeated up to four times.

CHNS 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CHNS 4992. Directed Study. 1-4 Hours.

Offers students a way of going beyond work given in the regular curriculum; may also enable students to complete major or minor requirements in certain situations. Priority is given to language majors and to juniors and seniors. May be repeated without limit.

CHNS 5976. Directed Study. 1 Hour.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

Civil and Environmental Engineering (CIVE)

Search CIVE Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=CIVE>)

CIVE 1200. How Cities Work: Experiencing Urban Infrastructure. 4 Hours.

Explores the networks that underpin the very existence of cities: our urban infrastructure. Designed as a grand tour of the engineering marvels that exist beneath our feet but whose operation is critical to urban dwellers, using Boston as our guide. Offers students an opportunity to study a new infrastructure system, first by learning and discussing the engineering principles behind its design and operation, and then by experiencing our local infrastructure through visits to local operation centers, city officials, and private contractors that manage and maintain them. Topics include transportation, energy, telecommunications, water and wastewater, food processing and distribution, and waste management. Explores how our infrastructure is interconnected and how this leads both to resilience and to fragility in the face of natural and anthropogenic disruptions.

CIVE 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CIVE 2000. Introduction to Engineering Co-op Education. 1 Hour.

Provides students preparation for the first co-op experience. Focuses on skills that provide a basis for successful co-op engagement including expectations and requirements, an introduction to professional credentials, rTsumT construction, self-assessment and goal setting, interviewing, professional and co-op ethics, issues of diversity in the workplace community, academic planning and decision making, and an introduction to career portfolios.

CIVE 2221. Statics and Solid Mechanics. 4 Hours.

Connects fundamentals of Newtonian physics to the stresses and deformations in solids. Introduces properties of areas and volumes (centroidal axes, moments of inertia); equilibrium of particles and rigid bodies in two and three dimensions; analysis of internal forces in trusses and simple frames; shear and moment diagrams in beams; computation of stresses induced by axial force, moment, shear, and torque; and mechanical properties of materials. .

CIVE 2222. Recitation for CIVE 2221. 0 Hours.

Accompanies CIVE 2221. Covers problem solving and topics related to the course.

CIVE 2260. Materials for the Built Environment. 4 Hours.

Introduces the physical, mechanical, and chemical properties of materials of importance to civil engineers. Offers an overview of the ways in which these properties affect the material selection process, material behavior, and the design process.

CIVE 2261. Lab for CIVE 2260. 1 Hour.

Involves the use of standard lab test methods and equipment to determine properties of materials common to civil engineering practice. Also introduces students to land surveying, site layout, and the measurement of distance, elevation, and direction.

CIVE 2320. Structural Analysis. 4 Hours.

Connects fundamentals from CIVE 2221 to analyze stresses, strains, strength, forces, and displacements in regular structures and structural members such as trusses, beams, frames, and arches. Covers shear stresses in beams; combined stress analysis (bars with axial load plus shear and bending); introduction to buckling; influence lines (application to statically determinate systems); computation of deflections (statically determinate systems); and analysis of indeterminate structures using virtual work and the flexibility method. Introduces applications to sensing and monitoring of civil structures using the flexibility method and moment distribution. .

CIVE 2321. Recitation for CIVE 2320. 0 Hours.

Accompanies CIVE 2320. Covers problem solving and topics related to the course.

CIVE 2324. Concrete Structure Design. 4 Hours.

Presents the mechanical properties of concrete and steel reinforcement. Discusses the design of reinforced concrete structures for various loading conditions and covers the design of common reinforced concrete structural elements. Examines behavior and design of reinforced concrete beams, one-way slab systems, footings, and short columns based on latest ACI-318 code.

CIVE 2331. Fluid Mechanics and Hydraulics. 4 Hours.

Introduces the principles of fluid mechanics and the applications in basic hydraulic engineering systems. Topics include properties of fluids; pressure and force on surfaces and submerged bodies; continuity, momentum, and energy conservation principles; dimensional analysis and hydraulic similitude; flow in closed conduits; steady flow in pipe networks; unsteady flow in pipes; flow in open channels; hydraulic machines; and hydraulic structures. The laboratory component includes demonstrations and experiments to show the applicability of fluid mechanics and hydraulics principles.

CIVE 2334. Environmental Engineering: Principles, Technology, and Sustainability. 4 Hours.

Focuses on the protection and management of the environment and the engineering methods to control environmental quality problems. Topics include assessment of environmental quality, introduction to water and wastewater treatment technologies, air pollution control technologies, solid waste management, and global atmospheric change.

CIVE 2335. Environmental Engineering Chemistry. 4 Hours.

Covers chemistry principles required for describing chemical processing of elements in natural systems, the distribution of pollutants in the environment, and chemical use in engineered treatment systems. Focuses on equilibrium thermodynamics and equilibria for acid-base, gas-water, precipitation-dissolution, metal complexation, oxidation-reduction, and sorption reactions. Discusses specific applications to pollutant reactions in surface waters, ground waters, soils, drinking water treatment, wastewater treatment, and the atmosphere.

CIVE 2340. Geotechnical Engineering. 4 Hours.

Focuses on the formation, composition, and classification of soil for engineering purposes; soil-water phase relations; water in soil; seepage; stresses in soil; consolidation theory; strength properties of soils; and the basics of geoenvironmental engineering.

CIVE 2341. Lab for CIVE 2340. 1 Hour.

Accompanies CIVE 2340. Introduces standard laboratory procedures for characterizing the physical, hydraulic, and mechanical properties of soils as well as data reduction and analysis methods for various test methods. Laboratory methods and determinations include moisture content, Atterberg limits, permeability, compaction, consolidation, and direct shear. Includes the use of computer-based data acquisition systems and measurement transducers.

CIVE 2949. Introductory Directed Research in Civil and Environmental Engineering. 4 Hours.

Offers an opportunity to pursue project and other independent inquiry opportunities under faculty supervision for first- and second-year students. The course is initiated with a student-developed proposal, including expected learning outcomes and research products, which is approved by a faculty member in the department. Permission of instructor is required.

CIVE 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CIVE 3000. Professional Issues in Engineering. 1 Hour.

Provides students with an opportunity to reflect on both academic and co-op experiences in the context of planning for the senior year and beyond. Issues include professional and ethical issues, resolving ethical conflicts, awareness of engineers as professionals in a diverse world, strengthening decision-making skills, career portfolios, and lifelong learning needs, goals, and strategies. Students reflect upon issues of diversity from their experience in the University and in their cooperative education placements. Explores the role of different work and learning styles and diverse personal characteristics on the workplace and the classroom. Professional issues include impact of the cultural context, both in the United States and around the world, on the client, government relations, and workplace.

CIVE 3425. Steel Structure Design. 4 Hours.

Presents the design of steel structures for various loading conditions, including design of different types of frame structures that include steel members subjected to tension, compression, bending, and combinations of loading, and design of connections. Establishes the fundamentals of the behavior and the principles of creative design of steel structures using the latest load and resistance factor design (LRFD) specification of the American Institute for Steel Construction.

CIVE 3430. Engineering Microbiology and Ecology. 4 Hours.

Introduces the importance of microorganisms and plants to the natural and built environments and evidence-based decision making for complex systems constrained and defined by multiple metrics. Seeks to provide a fundamental understanding of microorganisms (metabolisms, growth, genetics, resource requirements, and niche) and their role in the global ecosystem (element cycling, energy flows, food webs). Examines the role of plants and microbes in both engineered and natural environmental systems and bidirectional interactions between the natural and the built environments. Framed around a series of case studies that highlight the challenges of and strategies for engineering in the earth system context, such as microbially mediated infrastructure corrosion; ecological effects of nutrient pollution; bioaccumulation; green infrastructure and remediation (constructed wetlands, bioremediation); and wastewater treatment.

CIVE 3435. Environmental Pollution Fate and Transport. 4 Hours.

Provides a systematic approach to analyzing the fate and transport of pollutants within natural systems. Equilibrium modeling and reactive transport modeling are used to assess the predominant processes that control the movement and persistence of pollutants in water, soil, and air. Topics include mass transfer across multiple phases; physical, chemical, and biological transformations of substances; transport processes (diffusion, dispersion, advection, interphase mass transport); eutrophication of lakes; conventional pollutants in rivers and estuaries; groundwater contamination; and atmospheric deposition.

CIVE 3464. Probability and Engineering Economy for Civil Engineering. 4 Hours.

Introduces engineering probability and statistics, as well as engineering economic analysis for project or design evaluation. Case studies are used to illustrate the integration of these areas in the design/system analysis process. Topics in engineering probability and statistics include descriptive statistics, expected value of random variables, and hypotheses testing. Statistical process control and sampling methods are introduced. Reliability methods for the analysis and improvement of system/design performance are discussed. Also covers fundamental concepts of time value of money and economic evaluation of alternatives, including the effects of depreciation and taxes.

CIVE 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CIVE 4534. Water Treatment Systems Design. 3 Hours.

Continues CIVE 2334. Concentrates on unit operations; unit processes; and related fundamental design of physical, chemical, and biological water and wastewater treatment systems, using both lectures and laboratory instruction. Topics include aeration systems, activated sludge, fixed-film biological treatment, gas transfer, reaction kinetics, reactor modeling, coagulation, flocculation, sedimentation, filtration, and subsurface disposal system design. Includes project component.

CIVE 4535. Lab for CIVE 4534. 1 Hour.

Accompanies CIVE 4534. Covers topics from the course through various experiments.

CIVE 4540. Resource Recovery and Waste Treatment Technologies Abroad. 4 Hours.

Examines different aspects relative to municipal and industrial solid waste, with a special focus on material recovery. Covers chemical-physical characterization of waste, source reduction and toxicity, recycling and selection of different fractions, resource and energy recovery (e.g., composting, anaerobic digestion, combustion to energy), and analysis and preliminary design of treatment disposal options. Through design projects, offers students an opportunity to apply lessons learned to the U.S. context. Taught in a study-abroad format in a European nation.

CIVE 4541. Waste Management and Policy Abroad. 4 Hours.

Explores how the country visited manages the recovery and treatment of both industrial and municipal solid waste. Emphasizes waste generated in mining and other industrial activities (e.g., refinery, military). Examines multifaceted aspects, including governance; science/engineering; and health, social, and policy. Offers students an opportunity to interact with local experts and to visit key sights. Encourages students to think about possible policy lessons for the United States. Taught abroad.

CIVE 4542. Foundation Engineering and Design. 4 Hours.

Focuses on subsurface field investigation, soil-bearing capacity determination, settlement estimation, design of shallow foundations and pile foundations, and design of retaining walls. Includes project component.

CIVE 4554. Highway Design. 4 Hours.

Concentrates on highway design including route selection, geometric design, foundation and pavement design, drainage design, and construction issues. Analyzes highway traffic including traffic flow fundamentals and capacity and level of service analysis for freeways and rural highways. Covers the environmental impact and public review process for highway construction. Includes project component.

CIVE 4566. Design for Sustainable Transportation: Netherlands. 4 Hours.

Examines how the design of Dutch transportation infrastructure promotes travel by foot, bicycle, and public transportation as opposed to private automobile and how it promotes urban livability and traffic safety. Topics include bicycling infrastructure planning and design; Vision Zero traffic safety principles and design treatments for safe roads, intersections, and crossings; and high-quality transit service planning and design. Through design projects, offers students an opportunity to apply lessons learned to the U.S. context. Taught in a study-abroad format in the Netherlands.

CIVE 4567. Planning and Policy for Sustainable Urban Transportation: Netherlands. 4 Hours.

Examines urban transportation planning practices and policies in the Netherlands that promote travel by bicycling, public transportation, and foot and help prevent urban mobility from degrading urban livability. Topics include land-use planning at the site, neighborhood, and regional scale; transit- and bicycle-oriented development, including both land-use and transportation infrastructure planning and policies for large-scale urban expansions; and traffic-circulation planning and policies to promote safety, prevent roads from becoming barriers to walking, cycling, or transit, and to create car-free and car-lite zones. Taught in study-abroad format in the Netherlands.

CIVE 4575. Construction Management. 3 Hours.

Surveys the construction industry and tasks that must be addressed by construction management including resource allocation, construction environment, organization, contracts, funding, cash flow, productivity, conceptual and detailed cost estimating, labor relations, network planning and scheduling, construction accounting, and project control.

CIVE 4699. Special Topics in Civil Engineering. 4 Hours.

Covers special topics in civil engineering initiated by the appropriate discipline committee and approved by the department. May be repeated without limit.

CIVE 4700. Civil Engineering Research. 4 Hours.

Offers independent work for students in the University Honors Program under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

CIVE 4765. Senior Design Project—Environmental. 5 Hours.

Using teams, students design a civil engineering project that primarily involves the environmental subdiscipline. Design teams are advised by a faculty member and engineering practitioners. Lectures cover supplemental technical background specific to the project, as well as cross-disciplinary aspects of project development, value engineering, aesthetics, and constructability. Integrates project design with further development of student communications skills; students present the design to practicing engineers and interested parties such as community groups.

CIVE 4767. Senior Design Project—Structural. 5 Hours.

Using teams, students design a civil engineering project that primarily involves the structural subdiscipline. Design teams are advised by a faculty member and engineering practitioners. Lectures cover supplemental technical background specific to the project, as well as cross-disciplinary aspects of project development, value engineering, aesthetics, and constructability. Integrates project design with further development of student communications skills; students present the design to practicing engineers and interested parties such as community groups.

CIVE 4768. Senior Design Project—Transportation. 5 Hours.

Using teams, students design a civil engineering project that primarily involves the transportation subdiscipline. Design teams are advised by a faculty member and engineering practitioners. Lectures cover supplemental technical background specific to the project, as well as cross-disciplinary aspects of project development, value engineering, aesthetics, and constructability. Integrates project design with further development of student communications skills; students present the design to practicing engineers and interested parties such as community groups.

CIVE 4777. Climate Hazards and Resilient Cities Abroad. 4 Hours.

Focuses on the science of “global weirding”—unprecedented changes in weather caused by global warming and natural climate variability. Introduces the physical-science basis of climate, computer models of the earth system, statistical tools for the analysis of climate model, and remote sensor data. Also introduces the concept of urban resilience, focusing on preventing natural hazards from turning into catastrophic disasters in densely populated and vulnerable regions. Examines multifaceted aspects of resilience, including governance, emergency response, infrastructural, informational, social, and policy aspects. Encourages students to consider the science, engineering, and policy challenges in transforming vulnerable urban and coastal regions to climate-resilient cities and to examine how societies can learn from each other by comparing Boston with the country visited. Taught abroad. .

CIVE 4778. Climate Adaptation and Policy Abroad. 4 Hours.

Explores how the country visited plans to adapt to climate change and natural hazards and how that country participates in international climate and emissions negotiations, within the context of its history and culture. Focuses on how an emerging economy adjusts to the reality of climate change/extremes and how citizens may drive decisions and policy. Incorporates topics from climate change, environmental sciences, civil and chemical engineering, remote sensing, social sciences, electrical engineering, computer science, and the management sciences. Encourages students to think about possible policy lessons for the United States. Offers students an opportunity to visit key sights. Culminates with a mock “climate change war game,” simulating an event in which international negotiators meet to formulate treaties on climate change adaptation and mitigation. Taught abroad. .

CIVE 4970. Junior/Senior Honors Project 1. 4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student’s major field. Combined with Junior/Senior Project 2 or college-defined equivalent for 8 credit honors project. May be repeated without limit.

CIVE 4971. Junior/Senior Honors Project 2. 4 Hours.

Focuses on second semester of in-depth project in which a student conducts research or produces a product related to the student’s major field. May be repeated without limit.

CIVE 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CIVE 4991. Research. 4 Hours.

Offers an opportunity to conduct research under faculty supervision.

CIVE 4992. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

CIVE 4993. Independent Study. 1-4 Hours.

Offers theoretical or experimental work under individual faculty supervision. May be repeated without limit.

CIVE 5221. Construction Project Control and Organization. 2 Hours.

Overviews the organization of construction firms at the general corporate level and the project level. Covers cost, schedule, budget, and financial control of projects. Also examines the flow of information between parties to the project.

CIVE 5231. Alternative Project Delivery Systems in Construction. 2 Hours.

Offers a comprehensive overview of alternative construction project delivery systems in the public and private sectors; project life cycle including project development, schedule, cost and risk management, quality assurance/quality control, project management, and project closeout; innovative financing strategies including contractor financing, franchises, and super turnkey. Focuses on the analysis of design/bid/build execution compared to design/build and construction management systems of delivery. Examines international projects, contracts, and partnering options—for example JVs and alliances—as vehicles to ensure the meeting of project objectives. Uses case studies to identify and practice the management skills required for successful D/B project execution including effective communication, negotiations, and team building. .

CIVE 5260. Environmental Fluid Mechanics. 4 Hours.

Focuses on fundamentals of fluid mechanics, but with application to the natural and built environment based on transport and dispersion phenomena. Reviews theory necessary for an understanding of environmental fluid flows and methods of observation, including acoustic Doppler current profiles, profiling towers, and modeling, including large eddy simulation (LES).

CIVE 5261. Dynamic Modeling for Environmental Investment and Policymaking. 4 Hours.

Introduces the theory, methods, and tools of dynamic modeling for policy and investment decision making, emphasizing environmental issues. Makes use of state-of-the-art computing methods to translate theory and concepts into executable models and offers extensive hands-on modeling experience. Topics include management of discrete flows (e.g., models of traffic systems); discounting, intertemporal optimization (e.g., models of resource extraction); dynamic games (e.g., models for adaptive management); and treatment of risk, uncertainty, novelty, and complexity (e.g., for investment and policymaking).

CIVE 5271. Solid and Hazardous Waste Management. 4 Hours.

Introduce various aspects of integrated solid waste management system and hazardous waste management practices. Includes both engineering principles as well as socioeconomic and regulatory issues surrounding solid and hazardous waste management. Provides sufficient background to enable the student to understand, evaluate, and critique the design of and the decisions in various waste management alternatives.

CIVE 5275. Life Cycle Assessment of Materials, Products, and Infrastructure. 4 Hours.

Covers the conceptual and mathematical basis of life cycle assessment (LCA), including engineering models of industrial energy use and emissions and environmental science models of fate and transport, exposure, and toxicology. LCA is a widely used systems-modeling method for quantifying the emissions and environmental/health implications of a product over its life cycle, from manufacturing to use to disposal. This guides design, technology decisions, and policy on topics ranging from consumer products to green buildings to large-scale energy technologies. Presents Monte Carlo simulation, structural path analysis, and model sensitivity analysis for the industrial network structure that underlies LCA modeling. Offers students an opportunity to receive hands-on training for open-source LCA software packages and then carry out independent group projects for real clients in industry and government.

CIVE 5280. Remote Sensing of the Environment. 4 Hours.

Introduces remote sensing techniques, including obtaining, visualizing, and analyzing satellite data. Examines physical processes, methods, and data products used in satellite remote sensing of the Earth's environment. Topics include active and passive remote sensing methods based on fundamentals of electromagnetic radiation, concepts used to develop data products from the remotely sensed measurements, and a suite of satellite data products to investigate current and past conditions of the Earth's terrestrial and ocean surfaces. Uses geographic information systems (GIS) and student-developed programs to view and interpret satellite data. Knowledge of GIS, R, and Python is preferred. .

CIVE 5281. Coastal Dynamics and Design. 4 Hours.

Introduces the basic theory of the forcing and response of the built and natural coastal environment, including hurricanes and extratropical storms, wind waves, astronomical tides, storm surges, currents, fluid-structure interactions, sediment transport, and morphological changes. Seeks to provide an overview of the physical processes and the functional design of coastal works, including anthropogenic and natural and nature-based features. Uses examples and case studies to illustrate the theory and the interdependence of water motion and coastal morphology. Emphasizes the challenges of extreme events and natural hazards in the coastal environment. Requires prior completion of one semester of fluid mechanics or equivalent.

CIVE 5300. Environmental Engineering Laboratory. 4 Hours.

Offers a laboratory-based course that provides students with hands-on experiences to monitor and evaluate relevant environmental processes. Introduces the theory, application, methodology, and instrumentation used in planning, sampling, and analyzing environmental contaminants in air, water, and soil. Emphasizes instrument selection and quality control, including documentation, calibration, data analysis and interpretation, and sample management. Offers students an opportunity to demonstrate the capability to select measurements strategies and sensing technologies to analyze environmental samples, conduct laboratory experiments, critically analyze experimental data, and present the experimental results.

CIVE 5373. Transportation Systems: Analysis and Planning. 4 Hours.

Discusses urban transportation planning and engineering for modes other than highway. Covers travel demand forecasting for both the short and long term including impact analysis methods, simple elasticity models, and the four-step model system of trip generation, trip distribution, modal split, and network assignment. Introduces transit service analysis and design. Other topics include capacity, service, and engineering design basics for different travel modes, such as bus, airport, rail, and bicycle. Considers the environmental impact, economic evaluation, and financial impact of different modes of transportation.

CIVE 5376. Traffic Engineering and Sustainable Urban Street Design. 4 Hours.

Covers street and intersection design for meeting societal needs related to traffic capacity, level of service, safety, walkability, bikeability, and the quality of public space. Intersection analysis and design topics include traffic flow theory and measurement; capacity; queuing and delay for both vehicles and pedestrians; and signal timing plan design, including design for pedestrian crossings. Street design topics include street functions; speed control; street and intersection layout; bicycling facilities, including bike lanes and separated bike paths; and pedestrian facilities, including sidewalks and crossings. Offers students an opportunity to practice with standard design manuals and intersection analysis software.

CIVE 5520. Structural Systems. 4 Hours.

Covers the design of structural systems. Includes the major aspects of structural behavior and design (loads, load paths, structural system concepts, analysis, member and connection design, and structural detailing). Discusses typical structural building materials along with a brief introduction to less conventional materials. Emphasizes wood and masonry design. Also presents structural principles behind some innovative structural systems. Utilizes current professional practice with a focus on approximate hand methods of structural analysis. Requires one semester of undergraduate structural analysis.

CIVE 5522. Structural Systems Modeling. 4 Hours.

Continues CIVE 2320. Covers analysis of indeterminate structural systems using matrix methods. Studies how to implement matrix analysis of indeterminate structures using both flexibility and stiffness approaches. Serves as an introduction to the finite element method.

CIVE 5525. Prestressed Concrete Design. 4 Hours.

Introduces analysis and flexural design of prestressed concrete members, allowable stress in concrete and steel, pre- and posttensioned concrete beams, strength evaluation, and prestressed concrete bridge design. Requires one semester of undergraduate concrete design or one semester of undergraduate structural analysis.

CIVE 5536. Hydrologic and Hydraulic Design. 4 Hours.

Introduces principles of engineering hydrology. Covers the hydrologic cycle, rainfall and flood frequency analysis, rainfall intensity-duration-frequency relationships, rainfall-runoff processes, hydrologic flood routing, and culvert/channel hydraulics. Utilizes these concepts in design applications of civil infrastructure such as stormwater detention basins, drainage pipes, culverts, etc. Uses hydrologic and hydraulic modeling software such as HEC-HMS and HEC-RAS. Includes project component.

CIVE 5699. Special Topics in Civil Engineering. 4 Hours.

Offered when the need for a special topic is evident to faculty and students. Topics are initiated by appropriate faculty members and discipline committee and approved by the department. May be repeated up to two times for up to 12 total credits.

CIVE 5978. Independent Study. 1-4 Hours.

Offers theoretical or experimental work under individual faculty supervision. May be repeated without limit.

CIVE 5984. Research. 1-4 Hours.

Offers an opportunity to conduct research under faculty supervision. May be repeated without limit.

CIVE 6566. Sustainable Urban Transportation: Netherlands. 4 Hours.

Examines how Dutch communities and their transportation systems are planned and designed to promote ABC (all-but-car) transportation, traffic safety, and livability. Topics include design of urban bicycling infrastructure for the mainstream population; planning and service design for high-quality public transportation; urban planning in support of transit, bicycle, and foot transportation, including both suburban development and urban redevelopment; and Vision Zero/Systematic Safety policy and design for traffic safety and its application to urban areas. Taught in study-abroad format in the Netherlands.

CIVE 6777. Climate Hazards and Resilient Cities Abroad. 4 Hours.

Combines the science, engineering, economic, social, and policy aspects of how cities can prepare themselves for climate change and natural hazards. Focuses on the science of unprecedented changes in weather caused by global warming and natural climate variability. Introduces the physical-science basis of climate, computer models and statistical tools, and remote sensor data. Introduces the concept of urban resilience, focusing on preventing natural hazards from turning into catastrophic disasters in densely populated regions. Examines resilience, including governance, emergency response, infrastructural, informational, social, and policy aspects. Encourages students to consider the science, engineering, and policy challenges in transforming vulnerable urban and coastal regions to climate-resilient cities and to examine how societies can learn from each other by comparing Boston with the country visited. Taught abroad.

CIVE 6778. Climate Adaptation and Policy Abroad. 4 Hours.

Explores how the country visited plans to adapt to climate change and natural hazards and how it chooses to participate in international climate and emissions negotiations. Focuses on how an emerging economy adjusts to the reality of climate change/extremes and how the will of citizens may drive decisions and policy. Incorporates topics from climate change, environmental sciences, civil and chemical engineering, remote sensing, social sciences, electrical engineering, computer science, and the management sciences. Encourages students to think about possible policy lessons for the United States. Culminates with a mock climate change war game, simulating an event in which international negotiators meet to formulate treaties on climate change adaptation and mitigation. Taught abroad.

CIVE 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CIVE 6964. Co-op Work Experience. 0 Hours.

Provides eligible students with an opportunity for work experience. May be repeated without limit.

CIVE 6965. Co-op Work Experience Abroad. 0 Hours.

Provides eligible students with an opportunity for work experience abroad. May be repeated without limit.

CIVE 7100. Time Series and Geospatial Data Sciences. 4 Hours.

Offers an interdisciplinary course covering the fundamentals of time series and spatial statistics with applications in engineering, science, and business. Introduces analysis and forecasting methods for time series, spatial, and spatiotemporal data. Discusses classical time or frequency domain methods, as well as recent techniques motivated from computer science, physics, statistics, or engineering. Case studies relate to ongoing research and to real-world examples. A demo project is selected by the instructor based on discussion with individual students. A computer-based final project can be tailored to student interests in environmental engineering, sustainability sciences, security threat assessments, social sciences, business, or management science and finance. Requires undergraduate probability and statistics (CIVE 3464 or equivalent); background in programming languages such as MATLAB or R helpful but not required.

CIVE 7110. Critical Infrastructure Resilience. 4 Hours.

Introduces the concept of resilience by exploring engineering concepts and perspectives to offer students an opportunity to develop the ability to be prepared for and adapt to challenging situations and scenarios—e.g., globalization, climate change, security threats, and natural disasters—on critical infrastructures and key resources. Topics include application of tools for infrastructure modeling and risk assessment; identification of natural and man-made hazards; management of disaster risks and communications; resilience design; and future challenges, policy, and novel approaches to advance resilience. Explores application to real-life examples through group projects. Requires one semester of undergraduate statistics.

CIVE 7220. Construction Management. 4 Hours.

Presents all aspects of construction management, with emphasis on cost and schedule. Provides conceptual and detailed cost estimates and network-based scheduling techniques (CPM and PERT). Covers project cash flow and finances. Requires one semester of undergraduate probability and statistics.

CIVE 7230. Legal Aspects of Civil Engineering. 4 Hours.

Overviews the U.S. legal system and the theories necessary for the comprehension of business and contractual liabilities. Discusses various types of contracts, forms of business ownership, claims and disputes, and environmental law.

CIVE 7240. Construction Equipment and Modeling. 4 Hours.

Focuses on the selection and application of earthmoving equipment. Topics include equipment production systems and cost analysis, simulation modeling of equipment operations, statistical aspects of computer simulation, and risk analysis fundamentals. Requires one semester of construction management or one semester of undergraduate soil mechanics.

CIVE 7250. Environmental Chemistry. 4 Hours.

Examines applications of chemistry to environmental engineering. Covers properties of water and pollutants, acid-base reactions, pH, alkalinity, equilibrium chemistry, chemical kinetics, chemical thermodynamics, coordination chemistry, precipitation-dissolution reactions, surface chemistry, adsorption-desorption, redox reactions, and organic chemistry as it relates to the environment. Includes relevant laboratory exercises such as colorimetry, gravimetric, and electrochemical methods; atomic absorption spectrophotometry; and ion and gas chromatography. Requires one semester of undergraduate chemistry.

CIVE 7251. Environmental Biological Processes. 4 Hours.

Examines microbiology with emphasis on biological processes in environmental engineering applications. Topics include cell structure, morphology, cell nutrition and growth, energy transfer and utilization, aerobic and anaerobic microbial metabolism, biological wastewater process theory and modeling, biological nutrients removal, and disinfection of relevant microorganisms. Includes relevant laboratory exercises of treatment parameters used to monitor the biological processes, such as BOD, TOC, COD, gravimetric methods, and dissolved oxygen. Also covers enzyme kinetics and evaluation of kinetic coefficients for biotreatment. Requires one semester of undergraduate chemistry or one semester of undergraduate biology.

CIVE 7252. Water Engineering: Planning, Design, and Management. 4 Hours.

Covers the design principles and applications of major wastewater treatment processes, including the planning and procurement phases of design and construction services, sanitary sewer collections systems, waste treatment, handling and disposal, energy recovery, and future challenges and opportunities in the wastewater management field. Designed to provide students with theory and principles applicable to the water industry. Requires one semester each of undergraduate chemistry and undergraduate biology.

CIVE 7255. Environmental Physical/Chemical Processes. 4 Hours.

Examines the processes of physical and chemical phenomena related to water quality and water treatment within environmental engineering. Presents the use of fundamental theory, mathematical description, and applied knowledge of these processes and how they are used to characterize water quality in natural systems (lakes, rivers) and to predict performance in engineered systems (water treatment systems). Uses a mass balance and reaction kinetics approach to derive analysis and design equations for water treatment unit operations. Covers physical and chemical processes, including reaction kinetics, flow regimes, dissolved solute removal, particulate removal, phase transfer processes, and redox processes. Includes laboratory demonstrations. Basic knowledge of water quality, environmental chemistry, and differential equations preferred.

CIVE 7260. Hydrologic Modeling. 4 Hours.

Covers the vertical and lateral fluxes and stores of water within the terrestrial hydrologic cycle such as precipitation (rain and snow); infiltration; runoff; snowmelt; evapotranspiration; streamflow; groundwater recharge/discharge; and surface (snowpack, lakes, rivers) and subsurface (soil moisture and groundwater) storages. Individual simulation models are developed to represent key processes within the hydrologic cycle. Process models are then integrated to approximate the hydrologic cycle of a watershed. Covers model parameterization, calibration, validation, and uncertainty (model parameters and forcings). Knowledge of geographic information systems and programming is recommended.

CIVE 7261. Surface Water Quality Modeling. 4 Hours.

Offers a quantitative analysis of the fate and transport of contaminants in surface water systems. Water quality models are developed using a mass balance approach to describe the transport, dispersal, and chemical/biological reactions of substances introduced into river and lake systems. Covers water quality standards; model formulation and application; waste load allocation; and water quality parameters such as biochemical oxygen demand, dissolved oxygen, nutrients, and toxic chemicals. Requires one semester of undergraduate hydrologic engineering, hydrology, or equivalent.

CIVE 7272. Air Quality Management. 4 Hours.

Explores engineering theory and practice related to air resources management. Focuses on modeling dispersion and reactions for atmospheric pollutants and on analysis of systems for controlling gaseous and particulate emissions including dry collection, wet collection, absorption, and catalytic processes. Also addresses biological and chemical aspects of air pollution including toxicological issues, physiological effects of aerosols, analysis of organic and inorganic constituents of the atmosphere, and rationale for establishing air quality criteria and standards. Requires one semester of undergraduate chemistry.

CIVE 7281. Coastal and Nearshore Hydrodynamics. 4 Hours.

Presents the basic principles and theories of coastal and nearshore hydrodynamics as well as related engineering applications, including water waves, wave transformation and breaking, wave-induced nearshore circulation, wave setup, wave run-up, fluid vegetation interaction, wave-current interaction, storm surges, tide and wind-driven circulation, and tidal inlet hydraulics.

CIVE 7301. Advanced Soil Mechanics. 4 Hours.

Studies characterization of soils, soil mineralogy and chemistry, stresses within a soil mass, basic porous media flow principles, effective stress principle, compaction, drained and undrained stress-strain-strength concepts, and consolidation theory and its application. Requires one semester of undergraduate soil mechanics.

CIVE 7302. Advanced Foundation Engineering. 4 Hours.

Focuses on bearing-capacity and settlement analysis of conventional shallow foundations and combined footings; mat design; lateral earth pressure theory and application to retaining wall design, braced excavations, sheet pile wall design, and slurry trench walls; bearing-capacity design and analysis for deep foundations; and laterally loaded piles, friction piles, and pile-driven analysis. Requires one semester of undergraduate soil mechanics.

CIVE 7311. Soil and Foundation Dynamics. 4 Hours.

Considers dynamic loads, blast vibrations and monitoring, dynamic response of single-mass, multi degree-of-freedom systems, design of machine foundations, dynamic soil properties, ground response analysis, liquefaction, and seismic analysis of slopes and dams. Requires one semester of undergraduate statics.

CIVE 7312. Earthquake Engineering. 4 Hours.

Studies plate tectonics, seismology, faults and characteristics, ground motions, seismic hazard analysis, dynamic response of single degree-of-freedom system, response spectrum, site effects, and seismic design considerations for buildings, bridges, and earth-retaining structures. Requires one semester of undergraduate statics.

CIVE 7330. Advanced Structural Analysis. 4 Hours.

Explores modern methods of structural analysis, matrix formulation of flexibility and stiffness methods, and analysis of structures with material and geometric nonlinearities. Also introduces energy methods. Requires CIVE 5522 or one semester undergraduate matrix structural analysis.

CIVE 7331. Structural Dynamics. 4 Hours.

Examines single and multi degree-of-freedom systems subjected to arbitrary dynamic loads. Topics include convolution and frequency domain solutions, introduction to analytical dynamics, damping models, modal analysis of classically damped systems, and state-space formulation. Requires one semester of undergraduate structural analysis.

CIVE 7340. Seismic Analysis and Design. 4 Hours.

Considers the response of linear systems to coherent and incoherent support motion, nonlinear response, the concept of ductility, inelastic response spectra, soil-structure interaction, random vibration theory, development of seismic codes, and characterizations of earthquakes for design.

CIVE 7341. Structural Reliability. 4 Hours.

Examines applications of probability theory and random variables for determining the reliability of structures. Includes the following topics: formulation of reliability for structural components and systems; first-order second-moment method, first- and second-order reliability methods, and simulation methods; analysis of model uncertainty and Bayesian parameter estimation technique; load and resistance models and bases for probabilistic structural codes; and time-dependent reliability methods. Assumes no prior knowledge of probability theory.

CIVE 7350. Behavior of Concrete Structures. 4 Hours.

Considers flexural mechanics of reinforced concrete cross sections and members; combined bending, axial, and shear loads; advanced topics in shear, torsion, and connection design; and application of plastic analysis to reinforced concrete frames, their behavior under cyclic loading, and response of structures under seismic actions. Requires one semester of undergraduate concrete design.

CIVE 7351. Behavior of Steel Structures. 4 Hours.

Studies the behavior and design of steel structural systems, including structural stability; advanced topics in mechanics and design of structural steel members, including combined axial, flexure, and shear loads; composite steel/concrete beam and column behavior and design; plate girders; and advanced topics in connection design. Requires one semester of undergraduate steel design.

CIVE 7354. Wind Engineering. 4 Hours.

Covers atmospheric circulation, atmospheric boundary layer winds, bluff-body aerodynamics, introduction to random vibration theory, response of structures to fluctuating wind loads, aeroelastic phenomena, wind-tunnel and full-scale testing, nonsynoptic winds (hurricanes, tornadoes, etc.), wind-load standards, and design applications.

CIVE 7355. Advanced Bridge Design. 4 Hours.

Studies the behavior and design of prestressed concrete bridges. Includes conceptual design, flexural design, shear design, and torsional design of prestressed elements. Analyzes indeterminate prestressed structures and design for prestressed concrete bridges, including material properties, loads, reinforcement, structural analysis, temperature effects, and construction methods. Covers solid slab, T-beam, and box girders. Final projects include complete designs for a simple supported girder bridge and a continuous girder bridge using load factor and resistance design (LFRD) specifications. Requires one semester of undergraduate structural analysis.

CIVE 7357. Advanced Structural Mechanics. 4 Hours.

Covers stress and strain analysis of structural components, including beams and plates subject to bending, shear, tension, and compression, as well as nonsymmetric geometry and loading cases. Considers the derivation and analysis of elastic instabilities of structural components, including the lateral, torsional, and lateral-torsional buckling of beams and the inelastic yielding and concentrated plasticity of beam components. Includes 3D stress and strain analysis for elastic and inelastic continua as related to advanced structural problems. Introduces variational methods. Requires one semester of graduate structural analysis.

CIVE 7380. Performance Models and Simulation of Transportation Networks. 4 Hours.

Reviews concepts and methods for the analysis of the performance of complex transportation systems and approaches for planning, design, monitoring, and management and control of traffic flows over complex transportation networks. Topics include deterministic and probabilistic models, elements of queuing theory, network optimization algorithms, and simulation. Includes applications in traffic flow modeling, capacity analysis of diverse transportation facilities, level of service and estimation of delays, optimal design of transportation network services, and traffic assignment on congested networks.

CIVE 7381. Transportation Demand Forecasting and Model Estimation. 4 Hours.

Studies methods used for model estimation, model building, and interpretation of results. Emphasizes travel demand forecasting, including trip generation, distribution, model choice, and route choice. Topics include aggregate and disaggregate models, including discrete choice (binary and multinomial logit and extensions), model building and statistical testing, aggregation, sampling, and sample design. Demonstrates the applicability and underlying principles of the various models through case studies with focus on practical aspects and interpretation. Bases main methodological approaches on econometric methods, mainly on regression modeling and maximum likelihood estimation. Uses general and specialized software tools for data analysis and model estimation. While the focus is on estimating transportation demand models, the methods are applicable to a broad class of applications in engineering, marketing, etc.

CIVE 7382. Advanced Traffic Control and Simulation. 4 Hours.

Covers analysis and design of traffic signal control, including actuated control, coordinated control, transit signal priority, and signal control schemes for better accommodating pedestrians and bicycles. Includes the study of traffic microsimulation for urban street networks, including modeling techniques and simulation-based evaluation, and intersection performance models. Offers students an opportunity to practice with standard microsimulation software, including coding traffic signal control logic.

CIVE 7385. Public Transportation. 4 Hours.

Studies the analysis, planning, and operational design of urban public transportation systems. Topics include service planning and scheduling; service reliability and operational control; automated systems for location, fare collection, and passenger counting; service performance measurement; rail system operations and design; data collection; ridership estimation; demand forecasting; pricing; and coordinated transit and land-use planning. Introduces supporting mathematical methods in optimization, random processes, and statistical sampling. Requires knowledge of probability theory.

CIVE 7387. Design Aspects of Roadway Safety. 4 Hours.

Concentrates on roadway design features that affect safety, including system users and design elements. Topics include crash causation and countermeasures, statistical procedures for crash analysis, and geometric design improvements for roads and intersections. Analyzes crash data, including both intersecting and nonintersecting locations. Presents concepts, including design, to create a safer transportation system while addressing specific high-crash locations.

CIVE 7388. Special Topics in Civil Engineering. 4 Hours.

Offered when the need for a special topic is evident to faculty and students. The course is initiated by the appropriate faculty members and discipline committee and approved by the department. May be repeated without limit.

CIVE 7390. Special Topics in Construction Management Engineering. 4 Hours.

Offered when the need for a special topic is evident to faculty and students. The course is initiated by the appropriate faculty members and discipline committee and approved by the department. May be repeated without limit.

CIVE 7392. Special Topics in Environmental Engineering. 4 Hours.

Offered when the need for a special topic is evident to faculty and students. The course is initiated by the appropriate faculty members and discipline committee and approved by the department. May be repeated without limit.

CIVE 7394. Special Topics in Geotechnical Engineering. 4 Hours.

Offered when the need for a special topic is evident to faculty and students. The course is initiated by the appropriate faculty members and discipline committee and approved by the department. May be repeated without limit.

CIVE 7396. Special Topics in Structural Engineering. 4 Hours.

Offered when the need for a special topic is evident to faculty and students. The course is initiated by the appropriate faculty members and discipline committee and approved by the department. May be repeated without limit.

CIVE 7400. Seminar. 0 Hours.

Presents topics of an advanced nature by staff, outside speakers, and students in the graduate program. This course must be attended every semester by all full-time graduate students in the Department of Civil and Environmental Engineering. Environmental engineering students permitted. May be repeated without limit.

CIVE 7962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CIVE 7976. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

CIVE 7978. Independent Study. 1-4 Hours.

Offers an individual effort in an area selected by student and adviser and approved by the Department Discipline Committee resulting in a definitive report. May be repeated without limit.

CIVE 7990. Thesis. 1-8 Hours.

Offers analytical and/or experimental research conducted by arrangement with and under the supervision of the department. May be repeated without limit.

CIVE 7996. Thesis Continuation. 0 Hours.

Offers continued thesis work conducted under the supervision of a departmental faculty.

CIVE 8674. Master's Report. 2,4 Hours.

Offers an individual effort consisting of laboratory and/or literature investigation and analysis of advanced design of a project in an area of civil engineering selected by student and adviser resulting in a definitive report. Requires a completed report seven years from the start of the master's program.

CIVE 8960. Exam Preparation—Doctoral. 0 Hours.

Offers students an opportunity to prepare for the PhD qualifying exam under faculty supervision. Intended for students who have completed all required PhD course work and have not yet achieved PhD candidacy; students who have not completed all required PhD course work are not allowed to register for this course. May be repeated once.

CIVE 8984. Research. 1-4 Hours.

Offers an opportunity to conduct research under faculty supervision. May be repeated without limit.

CIVE 8986. Research. 0 Hours.

Offers an opportunity to conduct full-time research under faculty supervision. May be repeated without limit.

CIVE 9000. PhD Candidacy Achieved. 0 Hours.

Indicates successful completion of program requirements for PhD candidacy.

CIVE 9984. Research. 1-4 Hours.

Offers an opportunity to conduct research under faculty supervision. May be repeated without limit.

CIVE 9986. Research. 0 Hours.

Offers an opportunity to conduct full-time research under faculty supervision. May be repeated without limit.

CIVE 9990. Dissertation. 0 Hours.

Offers analytical and/or experimental research conducted by arrangement with and under the supervision of the department. Open to full-time students only. Requires PhD candidacy in civil engineering or in interdisciplinary engineering. May be repeated once.

CIVE 9996. Dissertation Continuation. 0 Hours.

Offers continued thesis work conducted under the supervision of a departmental faculty. Requires prior completion of CIVE 9990 twice and PhD candidacy in civil engineering or in interdisciplinary engineering. May be repeated without limit.

Co-op/Experiential Education in Arts, Media, and Design (EEAM)

Search EEAM Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=EEAM>)

EEAM 2000. Professional Development for Co-op. 1 Hour.

Introduces students to the Cooperative Education Program and provides them with an opportunity to develop job-search and career-management skills. Offers students an opportunity to perform assessments of their workplace skills, interests, and values and discuss how they impact personal career choices. Students also have an opportunity to prepare a professional-style résumé, learn proper interviewing techniques, and gain an understanding of the opportunities available to them for co-op. Introduces career paths, choices, professional behaviors, work culture, and career decision making. Familiarizes students with workplace issues relative to their field of study and teaches them to use myNEU in the job-search and referral process. Presents co-op policies, procedures, and expectations of the Department of Cooperative Education and co-op employers.

EEAM 2010. Internship for Career Decision Making. 1 Hour.

Offers students an opportunity to gain experience in a field they would like to explore and receive internship credit. Students complete a one-hundred-hour internship during the semester, which they obtain prior to the course. Students attend group meetings and individual appointments with the instructor, maintain a weekly journal, and complete an evaluation of their internship experience.

EEAM 2945. College of Arts, Media and Design Co-op Experience. 1 Hour.

Offers students an opportunity for work experience. May be repeated up to three times.

EEAM 6954. Co-op Work Experience - Half-Time. 0 Hours.

Provides eligible students with an opportunity for work experience. May be repeated without limit.

EEAM 6955. Co-op Work Experience Abroad - Half-Time. 0 Hours.

Provides eligible students with an opportunity for work experience. May be repeated without limit.

EEAM 6964. Co-op Work Experience. 0 Hours.

Provides eligible students with an opportunity for work experience. May be repeated without limit.

EEAM 6965. Co-op Work Experience Abroad. 0 Hours.

Provides eligible students with an opportunity for work experience abroad. May be repeated without limit.

Co-op/Experiential Education in Science (EESC)

Search EESC Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=EESC>)

EESC 2000. Professional Development for Co-op. 1 Hour.

Introduces students to the Cooperative Education Program and provides them with an opportunity to develop job-search and career-management skills. Offers students an opportunity to perform assessments of their workplace skills, interests, and values and discuss how they impact personal career choices. Students also have an opportunity to prepare a professional-style résumé, learn proper interviewing techniques, and gain an understanding of the opportunities available to them for co-op. Introduces career paths, choices, professional behaviors, work culture, and career decision making. Familiarizes students with workplace issues relative to their field of study and teaches them to use myNEU in the job-search and referral process. Presents co-op policies, procedures, and expectations of the Department of Cooperative Education and co-op employers.

EESC 3000. Values, Ethics, and Professionalism in the Sciences. 4 Hours.

Designed to help students pursuing a science education to begin developing a coherent professional identity. Students examine, articulate, and defend their professional values and use concurrent reflection exercises to create action steps to reach multiple long-term professional goals. Examines ethical dilemmas in science fields in-depth. Offers students an opportunity to learn and utilize theoretical ethical frameworks to discuss a series of case studies and overlay existing ethical codes established by their fields' governing organizations. Students create novel case studies based on real-world events and extrapolate these ethical conversations into the "big ethical and moral issues" facing their fields in the near future (genetic engineering, energy production, etc.). Focuses on the value of lifelong learning through reflective practice, mentorship, professional organizations and conferences, and leadership opportunities in the field.

Co-op/Experiential Education in Social Sciences and Humanities (EESH)

Search EESH Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=EESH>)

EESH 2000. Professional Development for Co-op. 1 Hour.

Introduces students to the Cooperative Education Program and provides them with an opportunity to develop job-search and career-management skills. Offers students an opportunity to perform assessments of their workplace skills, interests, and values and discuss how they impact personal career choices. Students also have an opportunity to prepare a professional-style résumé, learn proper interviewing techniques, and gain an understanding of the opportunities available to them for co-op. Introduces career paths, choices, professional behaviors, work culture, and career decision making. Familiarizes students with workplace issues relative to their field of study and teaches them to use myNEU in the job-search and referral process. Presents co-op policies, procedures, and expectations of the Department of Cooperative Education and co-op employers.

Commerce and Economic Development - CPS (CED)

Search CED Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=CED>)

CED 6010. Applied Microeconomic Theory 1. 3 Hours.

Covers decision theory, theory of the firm, and consumer behavior; introduction to general equilibrium theory and welfare economics; game theory, including extensive form solution concepts, bargaining, and repeated games; and information economics, contract theory, and mechanism design.

CED 6011. Applied Microeconomic Theory 2. 3 Hours.

Offers a deep exploration into game theory, including extensive form solution concepts, bargaining, repeated games, information economics, contract theory, and mechanism design.

CED 6020. Applied Macroeconomic Theory 1. 3 Hours.

Develops a coherent framework for analyzing the determination of macroeconomic variables such as national output, unemployment, interest rates, government debt, and inflation. Explores the link between economic theory and current economic policy. Offers students an opportunity to learn the tools to analyze current macroeconomic policies.

CED 6021. Applied Macroeconomic Theory 2. 3 Hours.

Exposes students to the skills needed for interpreting macroeconomic data and macroeconomic policy. The course is designed to provide a link between economic theory and current economic policy and to provide students with the tools to analyze current macroeconomic policies.

CED 6030. Mathematical Methods for Economics 1. 3 Hours.

Covers applications of mathematics to economics: functions, simultaneous equations; linear models and matrix algebra; determinants, inverse matrix, Cramer's rule; differentiation and optimization of functions of one or more variables; quadratic forms, characteristic roots and vectors, constrained optimization; and interpretation of the Lagrange multiplier. Applies techniques to examples from the theory of the firm and consumer behavior.

CED 6031. Mathematical Methods for Economics 2. 3 Hours.

Explores applications of mathematics to economics: differentiation and optimization of functions of one or more variables; quadratic forms, characteristic roots and vectors, constrained optimization; interpretation of the Lagrange multiplier. Applies techniques to examples from the theory of the firm and consumer behavior.

CED 6040. Applied Econometrics. 3 Hours.

Studies statistical tools used to estimate economic relationships. Discusses the linear regression model. Introduces topics relevant to the analysis of economic data, including instrumental variables, discrete choice modeling, panel data analysis, and program evaluation. .

CED 6041. Applied Econometrics II. 3 Hours.

Focuses on specific topics in instrumental variables, discrete choice modeling, panel data analysis, program evaluation, and empirical strategies for applied micro research. The purpose of this course is to provide students with a solid foundation in econometric techniques with a focus on techniques that are commonly used in applied economics. Seeks to help students understand issues in connecting data, statistics, and economic theory and to read and precisely understand the econometrics typically used in empirical research for practical and academic purposes. These tools are of practical use to any student who plans on confronting data in their academic and professional work.

CED 6050. Commerce and Economic Development. 3 Hours.

Explores introductory material in economics, finance, and mathematics relevant for graduate studies. Covers basic concepts of micro- and macroeconomics, statistics, optimization, and market basics.

CED 6051. Open Economy Macroeconomic Analysis. 3 Hours.

Examines key issues in open economy macroeconomics, including the foreign exchange market, international monetary arrangements, the balance of payments and current account imbalances, national income accounting, the effectiveness of monetary and fiscal policies in open economies, the determinants of exchange rate changes, and the economics of monetary integration.

CED 6070. Economics of Human Capital. 3 Hours.

Focuses on an economic analysis of the labor market, the labor force, and workers' wages and earnings. Includes other topics such as the demand for labor by businesses and industries; wage inequality and its determinants; the changing occupational and industrial structure; the economic impact of unions; and the influence of related labor market institutions and relevant public policies, including minimum wages, wage subsidies, and earned income tax credits. Aims to help early stage entrepreneurs to understand issues of human labor.

CED 6080. Commerce, Institutions, and Innovation. 4 Hours.

Examines the impact of institutions and innovation upon commercial activity. Commerce comprises the institutional (economic, political, and social) structures that allow private enterprises to meet society's demand for goods and services. Begins with the history of commerce, focusing on the key capitalist institutions—markets, property rights, firms, efficiency, regulation—and analyzing economic development.

CED 6090. Cultural Economic Development. 3 Hours.

Examines the role of markets in art, culture, and entertainment in economic development. Includes topics such as the role of the creative economy in attracting tourists and industry and in driving economic growth and the strategic impact of a creative export sector. Explores additional topics such as an analysis of the economics of historic preservation and tourism—for example, rehabilitating historical buildings, funding museums and symphony orchestras, and encouraging traditional arts and tourist activities—to lead job growth and spur economic vitality.

CED 6110. Law and Economics. 3 Hours.

Addresses topics such as property rights, regulation, income distribution applied to health and safety, the environment, the legal services and insurance industries, and zoning and land use. Includes additional topics such as new digital information products, international piracy, and intellectual property protections and created issues.

CED 6120. Environmental Economics. 3 Hours.

Analyzes efficient allocation of environmental resources and the impact on commerce and economic development. Includes additional topics such as the negative impact of economic activities on air and water with consideration of effective public policy. Explores current issues—such as global warming, habitat and species protection, etc.—and requires consideration of worldwide approaches and solutions to international problems. .

CED 6130. Sustainable Economic Development. 3 Hours.

Addresses the economics of balancing development and environmental impacts in the context of meeting current and future human needs while protecting the environment. Considers challenges and strategies in both developed and developing economies. Beginning with the market failure resulting from not including environmental impacts in cost calculations, this course explores the competing models of economic development, the environment, and population growth.

CED 6140. Economics of E-Commerce. 3 Hours.

Uses theory and analysis of traditional industries to help understand the growth and future of electronic commerce. Includes relevant topics from industrial organization, including monopoly pricing, price discrimination, product differentiation, barriers to entry, network externalities, and search and first-mover advantages. Discusses a number of e-industries, including extensions and applications of the underlying economics, drawing analogies to previous technological revolutions, bubbles in asset markets, and the macroeconomic effects of the Internet.

CED 6210. Managerial Finance. 3 Hours.

Offers knowledge and tools to make informed investment and financing decisions. Topics include capital markets, advanced capital budgeting, decision making under uncertainty, asset pricing models, contingent claims models, capital structure, dividend policy, mergers, restructuring and corporate control, and exchange rate systems and international finance.

CED 6220. International Finance. 3 Hours.

Studies the international financial and monetary system, emphasizing currency markets. Examines market instruments and techniques, including synthetic and derivative securities and their application to management of currency risk in international trade and finance.

CED 6230. Quantitative Methods. 3 Hours.

Explores the development, testing, and application of multiple regression models in financial, economic, and business analysis and forecasting. Course material includes statistical concepts, probability concepts, probability distributions, sampling, hypothesis testing, time series analysis, and multifactor models. Topics are organized around the requirements of the "quantitative methods" portion of the CFA Level I exam.

CED 6240. Financial Ethics. 3 Hours.

Studies ethical problems in business and finance and lays the foundations for decisions involving ethical issues. Topics include ethical concepts, including personal integrity, financial industry ethical norms, and company loyalty and responsibility conflicts as they impact decision processes in the functional areas of finance. Organizes topics around the requirements of the ethics portion of the CFA Level I exam.

CED 6250. Derivatives and Alternative Investments. 3 Hours.

Introduces the mechanics of derivatives markets and types of available derivatives investments. Examines the fundamentals of the future markets, hedging strategies using futures, the market of SWAPs, and the mechanics of the options markets. Topics are organized around the requirements of the "derivatives" portion of the CFA Level I exam.

CED 6910. Capstone: Master's Project. 4 Hours.

Offers students, working in individuals and groups, an opportunity to design and carry out an interdisciplinary economic policy analysis comparable to those performed for a government or nonprofit agency. Projects can be done with real-world clients and utilize experience learned from co-op or experiential learning projects.

CED 6983. Special Topics. 3 Hours.

Covers special topics within the realm of Commerce and Economic Development.

CED 6995. Project. 1-4 Hours.

Focuses on an in-depth project in which a student conducts research or produces a product related to the student's major field. May be repeated without limit.

Communication Studies (COMM)

Search COMM Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=COMM>)

COMM 1000. Communication Studies at Northeastern. 1 Hour.

Designed to provide a unique opportunity to engage faculty, professional staff, and peer mentors in small group discussions. Introduces students to the College of Arts, Media and Design. Offers students an opportunity to learn about the communication studies major and to explore the different areas of emphasis offered by the department. As part of the course, students are expected to prepare a detailed plan of study and are introduced to the co-op program and meet their academic co-op advisor.

COMM 1101. Introduction to Communication Studies. 4 Hours.

Surveys the field of communication studies. Covers major theories and methodological approaches in communication studies and situates communication within larger social, political, and economic institutions. Exposes students to ways of ethical reasoning across communication contexts, including organizational communication, social media, intercultural communication, mass media, and interpersonal communication.

COMM 1112. Public Speaking. 4 Hours.

Develops skills in public communication. Topics include choosing and researching a topic, organizing and delivering a speech, handling speech anxiety, listening critically, and adapting language to an audience. Offers the opportunity for students to present a series of speeches and receive advice and criticism from an audience.

COMM 1113. Business and Professional Speaking. 4 Hours.

Designed to assist students in developing advanced public speaking and presentational skills for professional and leadership positions. Covers fundamentals such as audience, speech objectives and structure, and effective delivery. Emphasizes the production and successful interaction with electronic and traditional supportive media. Offers students an opportunity to develop their presentational skills in a variety of settings and realistic business tasks.

COMM 1120. Principles of Argumentation. 4 Hours.

Considers how the theories and techniques of argumentation can be used to understand and promote differing points of view, explore ideas and alternatives, and convince others of the need to change or act. Starts with the principles of formal logic and introduces students to truth tables and diagramming techniques. Continues to discuss informal logic and modern argumentation theory, including argumentative reconstruction, argument structures, argument schemes and critical questions, as well as informal fallacies. Concludes with a discussion of the effective use of reasoning in society from a logical, dialectical, and rhetorical point of view.

COMM 1125. Science, Communication, and Society. 4 Hours.

Introduces the major areas of research analyzing the role of communication and the media in shaping debates over science, technology, and the environment. Focuses on what U.S. National Academies calls the "science of science communication" to offer students an opportunity to acquire the knowledge necessary to assess the interplay between science, engineering, and society, including the implications for strategic communication, public engagement, personal decisions, and career choices. Examines the scientific, social, and communication dimensions of debates over climate change, evolution, human genetic engineering, childhood vaccination, food biotechnology, and other case studies. Covers how to find, discuss, evaluate, and use expert sources of information; to formulate research questions and expectations; to think effectively about professional situations and choices; and to write evidence-based, persuasive papers and essays.

COMM 1131. Sex, Relationships, and Communication. 4 Hours.

Focuses on communication within the context of close relationships. Topics covered include the role of communication in interpersonal attraction, relationship development, relationship maintenance, and relationship dissolution. Examines how communication impacts relationship quality and commitment. Offers students an opportunity to apply what they learn in the course to their personal and professional lives.

COMM 1210. Persuasion and Rhetoric. 4 Hours.

Seeks to teach students to be more astute receivers and producers of persuasive messages by learning how to dissect them. Examines both classical and contemporary theories of persuasion, after which students consider “persuasion in action”—how persuasion is used in everyday language, nonverbal communication, sales techniques, politics, and propaganda. Ethical issues in persuasion are addressed throughout the course.

COMM 1225. Communication Theory. 4 Hours.

Explores communicative and cultural practice from a wide variety of theoretical perspectives. Considers a wide range of cultural practices, texts, and artifacts, including popular culture (television shows, movies, and video games); social media and online content; as well as organizational communication (press releases) and interpersonal interactions (conversations between romantic partners). Communication theory is based on two premises: Our cultural assumptions inform and shape our ability to communicate; and communication is the process through which culture is created, modified, and challenged.

COMM 1231. Principles of Organizational Communication. 4 Hours.

Surveys the communication process in complex organizations. Topics include the evolution of organizational communication, communication networks, information management, and communication climate. Analyzes case studies and teaches how to improve the quality of communication in an organization.

COMM 1255. Communication in a Digital Age. 4 Hours.

Covers digital communication’s history, technical basis (“protocol” and the “Web”), communicative effects, commercial applications, culture, and societal interactions. Digital communication is central to contemporary life and is (consequently) often taken for granted, which this course seeks to remedy. Applies practical skills relative to theories about collaboration and cultural production and engagement with and analyses of online cultures. Offers students an opportunity to become effective online communicators—using practical exercises such as email filtering, online collaboration, and writing in a Web markup format—and to make use of critical thinking to understand and engage with issues such as online privacy, gender and racial bias, and marketplace credibility and fraud.

COMM 1331. Legal Argumentation, Advocacy, and Citizenship. 4 Hours.

Seeks to train students in effective civic engagement by studying legal argumentation, while preparing students for careers in which persuasive skills are critical to success. Offers students an opportunity to study historical documents to understand the processes of argumentation and to develop arguments by performing detailed research about contemporary issues.

COMM 1412. Social Movement Communication. 4 Hours.

Examines the communication strategies (including rhetorical messaging, public advocacy, grassroots organizing, fund-raising, and media outreach) of historical and contemporary social movement and activist organizations. Social movements considered may include immigration protests, AIDS activism, environmental advocacy, disability movements, racial justice, and feminism.

COMM 1450. Sound Production for Digital Media. 4 Hours.

Designed to prepare students to work with audio in modern media settings. Introduces the process of planning, preparing, producing, and evaluating audio production styles and techniques. Through a series of discussions, screenings, homework, and in-class exercises, offers students an opportunity to gain the skills needed to produce successful audio recordings. Exposes students to the elements and terminology of audio production as they record, mix, and produce their own original projects.

COMM 1511. Communication and Storytelling. 4 Hours.

Engages students in the discovery of varied and culturally diverse texts in the literary genres of poetry, prose, and drama. Students focus on analyzing an author’s meaning and communicating that meaning to an audience through interpretive performance.

COMM 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

COMM 2100. Elements of Debate. 4 Hours.

Introduces the principles and skills of effective argument. Topics include the process of advocacy, how to develop an argument through reasoning, the psychology of argument, and motivational techniques of argumentation. Combines theory and practice in argument through individual presentations and team debates.

COMM 2105. Social Networks. 4 Hours.

Applies network science theories and methods to understand the connectivity and complexity in the world around us on different scales, ranging from small groups to whole societies. Applies network theories, data collection methods, and visual-analytic analyses to map, measure, understand, and influence a wide range of online and offline social phenomena, including friendships and romantic relationships, professional networks, social media, social influence and marketing, diffusion and viral media, recommender systems, and collective action. Offers students an opportunity to learn to use computational tools to gather and analyze network data, derive data-supported insights, and develop effective network interventions.

COMM 2110. Sports, Media, and Communication. 4 Hours.

Addresses the interdependent links between sports and communication. Sports communication is an emerging area within communication studies and journalism programs. Examines the symbiotic relationship between sports and media, as well as how communication affects team culture, player-coach dynamics, crises in sport, race and gender issues, international relationships, and fandom. Requires students to analyze cases and address both pragmatic and ethical factors related to these cases.

COMM 2113. Interviewing. 4 Hours.

Introduces students to interviewing through the application of communication theory. Presents a variety of methods for interview preparation. Offers students an opportunity to practice real interviewing both as an interviewee and an interviewer. Students apply persuasive principles, effective question-asking strategies, and business communication topics while participating in multiple forms of interviews, including informational, persuasive, and employment contexts. Also covers issues of cultural competence in the workplace so that students can become more informed about how approaches to business and work relationships differ across cultures. Finally, seeks to better prepare students for their co-op experiences or future work opportunities by reviewing professional writing skills and principles for effective video-interviewing practices. .

COMM 2131. Dark Side of Interpersonal Communication. 4 Hours.

Offers students an opportunity to learn about some of the communicative challenges people face in starting, maintaining, and terminating close relationships. The “dark side” is a metaphor used to describe areas of interpersonal and relational communication that are underexplored or “lying in the shadows”; destructive or dysfunctional; and/or poorly understood or often misinterpreted. The dark side perspective acknowledges that while relationships are often a source of joy and satisfaction, they can also elicit feelings of uncertainty, frustration, and pain. Studies the ways in which communication can influence (and possibly resolve) turmoil in close relationships.

COMM 2135. Sex and Interpersonal Communication. 4 Hours.

Offers students an opportunity to understand and articulate individual values, assumptions, and paradigms regarding sexuality and how these fit into current research and theory (as demonstrated through in-class discussions, activities, and the opinion paper assignment). Considers how competing communication perspectives can be contrasted, compared, and/or synthesized for a stronger literacy related to sex, sexuality, and sexual identities in an effort to understand how communication research and theory can be utilized in academic, personal, and professional settings. Sexual health is also a focus of the course.

COMM 2200. Visual Communication. 4 Hours.

Examines visual communication—in print, photography, video, digital imagery, and more, and thus in things like posters, pictures, advertisements, films, television shows, and online content—in order to understand how visibility contributes to images and ideas of public life. Examines visual communication as it shares connections with, participates in, and ultimately discloses visual culture, which means images maintain a sense of community and represent shared beliefs as much as they impart information or extend messages into public spaces.

COMM 2300. Risk Communication. 4 Hours.

Offers a broad overview of the psychological, social, and communication processes involved in risk perception to better understand how communication influences the way we think about and respond to risk. Cigarette pack warnings, weather advisories, nutrition labels, and town hall meetings are among the many examples of risk communication in daily life. We live in a modern “risk society”—preoccupied with assessing, debating, preventing, and managing potential hazards to our health and safety. Offers students an opportunity to learn how these processes inform the development of effective risk-communication strategies, including institutional risk assessment, stakeholder participation, and formal messaging. Designed to help students both construct and critique risk-communication techniques in the context of contemporary social issues (e.g., texting and driving, pollution, terrorism).

COMM 2301. Communication Research Methods. 4 Hours.

Offers an overview of the concepts, methods, tools, and ethics of communication research. Introduces students to the basic statistical concepts used by communication researchers. Designed to help students become knowledgeable consumers and limited producers of communication research. Offers students an opportunity to learn to read, interpret, and critically evaluate research reports. Exposes students to basic social science concepts and research designs and the fundamentals of conducting and analyzing research using surveys, experiments, and content analyses. Students conduct their own empirical research study as a final project, which entails research design, data collection, data analysis, and a written presentation.

COMM 2303. Global and Intercultural Communication. 4 Hours.

Focuses on theories of and approaches to the study of intercultural communication. Emphasizes the importance of being able to negotiate cultural differences and of understanding intercultural contact in societies and institutions. Stresses the benefits and complexities of cultural diversity in global, local, and organizational contexts.

COMM 2304. Communication and Gender. 4 Hours.

Presents a theoretical and practical examination of the ways in which communication is gendered in a variety of contexts. Integrates into this analysis how different institutions and interpersonal situations affect our understanding of gender roles. COMM 2304 and WMNS 2304 are cross-listed.

COMM 2350. Producing for the Entertainment Industry. 4 Hours.

Investigates the role of the producer in the production of content for traditional and new media venues. Explores a variety of distribution systems, including online channels, mobile video, terrestrial/satellite radio, documentary film, and independent films, among other platforms. Examines the producer’s role in story conceptualization, budget planning, preproduction, and marketing. Through a series of discussions, screenings, homework writing assignments, and in-class writing workshops, offers students an opportunity to gain the skills to produce commercially viable content.

COMM 2500. Analyzing Conversations in Everyday Life. 4 Hours.

Considers aspects of talk, such as turn taking, sequence organization, and repair for handling breakdowns, in speaking or understanding. Studies the full range of things people do, such as making requests, blaming others, apologizing, complaining, etc. Having conversations with others is among the things that humans do most. Since talk is a locus of sociality and a site for examining language in use, offers students an opportunity to learn how to make discoveries about the orderliness of social life. By the end of the course, successful students recognize what people are doing with their talk, how to identify communication breakdowns, and learn methods for increasing communication efficiency in everyday and organizational encounters.

COMM 2501. Communication Law. 4 Hours.

Introduces the fundamental principles of communication law and ethics. Explores the complex interplay between law (the First Amendment) and ethics (personal and professional responsibilities). Topics covered include blasphemy, commercial speech, copyright, defamation, fighting words, free press/fair trial, hate speech, heresy, incitement, obscenity, political speech, pornography, prior restraint, public forums, special settings (such as schools, prisons, and the military), symbolic speech, threats, and time-place-manner restrictions. Emphasizes ethical issues involving privacy, accuracy, property, and accessibility. The transcendent question in communication law and ethics is whether it is right to exercise the rights granted communication professionals under the First Amendment.

COMM 2525. Communication and Privacy. 4 Hours.

Explores the ongoing evolution of legal protections for personal data. Maps how new digital technologies offer both the prospect of enhanced privacy protections and radical new forms of surveillance that infringe on privacy. Traces how much of our contemporary economy thrives on the witting and unwitting exchange of personal data. Sketches changing popular attitudes toward privacy. Examines contemporary controversies, historical examples, and theoretical texts to analyze the collision of privacy and other important values, including free speech, transparency and accountability, efficiency, and security. Explores the history, foundations, and significance of privacy. Considers why privacy matters and how new technologies, cultural practices, business strategies, and legal upheavals are redefining privacy.

COMM 2534. Group Communication. 4 Hours.

Aims to study and increase your level of proficiency in group interaction. Studies small group decision-making processes, problem solving, and the interpersonal dynamics of groups. Offers students an opportunity to develop skills in working with and in a variety of small groups. Topics include communication dynamics, systems thinking, dialogue, conflict management, leadership, power, teams, and learning organizations.

COMM 2535. Family Communication. 4 Hours.

Focuses on the fundamental role that communication plays in family life. Family relationships are some of the most important and influential relationships in which people are involved. Explores family interaction from a variety of theoretical perspectives. Covers family systems and communication patterns, family rituals, power, conflict, stress in families, relationship maintenance in families, and the role of family communication in health. Examines the changing and complex definition of family.

COMM 2550. Television Field Production. 4 Hours.

Offers advanced training in video production techniques, emphasizing remote location shooting. Includes location scouting, production budgets, writing techniques, equipment location, postproduction editing, and content analysis. Covers the fundamentals of single-camera field production and the nonlinear editing process. Offers students an opportunity to work in teams to produce and direct television using remote video equipment. .

COMM 2551. Free Speech in Cyberspace. 4 Hours.

Examines the extension of communication law to the Internet, assesses a range of pending proposals designed to regulate free speech in cyberspace, and discusses a variety of national and international schemes intended to govern the developing global information infrastructure. Considers free speech (political speech, sexually explicit expression, and defamation); intellectual property (trademark and copyright); and emerging issues (privacy, unsolicited commercial email or spam, schools, and international law). Does not cover issues related to electronic commerce or contracts, gambling, personal jurisdiction, or Internet taxation.

COMM 2555. Games for Change. 4 Hours.

Offers students sound introduction to the psychological and behavioral theories of entertainment media with the goal of implementing these theories to the future design and evaluation of games for change. Focuses more on the psychological, behavioral, and social aspects of video games than on pure technical aspects. Organized around a collection of selected readings and real-world games and discussions. The final project is based on reflective thinking, critical evaluation, and creative application. COMM 2555 and GAME 2555 are cross-listed.

COMM 2625. Communication, Technology, and Society. 4 Hours.

Surveys core concepts, histories, and controversies in the design, use, and critical study of communication technologies that both shape and are shaped by social relationships and social institutions (such as work, education, religion, and the family). Offers students an opportunity to learn about different definitions of communication, technology, and society; examine the values and assumptions of social actors who build communication technologies across various cultures and countries; and gain insights into how communication technologies are interpreted, resisted, and remade through ever-shifting institutional and interpersonal social dynamics. Through canonical works and contemporary case studies, students examine communication, technology, and society in the context of relationships, design, identity, mobility, value, labor, ethics, community, and belonging.

COMM 2650. The Business of Entertainment. 4 Hours.

Examines business issues associated with the entertainment industry. One dozen award-winning media industry guest speakers deliver lectures on the vital topics reshaping the entertainment landscape. Through lectures and case studies, introduces students to financing contracts, intellectual property issues, licensing, product placement, marketing and publicity, ratings, the impact of piracy, understanding and leveraging new technologies, and distribution. Offers students an opportunity to master these concepts by organizing into teams and developing an original entertainment industry business product or services. Requires each team to develop a formal business plan that includes a market analysis, a budget, and a marketing plan.

COMM 2655. Television Studio Production. 4 Hours.

Introduces the process of planning, preparing, producing, and evaluating studio productions. Exposes students to the elements and terminology of studio production using multiple cameras, live switching, audio mixing, and studio lighting. Through a series of discussions, screenings, homework, and in-class exercises, offers students an opportunity to obtain skills in the basics of directing creative and technical talent and the skills needed to produce successful television studio productions. .

COMM 2700. Sports Promotion in the 21st Century. 4 Hours.

Develops frameworks and conceptual tools for understanding the world of sports marketing and promotion in an increasingly global and interconnected world. Drawing on examples from domestic and international sports promotional campaigns and academic literature, explores the promotion of sports at the professional, collegiate, and special event level. Focuses on the role marketing plays in attracting fans and sponsors and communicating effectively with the public. Emphasizes quantitative and qualitative approaches to research as part of a comprehensive approach to the development of an on-campus sports promotional campaign. Covers brand marketing and positioning, sports marketing research, event sponsorship and promotion, social media, public relations and community outreach, and controversial issues in sports.

COMM 2725. Popular Communication. 4 Hours.

Offers students an opportunity to engage with a specific genre, using historical and critical methods, to better understand this reciprocal relationship between a people and their moment. Successful completion of this course enables one to recall, compare, and give examples of key concepts and theories in popular communication; understand how the popular shapes and is shaped by its people; understand the historical context of a popular genre; critically analyze a genre with respect to social, economic, and political values and events; and demonstrate proficiency in communicating one's analyses. Genres of popular communication—be they self-help books, speculative fiction, or fashion blogs—reflect the aspirations and fears of a people at their moment in history. Simultaneously, popular communication shapes people's sense of identity, purpose, and worth.

COMM 2750. Beyond Television. 4 Hours.

Designed to teach students how to conceive, pitch, write an outline, and complete a script for a cutting-edge half-hour comedy pilot or drama that might appear on Netflix, Hulu, Amazon, and other emerging, nonlinear networks. Emphasizes the differences and similarities between writing content for streaming vs. broadcasting. Culminates in a final project, in which small groups of students complete an episodic show that will be judged by a panel of professional television writers. Course objectives are achieved through reading professional scripts, critically viewing television content, and participating in group writing assignments and "table reads." .

COMM 2800. Sport and Spectacle. 4 Hours.

Introduces students to the lens of performance studies, the world of sports, and the intersection of the two in the field of communication studies. Addresses performance as a cultural and communicative process that enables us to constitute our identities and our lives. Explores how our lives and identities are performed in space and time, while applying those same concepts to athletes and athletic competition. Offers students an opportunity to understand key concepts in performance studies such as ritual, play, performativity, performing, and performance processes.

COMM 2912. Special Topics in Communication Studies. 4 Hours.

Offers a special topics course in communication studies. Course content may vary from term to term. May be repeated once.

COMM 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

COMM 2991. Research in Communication Studies. 1-4 Hours.

Offers an opportunity to conduct introductory-level research or creative endeavors under faculty supervision.

COMM 3200. Mobile Communication. 4 Hours.

Introduces students to the landscape of mobile communication technologies. Takes a broad view of what “mobile,” “communication,” and “technology” mean in the past, present, and future, encompassing a range of digital and nondigital objects as well as technological and communicative practices. Covers core concepts and theories in mobile communication, focusing on the impact that mobile hardware and software have on society, culture, and politics.

COMM 3201. Health Communication. 4 Hours.

Explores various topics as they relate to health communication including interpersonal aspects, cultural issues, and political complexities of health. Subject matter includes patient-provider communication, organizational systems, advertising in the health industry, and the role of media in the formation of expectations about health and the use of media to promote social change.

COMM 3230. Interpersonal Communication. 4 Hours.

Offers an overview of the theory and practice of interpersonal communication with the goal of developing the knowledge and skills to create dialogue in conversation, work through conflict, adapt to change, and establish/maintain relationships. Topics include definitions of the communication process, identity, self-disclosure, verbal and nonverbal language, listening, management of interpersonal conflict, and relational and dialogic communication.

COMM 3304. Communication and Inclusion. 4 Hours.

Explores the relationships between communication, social identity, and social inclusion. Focuses on how communication shapes perceptions and positions of social identity categories and how individuals and groups resist and transform identity and promote inclusion through communication. Examines communication and inclusion in the contexts of gender, race, sexual identity, social class, ability, and age. Course topics cover a range of theoretical and practical issues, including diversity in organizational settings and the social construction of identity. COMM 3304 and WMNS 3304 are cross-listed.

COMM 3306. International Communication Abroad. 4 Hours.

Applies communication theory and practice to a wide range of documents, artifacts, museums, and landmarks. Available to students participating in a Dialogue of Civilizations sponsored by the Department of Communication Studies. Content is adapted by the faculty depending on the location of the class. For example, students may study the classical foundations of communication and contemporary political discourse in Athens or British history and documentary film production in London. Often includes meetings with foreign professors, government officials, community organizers, and local artists that have shaped their own country in unique and innovative ways. May be repeated without limit.

COMM 3307. Production Practicum Abroad. 4 Hours.

Combines the process of filmmaking with exploring Britain’s multicultural society, offering students an opportunity to obtain firsthand experience to develop a deeper, more complex understanding of the culture, particularly as it is evident in London. Covers all aspects of field production from the reproduction process of intensive research and development of story ideas to the technical aspects of filming, lighting, sound recording, digital editing, and graphics. Students work with remote video equipment that includes HD cameras, audio, and remote editing equipment. Taught in London.

COMM 3320. Political Communication. 4 Hours.

Reviews the construction and influence of rhetoric in political campaigns, particularly contemporary presidential campaigns. Also studies the impact of mass communication on the outcome of elections. Offers students an opportunity to analyze artifacts from recent political campaigns such as stump speeches, campaign debates, campaign advertising, and formal campaign speeches such as nomination acceptance addresses, concession and victory speeches, and inaugural addresses.

COMM 3409. Advocacy Writing. 4 Hours.

Offers an Advanced Writing in the Disciplines (AWD) course. Dedicated to teaching students to write scholarly arguments in the discipline of public advocacy and rhetoric and to translate that work for a general audience. Features both an academic approach to writing in the field of rhetoric and a practical approach to writing persuasively for general audiences.

COMM 3414. Great Speakers and Speeches. 4 Hours.

Reviews significant moments of oratory, assessing them in the historical context in which they occurred. Offers students an opportunity not only to understand the way that history prompts public discourse and how that discourse shapes history but to learn critical approaches to better understand the rhetoric of this period. Emphasizes the analysis of rhetorical texts but adds to it the contemporary dimensions of sound and images.

COMM 3415. Communication Criticism. 4 Hours.

Offers students an opportunity to deepen their abilities to think critically about texts in a variety of forms such as orations, advertisements, music, and art. Studies methods that may range from close textual analysis to deconstruction to theories of performance. Students are required to write a lengthy research paper that carefully analyzes a rhetorical object.

COMM 3445. Public Relations Principles. 4 Hours.

Presents the principles, history, and methods of public relations; processes of influencing public opinion; responsibilities of the public relations practitioner; and analyses of public relations programs. Through case studies and class discussions, offers students an opportunity to confront real-life ethical dilemmas and learn to apply ethical frameworks to evaluate and resolve them. COMM 3445 and JRNL 3425 are cross-listed.

COMM 3450. Voice-Over Artist. 4 Hours.

Introduces voice-over acting techniques for TV commercials, radio, multimedia, and various styles of presentation for both audio and video projects. Offers students an opportunity to uncover and develop their vocal range as narrator, announcer, character, and spokesperson with effectiveness and emotional authenticity. Covers both the “business” and the technical aspects of being a voice talent. Includes the use of microphones, headphones, and recording equipment while in our audio lab. Studies the essentials of vocal techniques, studio etiquette, and working with direction during a studio session.

COMM 3451. Advertising Practices. 4 Hours.

Examines the development, procedures, economic functions, and responsibilities of advertising. Explores planning, research, production, and other elements that go into successful advertising. Covers the preparation of advertising for print and broadcast media, including campaign planning, space and time buying, and scheduling.

COMM 3500. Environmental Issues, Communication, and the Media. 4 Hours.

Analyzes major debates over the environment, climate change, and related technologies such as nuclear energy, wind power, natural gas “fracking,” and food biotechnology. Studies the relevant scientific, political, and ethical dimensions of each case; the generalizable theories, frameworks, and methods that scholars use to analyze them; and the implications for effective public communication, policymaker engagement, and personal decision making. Offers students an opportunity to gain an integrated understanding of their different roles as professionals, advocates, and consumers and to improve their ability to find and use expert sources of information; assess competing media claims and narratives; write persuasive essays, analyses, and commentaries; and author evidence-based research papers.

COMM 3501. Free Speech: Law and Practice. 4 Hours.

Provides students with an opportunity to better understand freedom and limits to freedom, particularly in the realm of speech and expression. Materials covered range from the philosophy of freedom to historical legal cases about free speech and the press to political correctness and the repression of dissent.

COMM 3530. Communication and Sexualities. 4 Hours.

Analyzes the ways in which sexualities intersect with issues relating to interpersonal communication, mediated communication, popular culture, identity, and social movements. Discusses outing, media representations, queer identity development, and the HIV/AIDS epidemic. Covers theoretical perspectives from communication and other social science disciplines, gender and sexuality studies, and cultural studies. Students work with a variety of materials, contemporary and historical, theoretical and empirical, fiction and nonfiction. Offers students an opportunity to design, conduct, and write their own original empirical research paper relating to sexualities and communication using class content as a theoretical framework. COMM 3530 and WMNS 3530 are cross-listed.

COMM 3532. Theories of Conflict and Negotiation. 4 Hours.

Explores both theories of conflict and potential strategies for more effectively managing conflict in a variety of contexts, that is, interpersonal relationships, organizational settings, and broader societal contexts. Offers students the opportunity to participate in the process of conflict assessment and to explore various negotiation strategies as well as discuss the role of forgiveness in conflict situations.

COMM 3610. Communication, Politics, and Social Change. 4 Hours.

Examines the place of race, gender, and sexual identity in American politics and public discourse. Emphasizes the role of communication in public attitudes toward identity, the role that identity plays in electoral politics, and how public policy and social change are made. Explores how public debate on issues related to identity influences how Americans think about the rights and place of minorities in society. Public discourse is defined broadly here—it encompasses different types of communication, from news stories and presidential speeches to sermons by clergy, television sitcoms, and film. COMM 3610 and WMNS 3610 are cross-listed.

COMM 3625. Public Relations Practice. 4 Hours.

Demonstrates practices and techniques employed in the field including organization of events and functions. Studies campaign planning, research, and media relationships. COMM 3625 and JRNL 3625 are cross-listed.

COMM 3655. Digital Editing for TV. 4 Hours.

Addresses the changes in editing practices through digitization and offers students advanced training in nonlinear editing utilizing Avid Media Composer. Introduces the terms and concepts of nonlinear editing as well as the technical/creative aspects of postproduction. Students are expected to have a working knowledge of digital video equipment and Macintosh computer skills.

COMM 3750. Special Effects and Postproduction for Television. 4 Hours.

Explores a variety of approaches to making special effects for film, video, and the World Wide Web. Offers students an opportunity to utilize cutting-edge technology and to apply state-of-the-art techniques to design and produce innovative special effects. Explores historical, technical, and theoretical aspects of special effects. Topics covered include compositing, matte painting, multiplane animation, explosions, smoke, three-dimensional lighting, particle emitters, chroma keying, motion graphics, video tracking, and more.

COMM 3912. Special Topics in Communication Studies. 4 Hours.

Offers a special topics course in communication studies. Course content may vary from term to term. May be repeated once.

COMM 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

COMM 4102. Health Communication Campaigns. 4 Hours.

Offers an in-depth look at how persuasive health campaigns are designed and executed. Discusses how campaigns are designed to intentionally influence awareness, knowledge gain, and attitude/behavior change. Offers students an opportunity to obtain skills to design and evaluate campaigns through the completion of their own campaign projects and to learn about visual and verbal arguments and the unique ethical and other considerations of health campaigns.

COMM 4530. Communication and Quality of Life. 4 Hours.

Seeks to further develop an understanding of the function of communication in life and how that relates to quality of life. Examines the communicative experiences of organizations and relationships using both theoretical approaches and practical experience. Students participate in activities designed to develop knowledge and skills necessary to successfully analyze and address ethical and interpersonal communication issues. Offers students an opportunity to be able to reflect on and assess one's own competence in communication and how one's communication affects one's quality of life and to respectfully consider the ethical complexities of quality-of-life issues in both organizational and interpersonal settings.

COMM 4533. Consultation Skills. 4 Hours.

Introduces the theoretical frameworks necessary to engage in a broad range of consulting activities (management consulting or organizational training and development). By studying nonprofit organizations in the Boston area, offers students an opportunity to learn how to gather and analyze data, to use mathematical methods to perform critical analysis, and to evaluate and critique choices made in the presentation of data. Requires students to make a formal report to the organization and to write a paper reflecting on the organization and its mission in the context of broader social, political, and economic issues. Emphasizes ethical considerations involving security, privacy, and fairness.

COMM 4535. Nonverbal Social Interaction. 4 Hours.

Offers analytic insight on methods people use to communicate different types of social action through body language. Much of our communication is nonverbal, as it is through our body language that we initiate new relationships (both personal and professional) and communicate anger, frustration, happiness, and grief. Offers students an opportunity to develop an understanding of the tools needed to examine the role nonverbal behaviors (body orientation, gaze direction, gesture, laughter, etc.) have in conveying meaning and constructing and negotiating interpersonal relationships. This course incorporates materials from communication, psychology, anthropology, and sociology.

COMM 4602. Contemporary Rhetorical Theory. 4 Hours.

Exposes students to contemporary perspectives on rhetorical theory and its use in society. 'Contemporary' refers to the models and theorists from the second halves of the 20th and the 21st centuries. 'Rhetoric' refers to strategic communication employed to reach the persuasive goal of an agent. 'Theory' is used in the holistic sense as the interested observation and careful scrutiny of an object. As a capstone course, the course also provides a transition for students from the role of receptive learners to independent researchers who can identify, answer, and defend research questions at the intersection of rhetorical theory and its neighbors (theories of argumentation, humor, style, politeness, courtship, and the like).

COMM 4605. Youth and Communication Technology. 4 Hours.

Examines how meanings of "youth" and "communication technology" shift in relation to one another and to broader changes in society, culture, politics, and the economy over time. Analyzes how communication technologies (and the content they deliver) positively and negatively affect the social, emotional, and cognitive development of young people and how these changes are influenced by the particular family, school, community, and institutional contexts in which children grow up. Examines how young people differ individually across the life span as well as collectively by class, race, ethnicity, nationality, gender, sexuality, and disability. Requires a final paper at the end of the term in which students articulate and defend positions about youth and communication technology.

COMM 4608. Strategic Communication Capstone. 4 Hours.

Offers students an opportunity to complete a semester-long, intensive research and writing capstone project related to the field of strategic communication. Research topics can span business, politics, advocacy, entertainment, public health, the environment, and other societal sectors. Building on previous course work, students have an opportunity to gain a deeper scholarly and professional understanding of strategic communication; cultivate professional and academic contacts; and demonstrate mastery of relevant theoretical concepts, professional principles, research methods, and writing approaches. Encourages students to share and translate their findings for relevant academic and professional communities.

COMM 4625. Online Communities. 4 Hours.

Considers online community dynamics, including formation, governance, conflict, and exit. Offers students an opportunity to understand and engage with online community and how this relates to topics such as human behavior, identity, and communication online. Reviews contemporary issues and concerns. Engages the question and practice of what it means to develop and maintain a successful online community.

COMM 4631. Crisis Communication and Image Management. 4 Hours.

Examines theories, models, and strategies related to crisis communication and establishes ethical principles regarding what, how, and when essential elements must be employed for effective and ethical crisis communication. Offers students an opportunity to learn how to distinguish between an incident and crisis; to analyze communication practices and methods applied during a crisis; to apply social scientific theory to explain how and why a crisis occurred; and to draw upon theory to develop effective crisis communication plans. Assesses responses to crises using ethical principles such as transparency, two-way symmetrical communication, and timing. Designed to prepare communication professionals who appreciate the need for responsible advocacy when responding to crises.

COMM 4755. Production Capstone. 4 Hours.

Offers advanced training in video production techniques, allowing students an opportunity to develop a deeper theoretical understanding of cohesive marketing strategies. Through case study assessments and hands-on exercises, explores the process of marketing video techniques from designing, building, and executing marketing ideas to evaluating effectiveness and exploring online corporate identities. Offers students an opportunity to hone their skills in all aspects of the production process by incorporating the knowledge they have acquired from previous production courses—from the preproduction process of intensive research and development of story ideas and scriptwriting; producing; to the technical aspects of filming, lighting, green screen, sound recording, digital editing, and graphics. .

COMM 4901. Seminar in Communications. 4 Hours.

Integrates students' experiences in cooperative education with classroom concepts and theories. Topics include integrative learning, the field of communication, pathways and careers in communication, and the professional communicator. Offers students the opportunity to demonstrate competency in communication skills such as oral reporting, conducting research in communication, and writing.

COMM 4912. Special Topics in Communication Studies. 4 Hours.

Offers a special topics course in communication studies. Course content may vary from term to term. May be repeated up to four times.

COMM 4940. Special Topics in Media Production. 4 Hours.

Addresses the emerging developments in the production of television, film, and video. Course content may vary from term to term. May be repeated up to four times.

COMM 4970. Junior/Senior Honors Project 1. 4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student's major field. Combined with Junior/Senior Project 2 or college-defined equivalent for 8 credit honors project. May be repeated without limit.

COMM 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

COMM 4992. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

COMM 4993. Independent Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

COMM 4994. Internship in Communication. 4 Hours.

Offers students the opportunity to gain hands-on experience in the communications industry. Further internship details are available in the department office. May be repeated without limit.

COMM 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

COMM 7962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

Communication Studies - CPS (CMN)

Search CMN Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=CMN>)

CMN 1100. Organizational Communication. 3 Hours.

Introduces psychological, sociological, and communication theories as they apply to organizational life. Offers students an opportunity to analyze the importance of effective communication for organizations in a rapidly changing environment. Topics include management and leadership, culture and change, diversity, conflict management, and employee engagement. Throughout the course, students are encouraged to examine their communication skills in the context of those competencies necessary in today's complex organizational environments. .

CMN 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CMN 2310. Professional Speaking. 3 Hours.

Emphasizes the practical skill of public speaking, including methods for overcoming presentation anxiety, and the use of visual aids to enhance speaker presentations. Offers students an opportunity to prepare for a variety of typical public speaking situations and to learn the basic principles of organization and research needed for effective message design and delivery.

CMN 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CMN 3100. Negotiation. 3 Hours.

Introduces the techniques of dispute resolution. Focuses on the processes of mediation, facilitation, and negotiation. Through readings, lectures, and class activities, offers students an opportunity to explore methods of applying these skills to professional settings.

CMN 3200. Communication Research Methods. 3 Hours.

Offers students an opportunity to explore research methodologies in order to develop data-driven marketing and communication strategies. Covers primary and secondary research, how to obtain sources of data using both traditional and digital methods, tools to collect data, and how to interpret data to help inform sound business decisions. Focuses on greater understanding of the customer and their buyer's journey in the social and digital era, marketing metrics, how to interpret these metrics to make decisions on communication channels, and how to go to market.

CMN 3220. Introduction to Public Relations. 3 Hours.

Offers students an opportunity to gain insight into the role of public relations in assisting organizations to achieve business objectives, ranging from branding and employee recruitment to product launches and stakeholder engagement. In particular, explores the intersection of traditional PR planning methodologies with today's internet, email, and social media communications channels. Flows from the research, strategies, tactics, and evaluation found in effective public relations plans to the major tools that a practitioner can apply to a public relations campaign. These tools include media relations, social media, websites, employee communications, community relations, and events.

CMN 3330. Digital Communication and Organizations. 3 Hours.

Explores how rapidly changing digital communication impacts the ways in which individuals and organizations interact. Focuses on the history, present use, and newly emerging forms of digital communication. Offers students an opportunity to examine principles, practice with, and evaluate the effectiveness of a variety of digital communication media in selected contexts.

CMN 3340. Gender and Communication. 3 Hours.

Examines the personal and social aspects of gender and the role communication plays in our understanding of gender identities. Encourages students to examine their own attitudes toward gender and communication, especially in organizational contexts.

CMN 3350. Intercultural Communication. 3 Hours.

Focuses on gaining an advanced understanding of the concepts associated with culture and communication. Offers students an opportunity to develop intercultural awareness and patterns of perception and thinking to enable effective communication across cultural boundaries. Discusses the effect of cultural differences on communication styles, personal identities, and various organizational contexts.

CMN 3360. Crisis Communication. 3 Hours.

Introduces important implications of effective internal and external communication during crises. Examines proactive and reactive approaches to crisis communication from an academic and practical perspective. Considers elements of effective crisis communication plans and tactics. Offers students an opportunity to analyze several crisis situations.

CMN 3400. Advanced Organizational Communication. 3 Hours.

Examines communication as the center of organizational life. Includes a detailed overview of the field of organizational communication from classical theories to critical perspectives of organizational behavior. In the second half of the course, offers students an opportunity to apply this learning to analyze communication in a variety of contexts.

CMN 3410. Digital Communication Strategy. 3 Hours.

Introduces students to a communication-planning methodology that supports an organization's short- and long-term goals. Defining digital communication objectives, audiences, tactics, channels, and success indicators are all critical components of an effective strategy. Emphasizes content marketing and inbound marketing tactics and how they fit the voice of the customer and the voice of the organization.

CMN 3750. Inbound Marketing Fundamentals. 3 Hours.

Covers inbound marketing tactics to support organizational objectives, such as building brand awareness or generating leads. Involves the creation of messaging for a range of tactics and experience using marketing automation software to facilitate campaign implementation.

CMN 3800. Designing and Implementing a Promotional Campaign. 3 Hours.

Offers students an opportunity to design and implement a digitally based promotional campaign for an external sponsoring organization. During the campaign design phase, students become part of a creative team, perform target audience research, analyze the research findings, review key performance indicators, and develop a communication plan. During the campaign implementation phase, students execute the communication plan. Implementation includes creating email marketing and social media marketing messages, calls to action, client presentations, monitoring campaign results, and performing an overall project assessment. Each phase includes project updates to the sponsor and self-reflection on the learning experience. Students develop deliverables and track their work using a leading-edge marketing automation platform. .

CMN 3850. Managing Communication Projects. 3 Hours.

Offers students an opportunity to manage creative teams and develop client relationships during the design and implementation of a promotional campaign for an external sponsoring organization. Topics include project leadership, client management techniques, communication planning methodology, client and team presentations, evaluation of campaign effectiveness, coaching, and supervision. .

CMN 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CMN 4220. Organizational Communication Measurement and Assessment. 3 Hours.

Offers students an opportunity to apply and extend learning from previous courses in organizational communication. Guides students in completing communication research. Through application assignments and project work, students are exposed to a variety of methods for conducting organizational communication research, gathering and analyzing data, and communicating results in a professional report.

CMN 4850. Capstone in Professional Communication. 3 Hours.

Seeks to guide students in developing a semester-length service-learning project that integrates theory, practice, creativity, and reflection explored throughout their communication studies. The project helps students deepen knowledge and extend ability within their chosen concentrations by having them analyze and apply what they have learned in pragmatic ways that enhance the learning experience, teach civic responsibility, and strengthen communities. Offers students an opportunity to create a portfolio of meaningful artifacts useful for career entry, development, and advancement in this writing-intensive course.

CMN 4955. Project. 1-4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student's major field. May be repeated without limit.

CMN 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CMN 6000. Introduction to Organizational Communication. 2,3 Hours.

Considers writing and other forms of communication as a management tool. Addresses how effective writing—in plain English—can shape project plans, motivate people, solve problems, and enhance one's role as a communicator. Offers students an opportunity to demonstrate their writing and editing skills through research, case study analysis, and composing business-related communications as well as to develop other forms of communication, including oral presentations. As such, the two major goals of this course are to acquaint students with a step-by-step communication methodology and to provide them with an opportunity to develop and polish their writing and communication skills.

CMN 6005. Foundations of Professional Communication. 4 Hours.

Focuses on comprehensive reading and written communication from both academic and professional perspectives and integrates best practices in both. The key to success in any professional field is the ability to communicate effectively. Offers students an opportunity to evaluate personal adaptation to a new cultural and educational setting, including the use of learning resources.

CMN 6010. Strategic Communication Management. 3 Hours.

Focuses on the rapidly evolving role of organizational communication in the digital era. Since audience expectations regarding transparency and responsiveness are changing dramatically, the course introduces students to stakeholder analysis and the theory and practice of persuasion. Managing communication strategies requires a strong foundation in communication planning methodology in order to design communication programs and initiatives that support organizational performance. Offers students an opportunity to gain an understanding of the evolving roles and responsibilities of communication functions addressing both internal and external audiences.

CMN 6015. Introduction to the Digital Era: The Power of Social Media. 3 Hours.

Introduces social media concepts, including the historical, economic, and social foundations of digital era realities. Explores the potential applications of new technologies for both internal and external purposes, across a range of organizations and industries. Explores strategic responsibilities, issues, and challenges in the context of social media leadership. Addresses digital era career-management responsibilities, including the need to establish a strong digital presence, stay current with changing technologies, and consider new and evolving positions and career trajectories. Offers students an opportunity to apply concepts by establishing and/or strengthening their own digital presence and professional brand, in addition to assessing the digital presence of relevant individuals and organizations.

CMN 6020. Ethical Issues in Organizational Communication. 3 Hours.

Examines ethical questions that directly affect how organizations communicate and what they choose to relay and omit to their various audiences. Organizational women and men are compelled to make ethical decisions when they communicate. Proponents of strategic ambiguity in and for organizations have been confronted and countered by other theorists who reject ambiguity as a euphemism for lying. Analyzes cases and academic studies that reflect how ethical and unethical communication affected the fortunes of organizations. Analyzes and evaluates the practical values of ethical yardsticks.

CMN 6025. Digital Era Skills: Platforms, Tools, and Techniques. 3 Hours.

Seeks to help students develop content and community management skills by focusing on specific tools, techniques, and best practices for effective engagement on both public and private platforms (including time and information management skills). Both individual and organizational success in the digital era depends on the development of these skills by professionals in a range of disciplines. Offers students an opportunity to apply concepts by experimenting with various tools and platforms and reflecting on lessons learned from their own active engagement and to learn from the experiences and reflections of their peers.

CMN 6035. Legal, Policy, and Ethical Issues in the Digital Era. 3 Hours.

Provides an overview of the challenges that need to be addressed from both commercial and employment law perspectives. Also covers general social concerns like privacy. Digital era leaders must understand the legal, policy, and ethical issues resulting from increased use of digital technologies and learn how to effectively manage the associated risks. Emphasizes managing organizational risks but also explores the impact of various legal considerations on individuals. The U.S. legal environment serves as the focal point; however, global issues are also addressed.

CMN 6040. Consumer Behaviors in the Online Environment. 3 Hours.

Explores important concepts about consumer behaviors in the online environments, including the social media environment and the electronic commerce (e-commerce) environment. Topics include consumer engagement with social media, electronic word of mouth (eWOM), branding and advertising issues in social media, methodological perspectives on social media, consumer expectations and online shopping preferences in the e-commerce environment, and public policy issues in social and digital media.

CMN 6045. Leveraging Digital Technologies: Strategy, Assessment, and Governance. 3 Hours.

Focuses on the initial stages of social media initiatives: strategy identification, assessment, and governance considerations. Offers students an opportunity to learn the importance of establishing goals and objectives to guide subsequent development and implementation efforts, how to evaluate the potential for digital technologies to enable the pursuit of those goals and objectives, and how to conduct a comparative assessment of current and potential tools and practices to identify the most efficient and effective approaches. Also offers an opportunity to develop an appreciation for the governance issues that have to be considered once a commitment to leveraging new technologies has been made.

CMN 6050. Crisis Communication. 3 Hours.

Examines crisis communication from the perspective of practitioners as well as academics. Both groups have examined accommodation as well as avoidance strategies for crisis communication. Crises are a fact of life in organizations. Natural disasters, sexual harassment charges, psychopathic acts, and product callbacks are a few situations that require intelligent communication to internal and external stakeholders. Includes analysis of several crisis-communication studies, including recommendations for "what I would have done instead." Reviews the elements of an effective crisis communication plan and development of communication tactics for a range of stakeholder audiences.

CMN 6060. Negotiation, Mediation, and Facilitation. 3 Hours.

Introduces the techniques of dispute resolution. Emphasizes the processes of mediation, facilitation, and negotiation. Examines techniques suggested by practitioners and researchers regarding best practices for effective negotiation. A central part of the course requires students to participate in and evaluate negotiation simulations.

CMN 6061. Personal Branding. 3 Hours.

Examines the importance of developing a personal brand in today's hyper-competitive marketplace. By engaging in a detailed self-assessment process, participants have an opportunity to clarify their skill sets, values, and career aspirations—the foundation of a personal brand. They then have an opportunity to focus on methods of conveying a consistent personal brand, including presentation skills, interviewing and networking skills, the use of social media, and involvement in targeted professional associations.

CMN 6065. Implementation and Management of Social Media Channels and Online Communities. 3 Hours.

Focuses on the implementation and management stages of social media initiatives. Offers students an opportunity to learn how to establish/expand an organization's initial presence on multiple platforms, define metrics for measuring success in both the short and longer terms, develop training for community managers and others, evaluate the performance of social media activities and revise strategies/tactics to adapt to feedback, and determine logical approaches for expanding a digital community and developing specific campaigns based on community activity.

CMN 6075. Digital Marketing Analytics. 3 Hours.

Examines the measurement tools and analytics required to assess the effectiveness of customer acquisition and brand awareness campaigns and tactics. Focuses on the interpretation of marketing data sets and their use in performance dashboards. The ability to assess the impact of marketing communication tactics is a critical skill set. Experience with basic statistical tools is strongly recommended.

CMN 6080. Intercultural Communication . 3 Hours.

Discusses the impediments to effective intercultural communication and methods for overcoming these impediments. The ease of travel, the pervasiveness of communication technology, and the realities of economic/political interdependence have made it essential for organizational women and men to be capable communicators in intercultural settings.

CMN 6085. Strategies for Cross-Cultural Facilitation and Negotiation. 3 Hours.

Examines several cultural theories, such as Hofstede's national cultural dimensions, Hall and Hall's contextual levels, along with Kluckhohn and Strodtbeck's variations in value orientations. Culture is defined as a group of people with shared values and means of being. Offers students an opportunity to acquire skills to move from gut reactions to applying empirically tested methods for cultural interactions and diplomacy. Includes case studies and role-play with a variety of intergenerational, international, racial, and religious groups. Students practice verbal and nonverbal communication to strengthen their diplomacy and public speaking skills. The written signature assignment designs a communication collateral that meets the needs of stakeholders from two different cultures (include different languages/wording). Supports collateral differences based on cultural theories and evidence.

CMN 6090. Organizational Culture, Climate, and Communication. 3 Hours.

Examines the relationship between organizational culture and communication and discusses the advantages and elements of a supportive communication climate. Some researchers believe that the culture of the organization drives the communication quality in an organization. Examines both case analysis and academic research to address common problems pertaining to cultivating supportive communication climates and methods for improving these climates.

CMN 6095. Foundations of Developing Cultural Awareness. 3 Hours.

Examines culture from three pillars: awareness, language, and history/politics. Offers students an opportunity to investigate their personal identity and barriers by incorporating two assessments to determine personal implicit bias and cultural intelligence. Interpretations are constructed from self-reports employing the cultural intelligence (CQ) assessment and Implicit Bias Project. Focuses on the impact of languages on cultures. By identifying nonstandard language and discussing the meaning of words across different languages, offers students an opportunity to gain understanding and formulate sensitivity when communicating with different audiences, albeit intergenerational and/or international. Examines the impact of history and politics on cultural groups, specifically as related to cross-cultural communication. The written signature assignment is a personal reflection analysis on insights gained throughout the course and career aspirations.

CMN 6100. Communication Networks and Managing Information. 3 Hours.

Examines new electronic technologies as well as other approaches to disseminating information. Organizations can employ various methods for communicating in organizations. Analyzes what types of information must be communicated in organizations and the impediments to successful transmission of information. Uses case studies to offer students an opportunity to identify problems with information management as well as methods for ameliorating situations caused by poor communication management.

CMN 6110. Group Dynamics and Interpersonal Conflict: Meeting Management. 3 Hours.

Examines common problems with organization meetings and intervention techniques that can be employed to reduce the tensions associated with such interaction. Discusses methods used for evaluating individual members in meeting contexts. A central part of the course involves participation in and evaluation of meeting interaction.

CMN 6200. Strategic Communications Advisor: Roles and Responsibilities. 3 Hours.

Examines the role of strategic communication in support of business and organizational performance and advisory capacity to senior management. Seeks to build consultative and leadership skills and competencies. Offers students an opportunity to articulate organizational strategy to internal and external audiences and to monitor communication effectiveness using communication dashboards/scorecards.

CMN 6201. Managing Communication Resources. 3 Hours.

Examines the fundamental responsibilities of managing and allocating resources to build an effective communication function, including return-on-investment methodology, negotiation skills, and budgeting. Explores the pros and cons of outsourcing vs. internal capacity development and the best practices in managing external agency resources.

CMN 6202. Management Symposium. 3 Hours.

Offers students an opportunity to be coached by instructors with senior communication management experience as they examine “real-time” challenges in managing talent and resources. Expects students to work in teams on short-term Experiential Network projects in order to test their consultative and management skills.

CMN 6910. Organizational Communication Assessment. 3 Hours.

Discusses quantitative and qualitative methods for conducting assessments called communication audits. If communication is central to organizational activity, then persons must be able to assess the quality of communication within organizations. Offers students an opportunity to evaluate the advantages and disadvantages of each technique and to participate in conducting a communication audit.

CMN 6940. Projects for Professionals. 4 Hours.

Offers students an opportunity to apply knowledge and skills gained through their organizational communication master's program to challenging short-term projects under faculty supervision. Students are matched with discipline-specific consulting projects provided by a wide range of sponsoring organizations in the private and nonprofit sectors. They develop a project plan, conduct research, develop and deliver recommendations to the sponsoring organization, and reflect on lessons learned. Mapping organizational communication concepts and skills to the consultative process is a primary learning outcome. Application process is required. This is a capstone course. Students with less than two years of professional communication-related experience must successfully complete a noncredit Experiential Learning project before registering for the capstone course.

CMN 6943. Integrative Experiential Learning. 3 Hours.

Offers students an opportunity to apply knowledge and skills gained through their previous course work to a challenging short-term project under faculty supervision. Students identify a communication-related project, conduct research, and develop and deliver recommendations to a sponsor within the student's own organization.

CMN 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CMN 6995. Project. 1-4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student's major field. May be repeated without limit.

Communication Studies - CPS Specialty (CMMN)

Search CMMN Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=CMMN>)

CMMN 1102. Professional Speaking. 4 Hours.

Seeks to provide students with the tools necessary to plan and deliver a professional speech and with opportunities to practice and perfect their own presentation styles. Discusses common issues in public speaking, such as anxiety, audience analysis, and selecting a topic. Covers organizing a speech and developing effective introductions and conclusions. Explores methods of delivery and presentation aids. Exposes students to different types of speeches, both inside and outside of academia.

CMMN 1103. Professional Speaking Discussion. 1 Hour.

Accompanies CMMN 1102. Offers students an opportunity to develop a digital diary of their experience in NU Immerse using techniques studied in CMMN 1102. Designed to improve English-language preparation through listening, reading, writing, and speaking while developing a script, creating a voice-over recording, and storyboarding their digital diary.

Computer Engineering Technology - CPS (CET)

Search CET Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=CET>)

CET 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CET 2100. Essentials of Computer Organization. 3 Hours.

Covers the structure and organization of computing systems. Topics include basic computer architecture, CPU and arithmetic-logic unit design, the datapath, input/output methods, memory management including caches and virtual memory, storage, instruction execution, assembly programming and assemblers, instruction formats, addressing modes, peripherals and interfacing, interrupts, and an introduction to operating systems and compilers.

CET 2200. Data Structures and Algorithms. 3 Hours.

Covers the design, analysis, and implementation of data structures and algorithms to solve engineering problems using an object-oriented programming language. Topics include elementary data structures (including arrays, stacks, queues, and lists); advanced data structures (including trees and graphs); the algorithms used to manipulate these structures; and their application to solving practical engineering problems.

CET 2300. Object-Oriented Programming. 3 Hours.

Discusses the fundamental principles of object-oriented programming (OOP) and associated concepts and definitions such as classes, objects, encapsulation, coupling, cohesion, inheritance, abstraction, polymorphisms, and generic dispatch. Provides contextual comparisons of programming paradigms drawing on simple examples and case studies, particularly of purely object-oriented, hybrid, and procedural programming. Examines applicability and illustrates techniques and idioms of OOP in the C++ language using a wide variety of in-class examples and via students' assignments and small projects. Examines methods of OOP analysis and design via the Unified Modeling Language diagrams. .

CET 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CET 3000. Computer Operating Systems. 3 Hours.

Covers the structure of modern operating systems. Topics include operating system structure, processes, threads, interprocess communication, system calls, context switching, address space, memory management, virtual memory, context switching, scheduling, synchronization, deadlocks, storage management, mass storage, file systems, I/O systems, security, and virtual machines.

CET 3100. Computer Networking and Communications Technology. 3 Hours.

Covers the technical foundation for designing, installing, maintaining, and monitoring computer networks. Covers technologies, protocols, and techniques used to connect computers to other computers and hardware components. Topics include the Open Systems Interconnection network model (OSI), internet protocols (TCP/IP), the User Datagram Protocol (UDP), Local Area Networks (LANs) and Wide Area Networks (WANs), wireless networks, network security, virtual private networking, and network management. Covers both circuit-switched and IP-based communications.

CET 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CET 4210. Robotics. 3 Hours.

Covers the theory and practice of robotics. Topics include kinematics, dynamics, position and orientation, trajectories, coordinate frames, navigation, closed-loop control, obstacle detection, manipulation of objects, actuators, sensors, systems modeling, analysis, motion control, and techniques for programming robots. Offers students an opportunity to obtain practical experience in constructing and programming a robot system.

CET 4220. Embedded Systems. 3 Hours.

Introduces fundamental concepts of digital signal processing. Offers students an opportunity to understand how to represent, analyze, and manipulate digital signals via theoretical background and hands-on work. Provides technical bases to evaluate, design, and program digital signal processors, considering their architecture and match to embedded applications. Students use acquired knowledge and skills in digital electronics and programming to design, implement, and test simple embedded microprocessors systems for data collection, control, and/or analysis. Topics include embedded systems characteristics, custom and general-purpose processors, general and dedicated software, testing and debugging approaches, memory system design, interfacing, serial and parallel communication, bus standards, protocols, and arbitration.

CET 4950. Seminar. 1-4 Hours.

Offers an in-depth study of selected topics.

CET 4955. Project. 1-4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student's major field. May be repeated without limit.

CET 4983. Topics. 1-4 Hours.

Covers special topics in computer engineering technology. May be repeated without limit.

CET 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CET 4991. Research. 1-4 Hours.

Offers students an opportunity to conduct research under faculty supervision.

CET 4992. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic.

CET 4993. Independent Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic.

CET 4994. Internship. 1-4 Hours.

Provides students with an opportunity for internship work.

CET 4995. Practicum. 1-4 Hours.

Provides eligible students with an opportunity for practical experience.

CET 4996. Experiential Education Directed Study. 1-4 Hours.

Draws upon the student's approved experiential activity and integrates it with study in the academic major.

Computer Engineering Technology - CPS (ETC)

Search ETC Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=ETC>)

ETC 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

Computer Science (CS)

Search CS Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=CS>)

CS 1100. Computer Science and Its Applications. 4 Hours.

Introduces students to the field of computer science and the patterns of thinking that enable them to become intelligent users of software tools in a problem-solving setting. Examines several important software applications so that students may develop the skills necessary to use computers effectively in their own disciplines.

CS 1101. Lab for CS 1100. 1 Hour.

Accompanies CS 1100. Covers topics from the course.

CS 1200. Leadership Skill Development. 1 Hour.

Focuses on leadership skill development to support student success in the College of Computer and Information Science and Northeastern University. Topics include ethics and accountability, leadership and communication, career development, and student services and resources. The course serves as a shared experience for students to make connections with faculty, staff, and students within CCIS and the Northeastern community.

CS 1210. Professional Development for Khoury Co-op. 1 Hour.

Continues the preparation of students for careers in the computing and information fields by discussing co-op and co-op processes. Offers students an opportunity to prepare a professional resumé; practice proper interviewing techniques; explore current job opportunities; learn how to engage in the job and referral process; and to understand co-op policies, procedures, and expectations. Discusses professional behavior and ethical issues in the workplace.

CS 1800. Discrete Structures. 4 Hours.

Introduces the mathematical structures and methods that form the foundation of computer science. Studies structures such as sets, tuples, sequences, lists, trees, and graphs. Discusses functions, relations, ordering, and equivalence relations. Examines inductive and recursive definitions of structures and functions. Discusses principles of proof such as truth tables, inductive proof, and basic logic. Also covers the counting techniques and arguments needed to estimate the size of sets, the growth of functions, and the space-time complexity of algorithms.

CS 1801. Recitation for CS 1800. 0 Hours.

Accompanies CS 1800. Provides students with additional opportunities to ask questions and to see sample problems solved in detail.

CS 1802. Seminar for CS 1800. 1 Hour.

Accompanies CS 1800. Illustrates topics from the lecture course through discussions, quizzes, and homework assignments.

CS 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CS 2500. Fundamentals of Computer Science 1. 4 Hours.

Introduces the fundamental ideas of computing and the principles of programming. Discusses a systematic approach to word problems, including analytic reading, synthesis, goal setting, planning, plan execution, and testing. Presents several models of computing, starting from nothing more than expression evaluation in the spirit of high school algebra. No prior programming experience is assumed; therefore, suitable for freshman students, majors and nonmajors alike who wish to explore the intellectual ideas in the discipline.

CS 2501. Lab for CS 2500. 1 Hour.

Accompanies CS 2500. Covers topics from the course through various experiments.

CS 2510. Fundamentals of Computer Science 2. 4 Hours.

Continues CS 2500. Examines object-oriented programming and associated algorithms using more complex data structures as the focus. Discusses nested structures and nonlinear structures including hash tables, trees, and graphs. Emphasizes abstraction, encapsulation, inheritance, polymorphism, recursion, and object-oriented design patterns. Applies these ideas to sample applications that illustrate the breadth of computer science.

CS 2511. Lab for CS 2510. 1 Hour.

Accompanies CS 2510. Covers topics from the course through various experiments.

CS 2800. Logic and Computation. 4 Hours.

Introduces formal logic and its connections to computer and information science. Offers an opportunity to learn to translate statements about the behavior of computer programs into logical claims and to gain the ability to prove such assertions both by hand and using automated tools. Considers approaches to proving termination, correctness, and safety for programs. Discusses notations used in logic, propositional and first order logic, logical inference, mathematical induction, and structural induction. Introduces the use of logic for modeling the range of artifacts and phenomena that arise in computer and information science.

CS 2801. Lab for CS 2800. 1 Hour.

Accompanies CS 2800. Covers topics from the course through various experiments.

CS 2810. Mathematics of Data Models. 4 Hours.

Studies the methods and ideas in linear algebra, multivariable calculus, and statistics that are most relevant for the practicing computer scientist doing machine learning, modeling, or hypothesis testing with data. Covers least squares regression, finding eigenvalues to predict a linear system's behavior, performing gradient descent to fit a model to data, and performing t-tests and chi-square tests to determine whether differences between populations are significant. Includes applications to popular machine-learning methods, including Bayesian models and neural networks.

CS 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CS 2991. Research in Computer Science. 1-4 Hours.

Offers an opportunity to conduct introductory-level research or creative endeavors under faculty supervision.

CS 2992. Research. 0 Hours.

Offers an opportunity to document student contributions to research projects or creative endeavors.

CS 3000. Algorithms and Data. 4 Hours.

Introduces the basic principles and techniques for the design, analysis, and implementation of efficient algorithms and data representations. Discusses asymptotic analysis and formal methods for establishing the correctness of algorithms. Considers divide-and-conquer algorithms, graph traversal algorithms, and optimization techniques. Introduces information theory and covers the fundamental structures for representing data. Examines flat and hierarchical representations, dynamic data representations, and data compression. Concludes with a discussion of the relationship of the topics in this course to complexity theory and the notion of the hardness of problems.

CS 3200. Database Design. 4 Hours.

Studies the design of a database for use in a relational database management system. The entity-relationship model and normalization are used in problems. Relational algebra and then the SQL (structured query language) are presented. Advanced topics include triggers, stored procedures, indexing, elementary query optimization, and fundamentals of concurrency and recovery. Students implement a database schema and short application programs on one or more commercial relational database management systems.

CS 3500. Object-Oriented Design. 4 Hours.

Presents a comparative approach to object-oriented programming and design. Discusses the concepts of object, class, meta-class, message, method, inheritance, and genericity. Reviews forms of polymorphism in object-oriented languages. Contrasts the use of inheritance and composition as dual techniques for software reuse: forwarding vs. delegation and subclassing vs. subtyping. Fosters a deeper understanding of the principles of object-oriented programming and design including software components, object-oriented design patterns, and the use of graphical design notations such as UML (unified modeling language). Basic concepts in object-oriented design are illustrated with case studies in application frameworks and by writing programs in one or more object-oriented languages.

CS 3520. Programming in C++. 4 Hours.

Examines how to program in C++ in a robust and safe manner. Reviews basics, including scoping, typing, and primitive data structures. Discusses data types (primitive, array, structure, class, string); addressing/parameter mechanisms (value, pointer, reference); stacks; queues; linked lists; binary trees; hash tables; and the design of classes and class inheritance, emphasizing single inheritance. Considers the instantiation of objects, the trade-offs of stack vs. heap allocation, and the design of constructors and destructors. Emphasizes the need for a strategy for dynamic memory management. Addresses function and operator overloading; templates, the Standard Template Library (STL), and the STL components (containers, generic algorithms, iterators, adaptors, allocators, function objects); streams; exception handling; and system calls for processes and threads.

CS 3540. Game Programming. 4 Hours.

Introduces the different subsystems used to create a 3D game, including rendering, animation, collision, physics, audio, trigger systems, game logic, behavior trees, and simple artificial intelligence. Offers students an opportunity to learn the inner workings of game engines and how to use multiple libraries such as physics and graphics libraries to develop a game. Discusses graphics pipeline, scene graph, level design, behavior scripting, object-oriented game design, world editors, and game scripting languages.

CS 3620. Building Extensible Systems. 4 Hours.

Deals with the design of extensible software systems, which enable clients to add functionality both statically as well as dynamically. Examples of such systems are operating systems, game servers, and Web browsers. Describes the classic systems built on C-like languages with unsafe, manual memory control and the more recent systems built on Java-like languages with safe, automated memory management. Introduces the Rust programming language, which combines the efficiency of C with safe manual memory control via type specifications and compiler constraints. Offers students an opportunity to build systems using all three settings but focuses on the Rust approach. Students also have an opportunity to evaluate their work via essays and memos.

CS 3650. Computer Systems. 4 Hours.

Introduces the basic design of computing systems, computer operating systems, and assembly language using a RISC architecture. Describes caches and virtual memory. Covers the interface between assembly language and high-level languages, including call frames and pointers. Covers the use of system calls and systems programming to show the interaction with the operating system. Covers the basic structures of an operating system, including application interfaces, processes, threads, synchronization, interprocess communication, deadlock, memory management, file systems, and input/output control.

CS 3700. Networks and Distributed Systems. 4 Hours.

Introduces the fundamentals of computer networks, including network architectures, network topologies, network protocols, layering concepts (for example, ISO/OSI, TCP/IP reference models), communication paradigms (point-to-point vs. multicast/broadcast, connectionless vs. connection oriented), and networking APIs (sockets). Also covers the construction of distributed programs, with an emphasis on high-level protocols and distributed state sharing. Topics include design patterns, transactions, performance trade-offs, security implications, and reliability. Uses examples from real networks (TCP/IP, Ethernet, 802.11) and distributed systems (Web, BitTorrent, DNS) to reinforce concepts.

CS 3800. Theory of Computation. 4 Hours.

Introduces the theory behind computers and computing aimed at answering the question, "What are the capabilities and limitations of computers?" Covers automata theory, computability, and complexity. The automata theory portion includes finite automata, regular expressions, nondeterminism, nonregular languages, context-free languages, pushdown automata, and noncontext-free languages. The computability portion includes Turing machines, the Church-Turing thesis, decidable languages, and the Halting theorem. The complexity portion includes big-O and small-o notation, the classes P and NP, the P vs. NP question, and NP-completeness.

CS 3950. Introduction to Computer Science Research. 2 Hours.

Introduces students to research in the fields of computer science, information science, data science, and cybersecurity. Explores how the scientific method is applied to these fields and covers the breadth of subareas of specialty that exist. Offers students an opportunity to practice how to locate and read scientific literature in different subareas. Also offers students an overview of graduate education in these fields.

CS 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CS 4000. Senior Seminar. 1 Hour.

Requires students to give a twenty- to thirty-minute formal presentation on a topic of their choice in computer science. Prepares students for this talk by discussing methods of oral presentation, how to present technical material, how to choose what topics to present, overall organization of a talk, and use of presentation software and other visual aids.

CS 4100. Artificial Intelligence. 4 Hours.

Introduces the fundamental problems, theories, and algorithms of the artificial intelligence field. Includes heuristic search; knowledge representation using predicate calculus; automated deduction and its applications; planning; and machine learning. Additional topics include game playing; uncertain reasoning and expert systems; natural language processing; logic for common-sense reasoning; ontologies; and multiagent systems.

CS 4120. Natural Language Processing. 4 Hours.

Introduces the computational modeling of human language; the ongoing effort to create computer programs that can communicate with people in natural language; and current applications of the natural language field, such as automated document classification, intelligent query processing, and information extraction. Topics include computational models of grammar and automatic parsing, statistical language models and the analysis of large text corpora, natural language semantics and programs that understand language, models of discourse structure, and language use by intelligent agents. Course work includes formal and mathematical analysis of language models and implementation of working programs that analyze and interpret natural language text. Knowledge of statistics is helpful.

CS 4150. Game Artificial Intelligence. 4 Hours.

Offers an overview of classical and modern approaches to artificial intelligence in digital games. Focuses on the creation of believable agents and environments with the goal of providing a fun and engaging experience to a player. Covers player modeling, procedural content generation, behavior trees, interactive narrative, decision-making systems, cognitive modeling, and path planning. Explores different approaches for behavior generation, including learning and rule-based systems. Requires students to complete several individual assignments in these areas to apply the concepts covered in class. Students choose a group final project to explore one aspect of artificial intelligence for games in further depth. Offers students an opportunity to learn team management and communication. Students who do not meet course prerequisites may seek permission of instructor.

CS 4180. Reinforcement Learning. 4 Hours.

Introduces reinforcement learning and the Markov decision process (MDP) framework. Covers methods for planning and learning in MDPs such as dynamic programming, model-based methods, and model-free methods. Examines commonly used representations including deep-learning representations. Students are expected to have a working knowledge of probability, to complete programming assignments, and to complete a course project that applies some form of reinforcement learning to a problem of interest.

CS 4240. Large-Scale Parallel Data Processing. 4 Hours.

Covers techniques for managing and analyzing very large data sets, with an emphasis on approaches that scale out effectively as more compute nodes are added. Introduces principles of distributed data management and strategies for problem-driven data partitioning through a selection of design patterns from various application domains, including graph analysis, databases, text processing, and data mining. Offers students an opportunity to obtain hands-on programming experience with modern big-data processing technology such as MapReduce, Spark, HBase, and cloud computing (this selection is subject to change as technology evolves).

CS 4300. Computer Graphics. 4 Hours.

Charts a path through every major aspect of computer graphics with varying degrees of emphasis. Discusses hardware issues: size and speed; lines, polygons, and regions; modeling, or objects and their relations; viewing, or what can be seen (visibility and perspective); rendering, or how it looks (properties of surfaces, light, and color); transformations, or moving, placing, distorting, and animating and interaction, or drawing, selecting, and transforming.

CS 4400. Programming Languages. 4 Hours.

Introduces a systematic approach to understanding the behavior of programming languages. Covers interpreters; static and dynamic scope; environments; binding and assignment; functions and recursion; parameter-passing and method dispatch; objects, classes, inheritance, and polymorphism; type rules and type checking; and concurrency.

CS 4410. Compilers. 4 Hours.

Studies the construction of compilers and integrates material from earlier courses on programming languages, automata theory, computer architecture, and software design. Examines syntax trees; static semantics; type checking; typical machine architectures and their software structures; code generation; lexical analysis; and parsing techniques. Uses a hands-on approach with a substantial term project.

CS 4500. Software Development. 4 Hours.

Considers software development as a systematic process involving specification, design, documentation, implementation, testing, and maintenance. Examines software process models; methods for software specification; modularity, abstraction, and software reuse; and issues of software quality. Students, possibly working in groups, design, document, implement, test, and modify software projects.

CS 4501. Recitation for CS 4500. 0 Hours.

Accompanies CS 4500. Provides students with additional opportunities to ask questions and engage with course material.

CS 4520. Mobile Application Development. 4 Hours.

Focuses on mobile application development on a mobile phone or related platform. Discusses memory management; user interface building, including both MVC principles and specific tools; touch events; data handling, including core data, SQL, XML, and JSON; network techniques and URL loading; and, finally, specifics such as GPS and motion sensing that may be dependent on the particular mobile platform. Students are expected to work on a project that produces a professional-quality mobile application. The instructor chooses a modern mobile platform to be used in the course.

CS 4550. Web Development. 4 Hours.

Discusses Web development for sites that are dynamic, data driven, and interactive. Focuses on the software development issues of integrating multiple languages, assorted data technologies, and Web interaction. Considers ASP.NET, C#, HTTP, HTML, CSS, XML, XSLT, JavaScript, AJAX, RSS/Atom, SQL, and Web services. Requires each student to deploy individually designed Web experiments that illustrate the Web technologies and at least one major integrative Web site project. Students may work as a team with the permission of the instructor. Each student or team must also create extensive documentation of their goals, plans, design decisions, accomplishments, and user guidelines. All source files must be open and be automatically served by a sources server.

CS 4610. Robotic Science and Systems. 4 Hours.

Introduces autonomous mobile robots, with a focus on algorithms and software development, including closed-loop control, robot software architecture, wheeled locomotion and navigation, tactile and basic visual sensing, obstacle detection and avoidance, and grasping and manipulation of objects. Offers students an opportunity to progressively construct mobile robots from a predesigned electromechanical kit. The robots are controlled wirelessly by software of the students' own design, built within a provided robotics software framework. The course culminates in a grand challenge competition using all features of the robots. .

CS 4650. High Performance Computing. 4 Hours.

Introduces students to research in the domain of high-performance computing. Each instance of this course covers a single topic with broad open questions. The required systems background needed to investigate these questions is covered in the first part of the course. Then, working in teams, students have an opportunity to address different aspects of the open questions so that in combination the entire class may learn more than any single team could accomplish. Example topics include use of new hardware such as GPUs on video boards, use of new software tools for multicore computing, development of check-pointing packages for more robust long computations, software for GUI window systems, and cloud computing. May be repeated once.

CS 4700. Network Fundamentals. 4 Hours.

Introduces the fundamental concepts of network protocols and network architectures. Presents the different harmonizing functions needed for the communication and effective operation of computer networks. Provides in-depth coverage of data link control, medium access control, routing, end-to-end transport protocols, congestion and flow control, multicasting, naming, auto configuration, quality of service, and network management. Studies the abstract mechanisms and algorithms as implemented in real-world Internet protocols. Also covers the most common application protocols (e-mail, Web, and ftp).

CS 4710. Mobile and Wireless Systems. 4 Hours.

Covers both theoretical foundations of wireless/mobile networking and practical aspects of wireless/mobile systems, including current standards, mobile development platforms, and emerging technologies. Incorporates a strong practical component; requires students to work in teams on several practical assignments (e.g., based on Wi-Fi sensing, mobile applications, Internet-of-Things devices, and software-defined radio applications) and a final project. The final project integrates knowledge about several wireless communication technologies and mechanisms.

CS 4805. Advanced Theory of Computation. 4 Hours.

Examines formal models of computation, notions of undecidability, and complexity theory. Topics include finite automata and regular languages, context-free grammars and pushdown automata, and time complexity. Advanced topics in complexity theory include probabilistic computation, polynomial hierarchy, oracle separations, circuit and space complexity, interactive proofs, and quantum computing.

CS 4810. Advanced Algorithms. 4 Hours.

Builds on CS 3000. Presents an advanced study of computer algorithms. Covers basic algorithmic paradigms (e.g., greedy, divide-and-conquer, and dynamic programming); graph algorithms; optimization; computational intractability (e.g., NP-completeness, PSPACE-completeness); randomized algorithms; and approximation algorithms.

CS 4820. Computer-Aided Reasoning. 4 Hours.

Covers fundamental concepts, techniques, and algorithms in computer-aided reasoning, including propositional logic, variants of the DPLL algorithm for satisfiability checking, first-order logic, unification, tableaux, resolution, Horn clauses, congruence closure, rewriting, Knuth-Bendix completion, decision procedures, Satisfiability Modulo Theories, recursion, induction, termination, Presburger arithmetic, quantifier elimination, and interactive theorem proving. Offers students an opportunity to develop and implement a reasoning engine in a sequence of projects over the course of the semester. Also covers how to formalize and reason about computational systems using a modern interactive theorem prover.

CS 4830. System Specification, Verification, and Synthesis. 4 Hours.

Covers the fundamental topics in formal modeling and specification (transition systems, temporal logic, regular and omega-regular languages, safety and liveness properties, etc.); computer-aided verification (state-space exploration, model checking, bounded-model checking, binary-decision diagrams, symbolic model checking, etc.); compositionality and assume-guarantee reasoning; contracts; and component-based design. Also covers fundamental topics in computer-aided synthesis of correct-by-construction systems, starting from high-level formal specifications or from example scenarios. Designing large and complex systems (digital circuits, embedded control systems such as automated vehicles, computerized healthcare devices such as pacemakers, cyber-physical systems such as automated intersections, etc.) and their software cannot be done by hand. Instead, designers use computer-aided techniques that allow them to build system models and verify correctness of the design before the real system is actually built.

CS 4850. Building Game Engines. 4 Hours.

Discusses the components of game engines and strategies for their software implementation. Includes graphics management algorithms (animation, scene graph, level of detail); basic artificial intelligence algorithms (search, decision making, sensing); and related algorithmic issues (networking, threading, input processing). Explores the use of data-driven software design. Offers students an opportunity to use a rendering engine and to build and integrate several software components to create a complete game engine. Requires students to work on several individual assignments to apply the algorithms and then develop a project in a team. Offers students an opportunity to learn team/project management; work division; team communication; and the software development cycle of implementation, testing, critique, and further iteration. Students who do not meet course prerequisites may seek permission of instructor.

CS 4910. Computer Science Topics. 4 Hours.

Offers a lecture course in computer science on a topic not regularly taught in a formal course. Topics may vary from offering to offering. May be repeated up to three times.

CS 4950. Computer Science Research Seminar. 1 Hour.

Offers students an in-depth look at research in a particular subarea of computer science, information science, data science, or cybersecurity. The particular subarea varies from semester to semester. Exposes students to current research topics, often via guest faculty members. Offers students an opportunity to practice reading and discussing scientific literature, presenting scientific work, and distilling the key ideas and contributions of papers through required weekly paper summaries.

CS 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CS 4991. Research. 4,8 Hours.

Offers an opportunity to conduct research under faculty supervision. May be repeated up to three times.

CS 4992. Directed Study. 1-6 Hours.

Focuses on student examining standard computer science material in fresh ways or new computer science material that is not covered in formal courses. May be repeated up to three times.

CS 4993. Independent Study. 1-6 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated up to three times.

CS 4994. Internship. 4 Hours.

Offers students an opportunity for internship work. May be repeated without limit.

CS 5001. Intensive Foundations of Computer Science. 4 Hours.

Introduces the fundamental ideas of computing and programming principles. Discusses a systematic approach to word problems, including analytic reading, synthesis, goal setting, planning, plan execution, and testing. Presents several models of computing, beginning with functional program design. The latter part of the course consists of two parts: a task organization (ranging from the description of data to the creation of a test suite) and a data-oriented approach to the organization of programs (ranging from atomic data to self-referential data definitions and functions as data). Offers students an opportunity to practice pair programming and public code review techniques, as found in industry today. No prior programming experience is assumed; therefore, suitable for students with little or no computer science background.

CS 5002. Discrete and Data Structures. 4 Hours.

Introduces the mathematical structures and methods that form the foundation of computer science. Studies structures such as sets, tuples, sequences, lists, trees, and graphs. Discusses functions, relations, ordering, and equivalence relations. Examines inductive and recursive definitions of structures and functions. Covers principles of proof such as truth tables, inductive proof, and basic logic and the counting techniques and arguments needed to estimate the size of sets, the growth of functions, and the space-time complexity of algorithms. Also, discusses data structures such as arrays, stacks, queues, lists, and the algorithms that manipulate them.

CS 5003. Recitation for CS 5001. 0 Hours.

Provides a small-group discussion format to cover material in CS 5001. *Coreq CS 5001.*

CS 5004. Object-Oriented Design. 4 Hours.

Presents a comparative approach to object-oriented programming and design. Discusses the concepts of object, class, metaclass, message, method, inheritance, and genericity. Reviews forms of polymorphism in object-oriented languages. Contrasts the use of inheritance and composition as dual techniques for software reuse—forwarding vs. delegation and subclassing vs. subtyping. Offers students an opportunity to obtain a deeper understanding of the principles of object-oriented programming and design, including software components, object-oriented design patterns, and the use of graphical design notations such as UML (unified modeling language). Illustrates basic concepts in object-oriented design with case studies in application frameworks and by writing programs in Java.

CS 5005. Recitation for CS 5004. 0 Hours.

Provides small-group discussion format to cover material in CS 5004.

CS 5006. Algorithms. 2 Hours.

Introduces the basic principles and techniques for the design and implementation of efficient algorithms and data representations. Considers divide-and-conquer algorithms, graph traversal algorithms, linear programming, and optimization techniques. Covers the fundamental structures for representing data, such as hash tables, trees, and graphs.

CS 5007. Computer Systems. 2 Hours.

Introduces the basic design of computing systems, computer operating systems, and assembly language using a RISC architecture. Describes caches and virtual memory. Covers the interface between assembly language and high-level languages, including call frames and pointers; the use of system calls and systems programming to show the interaction with the operating system; and the basic structures of an operating system, including application interfaces, processes, threads, synchronization, interprocess communication, deadlock, memory management, file systems, and input/output control.

CS 5010. Programming Design Paradigm. 4 Hours.

Introduces modern program design paradigms. Starts with functional program design, introducing the notion of a design recipe. The latter consists of two parts: a task organization (ranging from the description of data to the creation of a test suite) and a data-oriented approach to the organization of programs (ranging from atomic data to self-referential data definitions and functions as data). The course then progresses to object-oriented design, explaining how it generalizes and contrasts with functional design. In addition to studying program design, students also have an opportunity to practice pair-programming and public code review techniques, as found in industry today.

CS 5011. Recitation for CS 5010. 0 Hours.

Provides small-group discussion format to cover material in CS 5010.

CS 5081. Accessibility and Inclusiveness in Human-Computer Interaction. 2 Hours.

Covers the fundamentals of user experience. Emphasizes how to integrate accessibility and usability to enhance the user experience in everyday products and services for everyone, including seniors and people with disabilities.

CS 5082. Privacy and Security of User Accounts: Patterns and Best Practices. 2 Hours.

Introduces approaches for authentication (ensuring you know who someone is) and authorization (ensuring they have access to a given resource or service). Studies how to identify relevant issues from the consumer or user side of account creation and management; identify expectations and liabilities for the developer or company providing a user-based account; share existing software design patterns and technologies to help you implement secure user accounts, including OAuth and anonymous accounts; and discusses UX design issues around user account creation and maintenance. Relevant for anyone who wants to create an application or service with a user registration and login page. Covers why you don't want to build this functionality yourself and how you can use existing tools and technologies that shield you from liability for storing user data.

CS 5083. Software Project Management with Scrum. 2 Hours.

Offers students an opportunity to obtain an understanding of the Scrum methodology for managing software projects using lean principles. Explains the Scrum framework as well as key ceremonies and roles. Shows which aspects of Scrum are required and how they manage project risk. .

CS 5100. Foundations of Artificial Intelligence. 4 Hours.

Introduces the fundamental problems, theories, and algorithms of the artificial intelligence field. Topics include heuristic search and game trees, knowledge representation using predicate calculus, automated deduction and its applications, problem solving and planning, and introduction to machine learning. Required course work includes the creation of working programs that solve problems, reason logically, and/or improve their own performance using techniques presented in the course. Requires experience in Java programming.

CS 5150. Game Artificial Intelligence. 4 Hours.

Offers an overview of classical and modern approaches to artificial intelligence in digital games. Focuses on the creation of believable agents and environments with the goal of providing a fun and engaging experience to a player. Covers player modeling, procedural content generation, behavior trees, interactive narrative, decision-making systems, cognitive modeling, and path planning. Explores different approaches for behavior generation, including learning and rule-based systems. Requires students to complete several individual assignments in these areas to apply the concepts covered in class. Students choose a group final project, which requires a report, to explore one aspect of artificial intelligence for games in further depth. Offers students an opportunity to learn team management and communication. Requires knowledge of algorithms and experience with object-oriented design or functional programming.

CS 5180. Reinforcement Learning and Sequential Decision Making. 4 Hours.

Introduces reinforcement learning and the underlying computational frameworks and the Markov decision process framework. Covers a variety of reinforcement learning algorithms, including model-based, model-free, value function, policy gradient, actor-critic, and Monte Carlo methods. Examines commonly used representations including deep learning representations and approaches to partially observable problems. Students are expected to have a working knowledge of probability and linear algebra, to complete programming assignments, and to complete a course project that applies some form of reinforcement learning to a problem of interest.

CS 5200. Database Management Systems. 4 Hours.

Introduces relational database management systems as a class of software systems. Prepares students to be sophisticated users of database management systems. Covers design theory, query language, and performance/tuning issues. Topics include relational algebra, SQL, stored procedures, user-defined functions, cursors, embedded SQL programs, client-server interfaces, entity-relationship diagrams, normalization, B-trees, concurrency, transactions, database security, constraints, object-relational DBMSs, and specialized engines such as spatial, text, XML conversion, and time series. Includes exercises using a commercial relational or object-relational database management system.

CS 5310. Computer Graphics. 4 Hours.

Introduces the fundamentals of two-dimensional and three-dimensional computer graphics, with an emphasis on approaches for obtaining realistic images. Covers two-dimensional algorithms for drawing lines and curves, anti-aliasing, filling, and clipping. Studies rendering of three-dimensional scenes composed of spheres, polygons, quadric surfaces, and bi-cubic surfaces using ray-tracing and radiosity. Includes techniques for adding texture to surfaces using texture and bump maps, noise, and turbulence. Requires knowledge of linear algebra.

CS 5320. Digital Image Processing. 4 Hours.

Studies the fundamental concepts of digital image processing including digitization and display of images, manipulation of images to enhance or restore image detail, encoding (compression) of images, detection of edges and other object features in images, and the formation of computed tomography (CT) images. Introduces mathematical tools such as linear systems theory and Fourier analysis and uses them to motivate and explain these image processing techniques. Requires knowledge of linear algebra.

CS 5330. Pattern Recognition and Computer Vision. 4 Hours.

Introduces fundamental techniques for low-level and high-level computer vision. Examines image formation, early processing, boundary detection, image segmentation, texture analysis, shape from shading, photometric stereo, motion analysis via optic flow, object modeling, shape description, and object recognition (classification). Discusses models of human vision (gestalt effects, texture perception, subjective contours, visual illusions, apparent motion, mental rotations, and cyclopean vision). Requires knowledge of linear algebra.

CS 5335. Robotic Science and Systems. 4 Hours.

Introduces autonomous mobile robots with a focus on algorithms and software development, including closed-loop control, robot software architecture, wheeled locomotion and navigation, tactile and basic visual sensing, obstacle detection and avoidance, and grasping and manipulation of objects. Offers students an opportunity to progressively construct mobile robots from a pre-designed electromechanical kit. The robots are controlled wirelessly by software of the students' own design, built within a provided robotics software framework. Culminates in a project that connects the algorithms and hardware developed in the course with a selected topic in the current robotics research literature.

CS 5340. Computer/Human Interaction. 4 Hours.

Covers the principles of human-computer interaction and the design and evaluation of user interfaces. Topics include an overview of human information processing subsystems (perception, memory, attention, and problem solving); how the properties of these systems affect the design of user interfaces; the principles, guidelines, and specification languages for designing good user interfaces, with emphasis on tool kits and libraries of standard graphical user interface objects; and a variety of interface evaluation methodologies that can be used to measure the usability of software. Other topics may include World Wide Web design principles and tools, computer-supported cooperative work, multimodal and "next generation" interfaces, speech and natural language interfaces, and virtual reality interfaces. Course work includes both the creation and implementation of original user interface designs, and the evaluation of user interfaces created by others. Requires knowledge of C programming language/UNIX. .

CS 5400. Principles of Programming Language. 4 Hours.

Studies the basic components of programming languages, specification of syntax and semantics, and description and implementation of programming language features. Discusses examples from a variety of languages.

CS 5500. Foundations of Software Engineering. 4 Hours.

Covers the foundations of software engineering, including software development life cycle models (e.g., waterfall, spiral, agile); requirements analysis; user-centered design; software design principles and patterns; testing (functional testing, structural testing, testing strategies); code refactoring and debugging; software architecture and design; and integration and deployment. Includes a course project where some of the software engineering methods (from requirements analysis to testing) are applied in a team-based setting. Requires admission to MS program or completion of all transition courses.

CS 5520. Mobile Application Development. 4 Hours.

Focuses on mobile application development on a mobile phone or related platform. Discusses memory management; user interface building, including both MVC principles and specific tools; touch events; data handling, including core data, SQL, XML, and JSON; network techniques and URL loading; and, finally, specifics such as GPS and motion sensing that may be dependent on the particular mobile platform. Students are expected to work on a project that produces a professional-quality mobile application and to demonstrate the application that they have developed. The instructor chooses a modern mobile platform to be used in the course.

CS 5600. Computer Systems. 4 Hours.

Studies the structure, components, design, implementation, and internal operation of computer systems, focusing mainly on the operating system level. Reviews computer hardware and architecture including the arithmetic and logic unit, and the control unit. Covers current operating system components and construction techniques including the memory and memory controller, I/O device management, device drivers, memory management, file system structures, and the user interface. Introduces distributed operating systems. Discusses issues arising from concurrency and distribution, such as scheduling of concurrent processes, interprocess communication and synchronization, resource sharing and allocation, and deadlock management and resolution. Includes examples from real operating systems. Exposes students to the system concepts through programming exercises. Requires admission to MS program or completion of all transition courses.

CS 5610. Web Development. 4 Hours.

Discusses Web development for sites that are dynamic, data driven, and interactive. Focuses on the software development issues of integrating multiple languages, assorted data technologies, and Web interaction. Considers ASP.NET, C#, HTTP, HTML, CSS, XML, XSLT, JavaScript, AJAX, RSS/Atom, SQL, and Web services. Each student must deploy individually designed Web experiments that illustrate the Web technologies and at least one major integrative Web site project. Students may work in teams with the permission of the instructor. Each student or team must also create extensive documentation of their goals, plans, design decisions, accomplishments, and user guidelines. All source files must be open and be automatically served by a sources server.

CS 5700. Fundamentals of Computer Networking. 4 Hours.

Studies network protocols, focusing on modeling and analysis, and architectures. Introduces modeling concepts, emphasizing queuing theory, including Little's theorem, M/M/1, M/M/m, M/D/1, and M/G/1 queuing systems. Discusses performance evaluation of computer networks including performance metrics, evaluation tools and methodology, simulation techniques, and limitations. Presents the different harmonizing functions needed for communication and efficient operation of computer networks and discusses examples of Ethernet, FDDI, and wireless networks. Covers link layer protocols including HDLC, PPP, and SLIP; packet framing; spanning tree and learning bridges, error detection techniques, and automatic repeat request algorithms; sliding window and reliable/ordered services; and queuing disciplines including FQ and WFQ. Introduces flow control schemes, such as window flow control and leaky bucket rate control schemes, and discusses congestion control and fairness. Requires knowledge of probability theory.

CS 5800. Algorithms. 4 Hours.

Presents the mathematical techniques used for the design and analysis of computer algorithms. Focuses on algorithmic design paradigms and techniques for analyzing the correctness, time, and space complexity of algorithms. Topics may include asymptotic notation, recurrences, loop invariants, Hoare triples, sorting and searching, advanced data structures, lower bounds, hashing, greedy algorithms, dynamic programming, graph algorithms, and NP-completeness.

CS 5850. Building Game Engines. 4 Hours.

Discusses the components of game engines and strategies for their software implementation. Includes graphics management algorithms (animation, scene graph, level of detail); basic artificial intelligence algorithms (search, decision making, sensing); and related algorithmic issues (networking, threading, input processing). Explores the use of data-driven software design. Offers students an opportunity to use a rendering engine and to build and integrate several software components to create a complete game engine. Requires students to work on individual assignments and then develop a project in a team, which requires a report. Offers students an opportunity to learn team/project management; work division; team communication; and the software development cycle of implementation, testing, critique, and further iteration. Requires knowledge of computer graphics, differential calculus, operating systems concepts, and algorithms.

CS 5964. Experiential Project. 0 Hours.

Offers students an applied project setting in which to apply their curricular learning. Working with a sponsor, students refine an applied research topic, perform research, develop recommendations that are shared with a partner sponsor, and create a plan for implementing their recommendations. Seeks to benefit students with a curriculum that supports the development of key business communication skills, project and client management skills, and frameworks for business analysis. Offers students an opportunity to learn from sponsor feedback, review 'lessons learned,' and incorporate suggestions from this review to improve and further develop their career development and professional plan. May be repeated twice.

CS 5976. Directed Study. 2-4 Hours.

Focuses on student examining standard computer science material in fresh ways or new computer science material that is not covered in formal courses. May be repeated up to three times.

CS 6110. Knowledge-Based Systems. 4 Hours.

Focuses on the acquisition, organization, and use of world knowledge in computers, and the challenge of creating programs with common sense. Topics include knowledge representation and reasoning models beyond predicate calculus, Bayesian inference and other models of reasoning and decision making under uncertainty, rule-based expert systems, case-based and analogical reasoning, and introduction to natural language processing. Course work includes the creation of working programs that store and manipulate world knowledge using techniques presented in the course.

CS 6120. Natural Language Processing. 4 Hours.

Provides an introduction to the computational modeling of human language, the ongoing effort to create computer programs that can communicate with people in natural language, and current applications of the natural language field, such as automated document classification, intelligent query processing, and information extraction. Topics include computational models of grammar and automatic parsing, statistical language models and the analysis of large text corpuses, natural language semantics and programs that understand language, models of discourse structure, and language use by intelligent agents. Course work includes formal and mathematical analysis of language models, and implementation of working programs that analyze and interpret natural language text.

CS 6130. Affective Computing. 4 Hours.

Studies affective computing—computing that relates to, arises from, or influences emotions. Offers an overview of the theory of human emotion (how it arises from and influences cognition, the body, and the social environment) and computational techniques for modeling human emotion processes as well as for recognizing and synthesizing emotional behavior. Discusses how these can be applied to application design. Offers students an opportunity to gain a strong background in the theory and practice of human-centered computing as it relates to games, immersive environments, and pedagogical applications. Brings together students from different disciplines to work together and learn from each other. CS 6130 and PSYC 6130 are cross-listed.

CS 6140. Machine Learning. 4 Hours.

Provides a broad look at a variety of techniques used in machine learning and data mining, and also examines issues associated with their use. Topics include algorithms for supervised learning including decision tree induction, artificial neural networks, instance-based learning, probabilistic methods, and support vector machines; unsupervised learning; and reinforcement learning. Also covers computational learning theory and other methods for analyzing and measuring the performance of learning algorithms. Course work includes a programming term project.

CS 6200. Information Retrieval. 4 Hours.

Provides an introduction to information retrieval systems and different approaches to information retrieval. Topics covered include evaluation of information retrieval systems; retrieval, language, and indexing models; file organization; compression; relevance feedback; clustering; distributed retrieval and metasearch; probabilistic approaches to information retrieval; Web retrieval; filtering, collaborative filtering, and recommendation systems; cross-language IR; multimedia IR; and machine learning for information retrieval.

CS 6220. Data Mining Techniques. 4 Hours.

Covers various aspects of data mining, including classification, prediction, ensemble methods, association rules, sequence mining, and cluster analysis. The class project involves hands-on practice of mining useful knowledge from a large data set.

CS 6240. Large-Scale Parallel Data Processing. 4 Hours.

Covers big-data analysis techniques that scale out with increasing number of compute nodes, e.g., for cloud computing. Emphasizes approaches for problem and data partitioning that distribute work effectively, while keeping total cost for computation and data transfer low. Studies and analyzes deterministic and random algorithms from a variety of domains, including graphs, data mining, linear algebra, and information retrieval in terms of their cost, scalability, and robustness against skew. Course work emphasizes hands-on programming experience with modern state-of-the-art big-data processing technology. Students who do not meet course prerequisites may seek permission of instructor.

CS 6350. Empirical Research Methods. 4 Hours.

Presents an overview of methods for conducting empirical research within computer science. These methods help provide objective answers to questions about the usability, effectiveness, and acceptability of systems. The course covers the basics of the scientific method, building from a survey of objective measures to the fundamentals of hypothesis testing using relatively simple research designs, and on to more advanced research designs and statistical methods. The course also includes a significant amount of fieldwork, spanning the design, conduct, and presentation of small empirical studies.

CS 6351. Lab for CS 6350. 0 Hours.

Accompanies CS 6350. Covers topics from the course through various experiments.

CS 6410. Compilers. 4 Hours.

Expects each student to write a small compiler. Topics include parser generation, abstract syntax trees, symbol tables, type checking, generation of intermediate code, simple code improvement, register allocation, run-time structures, and code generation.

CS 6510. Advanced Software Development. 4 Hours.

Designed to integrate academic concepts and practical experience of software design by having students work as part of a programming team, with an option to lead a subteam. Offers students an opportunity to study, in-depth, some aspects of the development process. The goal is to have students participate in a large-scale project, taking time to reflect and analyze the work and the process, rather than concentrating exclusively on the final product. Students who do not meet course prerequisites may seek permission of instructor.

CS 6535. Engineering Reliable Software. 4 Hours.

Continues the exploration of several themes from CS 5010: unit testing, random testing, and logical reasoning about software. Specifically revisits the idea of systematic design and its connection to making logical claims about the workings of programs. After an introduction to the ACL2 programming language and theorem prover, offers students an opportunity to redesign interactive games (e.g., “Space Invaders”) and work on turning them into reliable projects. Students who do not meet course prerequisites may seek permission of instructor.

CS 6620. Fundamentals of Cloud Computing. 4 Hours.

Covers fundamentals of cloud computing, including virtualization and containers, distributed file systems and object stores, infrastructure as a service platforms, open source cloud platforms, key big data platforms, and topics in data center scale systems. Combines classroom material delivered via lectures, readings from literature, student presentations, and a semester-long software project.

CS 6650. Building Scalable Distributed Systems. 4 Hours.

Covers the essential elements of distributed, concurrent systems and builds upon that knowledge with engineering principles and practical experience with state-of-the-art technologies and methods for building scalable systems. Scalability is an essential quality of internet-facing systems and requires specialized skills and knowledge to build systems that scale at low cost.

CS 6710. Wireless Network. 4 Hours.

Covers both theoretical issues related to wireless networking and practical systems for both wireless data networks and cellular wireless telecommunication systems. Topics include fundamentals of radio communications, channel multiple access schemes, wireless local area networks, routing in multihop ad hoc wireless networks, mobile IP, and TCP improvements for wireless links, cellular telecommunication systems, and quality of service in the context of wireless networks. Requires a project that addresses some recent research issues in wireless and mobile networking.

CS 6760. Privacy, Security, and Usability. 4 Hours.

Challenges conventional wisdom and encourages students to discover ways that security, privacy, and usability can be made synergistic in system design. Usability and security are widely seen as two antagonistic design goals for complex computer systems. Topics include computer forensics, network forensics, user interface design, backups, logging, economic factors affecting adoption of security technology, trust management, and related public policy. Uses case studies such as PGP, S/MIME, and SSL. Introduces basic cryptography and hash function as it is needed. Course work includes analysis of papers, problem sets, and a substantial term project.

CS 6800. Application of Information Theory. 4 Hours.

Introduces information theory and its applications to various computational disciplines. Covers the basic concepts of information theory, including entropy, relative entropy, mutual information, and the asymptotic equipartition property. Concentrates on applications of information theory to computer science and other computational disciplines, including compression, coding, Markov chains, machine learning, information retrieval, statistics, computational linguistics, computational biology, wired and wireless networks, and image and speech processing. The course is self-contained; no prior knowledge of information theory is required or assumed. Requires an undergraduate course in probability.

CS 6949. Graduate Cooperative Education Seminar. 1 Hour.

Intended to prepare graduate students in computer and information science for co-op. Topics include resumé writing, interviewing, job search strategy, ethics, professional behavior, and the college's co-op policies. Students intending to participate in a co-op or internship must satisfactorily complete this course, which is typically taken during the student's first semester.

CS 6954. Co-op Work Experience - Half-Time. 0 Hours.

Provides eligible students with an opportunity for work experience. May be repeated without limit.

CS 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CS 6964. Co-op Work Experience. 0 Hours.

Provides eligible students with an opportunity for work experience. May be repeated without limit.

CS 6965. Co-op Work Experience Abroad. 0 Hours.

Provides eligible students with an opportunity for work experience abroad. May be repeated without limit.

CS 7140. Advanced Machine Learning. 4 Hours.

Covers topics in advanced machine learning. Presents materials in the current machine learning literature. Focuses on graphical models, latent variable models, Bayesian inference, and nonparametric Bayesian methods. Seeks to prepare students to do research in machine learning. Expects students to read conference and journal articles, present these articles, and write an individual research paper. CS 7140 and EECE 7397 are cross-listed.

CS 7170. Seminar in Artificial Intelligence. 2-4 Hours.

Gives students the opportunity to read and present various survey and research papers in artificial intelligence. May be repeated for credit for PhD students; faculty supervisor and topics vary from semester to semester.

CS 7180. Special Topics in Artificial Intelligence. 4 Hours.

Offers various topics on artificial intelligence. May be repeated up to two times.

CS 7240. Principles of Scalable Data Management: Theory, Algorithms, and Database Systems. 4 Hours.

Covers the algorithms, core principles, and foundational concepts for managing data at scale. Topics include data models, query languages, query execution and optimization, complexity of query execution and query resilience, data stream processing, parallel data processing, transactions, linear vs. relational algebra, factorizations, and uncertainty in logic. Requires standard CS knowledge of algorithms and hardness (e.g., a typical undergraduate class based on a standard algorithms textbook such as Ericson; Cormen, Leiserson, Rivest, and Stein; or Dasgupta, Papadimitriou, and Vazirani). Offers students an opportunity to gain hands-on experience through smaller assignments and a project. The project is flexible to allow students to explore scalable data management and analysis aspects related to their PhD research.

CS 7250. Information Visualization: Theory and Applications. 4 Hours.

Covers foundational as well as contemporary topics of interest in data visualization to enable the effective representation of data across disciplines, including examples drawn from computer science, physical sciences, biomedical sciences, humanities, and economics. Topics include data visualization theory and methodology, visualization design and evaluation, visual perception and cognition, interaction principles, and data encoding and representation techniques. Students who do not meet course restrictions may seek permission of instructor.

CS 7260. Visualization for Network Science. 4 Hours.

Covers the principles of information visualization in the specific context of network science. Introduces visual encoding of data and our understanding of human vision and perception; interaction principles including filtering, pivoting, aggregation; and both quantitative and human subjects evaluation techniques. Covers visualization techniques for several network types, including multivariate networks with attributes for entities and relationships, evolving and dynamic networks that change over time, heterogeneous networks with multiple types of entities, and geospatial networks. Offers students an opportunity to learn about the design of layout algorithms for node-link and matrix visualizations.

CS 7280. Special Topics in Database Management. 4 Hours.

Offers various topics. Possible areas include object-oriented database systems and distributed database systems. May be repeated up to two times.

CS 7290. Special Topics in Data Science. 4 Hours.

Offers special topics in data science, including machine learning, statistics, data mining, parallel and distributed data analysis, database systems, information retrieval, knowledge representation, information visualization, natural language processing, computational biology and bioinformatics, computational social science, digital humanities, health informatics, business, and predictive analytics. May be repeated once for up to 8 total credits.

CS 7295. Special Topics in Data Visualization. 4 Hours.

Offers various topics in data visualization. May be repeated once.

CS 7340. Theory and Methods in Human Computer Interaction. 4 Hours.

Covers the foundations of human abilities, computational artifacts, design, and evaluation. Human computer interaction concerns the design and evaluation of software based on a deep understanding of how humans interact with computers, devices, and sensors. The field merges theories from psychology and computer science, using methods from AI and design. Introduces cognitive, perceptual, and affective theories and theories of individual differences that allow us to design and develop better computer software and systems. Also covers research methods for designing and evaluating computer software systems. Topics discussed in the context of next-generation interaction modalities include sensors, haptics, wearables, and performative interfaces. Students who do not meet course restrictions may seek permission of instructor.

CS 7390. Special Topics in Human-Centered Computing. 4 Hours.

Offers various topics in human-centered computing.

CS 7400. Intensive Principles of Programming Languages. 4 Hours.

Studies the basic components of programming languages, specification of syntax and semantics, and description and implementation of programming language features. Discusses examples from a variety of languages.

CS 7480. Special Topics in Programming Language. 4 Hours.

Offers various topics in programming language. May be repeated up to two times.

CS 7485. Special Topics in Formal Methods. 4 Hours.

Offers various topics in formal methods. May be repeated without limit.

CS 7580. Special Topics in Software Engineering. 4 Hours.

Offers various topics on software engineering. May be repeated up to two times.

CS 7600. Intensive Computer Systems. 4 Hours.

Studies the structure, components, design, implementation, and internal operation of computer systems, focusing on the operating system level. Reviews computer hardware and architecture including the arithmetic and logic unit, and the control unit. Covers current operating system components and construction techniques including the memory and memory controller, I/O device management, device drivers, memory management, file system structures, and the user interface. Discusses distributed operating systems, real-time systems, and addresses concurrent processes, scheduling, interprocess communication, and synchronization. Discusses relevant distributed algorithms. Also covers design and analysis techniques for desirable properties in computer systems including functional correctness (in the absence of faults), performance and throughput, fault-tolerance and reliability, real-time response, security, and quality of service. Draws examples from real operating systems. Emphasizes abstraction, while programming exercises are used to facilitate the understanding of concepts.

CS 7610. Foundations of Distributed Systems. 4 Hours.

Covers foundational concepts in the design and implementation of efficient and reliable distributed computing systems. Covers internet communication protocols, fault-tolerant computing, synchronization protocols, synchronous and asynchronous computing, dynamic group communication systems, load balancing, Byzantine models, distributed hash tables, distributed file systems, and application of foundational concepts to modern distributed systems in the field. Requires knowledge of operating systems; e.g., an undergraduate course in Systems and Networks, Computer Systems, or Networks and Distributed systems.

CS 7680. Special Topics in Computer Systems. 4 Hours.

Offers various topics on computer systems. May be repeated up to two times.

CS 7775. Seminar in Computer Security. 2-4 Hours.

Gives students the opportunity to read and present various survey and research papers in cryptography and computer security. Faculty supervisor and topics vary from semester to semester. May be repeated for credit for PhD students.

CS 7780. Special Topics in Networks. 4 Hours.

Offers various topics on networks. May be repeated up to two times.

CS 7800. Advanced Algorithms. 4 Hours.

Presents advanced mathematical techniques for designing and analyzing computer algorithms. Reviews some of the material covered in CS 5800 and then covers advanced topics. Emphasizes theoretical underpinnings of techniques used to solve problems arising in diverse domains. Topics include asymptotic analysis, advanced data structures, dynamic programming, greedy algorithms and matroid theory, amortized analysis, randomization, string matching, algebraic algorithms, and approximation algorithms. Introduces Turing machines, P and NP classes, polynomial-time reducibility, and NP completeness.

CS 7805. Theory of Computation. 4 Hours.

Examines formal models of computation, notions of undecidability, and basic complexity theory. Models of computation include finite state automata, pushdown automata, and Turing machines. Discusses the properties of regular sets and context-free languages. Also covers partial recursive functions, primitive recursive functions, recursively enumerable sets, Turing decidability, and unsolvable problems. Discusses the concept of reductions, time and space complexity classes, and the polynomial-time hierarchy.

CS 7810. Foundations of Cryptography. 4 Hours.

Offers students at the PhD level an accelerated introduction to cryptography and quickly progresses to advanced topics that are at the forefront of current research. Cryptography is the science of protecting information against adversarial eavesdropping and tampering. Examines what kind of security properties can be achieved by relying solely on probability and information theory, without restricting the adversary's computational power. Studies the complexity-theoretic basis of modern cryptography and the connection between computational hardness and pseudo-randomness. Explores, as the main component of the course, how to take a few well-studied problems in number theory and algebra and use them to build powerful cryptosystems with advanced functionality and security properties. Requires prior completion of an undergraduate course in the theory of computation (Northeastern's CS 3800 or equivalent).

CS 7880. Special Topics in Theoretical Computer Science. 4 Hours.

Covers various topics including advanced cryptography, approximation algorithms, complexity theory, computational algebra, distributed computing, formal verification, network algorithms, online computation, parallel computing, and randomness and computation. May be repeated up to two times.

CS 7962. Elective. 2-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CS 7976. Directed Study. 2-4 Hours.

Focuses on student examining standard computer science material in fresh ways or new computer science material that is not covered in formal courses. May be repeated without limit.

CS 7990. Thesis. 4 Hours.

Offers selected work with the agreement of a project supervisor. May be repeated without limit.

CS 7996. Thesis Continuation. 0 Hours.

Offers continued thesis work conducted under the supervision of a departmental faculty.

CS 8674. Master's Project. 4 Hours.

Offers selected work with the agreement of a project supervisor. May be repeated once.

CS 8949. Research Work Experience. 0 Hours.

Provides an opportunity for all doctoral students to engage in industry research in the area of their dissertation. Doctoral students register for this course before starting their off-campus internships. May be repeated without limit.

CS 8982. Readings. 1-8 Hours.

Offers selected readings under the supervision of a faculty member. May be repeated without limit.

CS 9000. PhD Candidacy Achieved. 0 Hours.

Indicates successful completion of the doctoral comprehensive exam.

CS 9990. Dissertation. 0 Hours.

Offers selected work with the agreement of a thesis supervisor. May be repeated once.

CS 9996. Dissertation Continuation. 0 Hours.

Continues work with the agreement of a thesis supervisor. May be repeated without limit.

Computer Systems Engineering (CSYE)

Search CSYE Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=CSYE>)

CSYE 6200. Concepts of Object-Oriented Design. 4 Hours.

Introduces object-oriented design and programming via the Java programming language; the use of inheritance, composition, and interface classes in software design; development of Java applets and applications; study of the Java class libraries, including the swing tool kit for building human computer interfaces, the network package for development of client-server systems, and the collections' package for data structures and sorting algorithms. Requires a course project. Requires knowledge of C programming.

CSYE 6202. Concepts of Object-Oriented Design with C#. 4 Hours.

Introduces object-oriented design and programming via the C# (C-sharp) programming language and its underlying .NET platform. Covers the use of inheritance and composition in software design and development of complex C# .NET applications. Topics include classes, overloading, data abstraction, information hiding, encapsulation, inheritance, polymorphism, file processing, templates, exceptions, container classes, and low-level language features.

CSYE 6205. Concepts of Object-Oriented Design with C++. 4 Hours.

Introduces object-oriented design and programming via the C++ programming language. Covers the use of inheritance and composition in software design and development of complex C++ applications. Topics include classes, overloading, data abstraction, information hiding, encapsulation, inheritance, polymorphism, file processing, templates, exceptions, container classes, and low-level language features. Requires a course project.

CSYE 6220. Enterprise Software Design. 4 Hours.

Designed to build on previous experience in concepts of object-oriented design courses with equal focus in the three areas of architecture, design, and implementation. Instruction and hands-on exercises cover both server-side and client-side web programming. Offers students an opportunity to build a conceptual understanding and to gain practical experience with popular frameworks (Spring MVC, Hibernate, and Dojo or jQuery) that increase productivity, empower developers, and greatly simplify web development. The goal is to be able to build the server side and client side of substantial web-based, client-server, database-intensive, multitier applications.

CSYE 6225. Network Structures and Cloud Computing. 4 Hours.

Offers a practical foundation in cloud computing and hands-on experience with the tools used in cloud computing. Designed as a foundation course for cloud-aware, adept professionals. Focuses on the fundamentals of cloud computing, the principal areas of cloud architectures, cloud security, cloud governance, cloud storage, cloud virtualization, and cloud capacity. Discusses the Internet evolution that led to cloud and how cloud applications revolutionized Web applications.

CSYE 6230. Operating Systems. 4 Hours.

Covers basic concepts of operating systems and system programming, such as utility programs, subsystems, and multiple-program systems. Main topics include processes, interprocess communication, and synchronization; memory allocation, segmentation, and paging; loading, linking, and libraries; resource allocation, scheduling, and performance evaluation; file systems, storage devices, and I/O systems; and protection, security, and privacy. Emphasizes key concepts through code design and development.

CSYE 6510. Fundamentals of the Internet of Things. 4 Hours.

Explores the foundations and technologies involved in the Internet of Things (IoT). Topics include machine-to-machine (M2M) communication and its relationship with IoT as well as their evolution. Examines fundamental components of the IoT architecture and presents a large array of real-life applications and case studies. Focuses on different wireless technologies that are relevant to the IoT including WiFi, Bluetooth Low Energy, and ZigBee, as well as several network layer protocols that are instrumental to the deployment of these networks. Discusses the most common IoT application technologies with special emphasis on MQTT, CoAP, and AMQP. Also explores special issues that affect IoT networks, including security and privacy considerations as well as reliability mechanisms intended to overcome network impairments.

CSYE 6530. Connected Devices. 4 Hours.

Offers an introduction to the Internet of Things (IoT) via a hands-on approach to understanding connected devices. Covers concepts and technologies such as architectures, software stacks, DevOps specific to IoT, communications and messaging protocols, types of devices, cloud services designed for IoT systems, and device management.

CSYE 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CSYE 6964. Co-op Work Experience. 0 Hours.

Provides eligible students with an opportunity for work experience. May be repeated without limit.

CSYE 6965. Co-op Work Experience Abroad. 0 Hours.

Provides eligible students with an opportunity for work experience abroad. May be repeated without limit. .

CSYE 7200. Big-Data System Engineering Using Scala. 4 Hours.

Covers the fundamentals of functional programming with Scala and seeks to provide a basic, practical foundation for students who want to use it as a language for working with big-data platforms. Scala is one of a new breed of general-purpose functional programming languages that is strongly typed and is object oriented. It runs on the Java virtual machine and is able to share libraries from the vast collection of open-source projects written in Java. For these reasons it is readily accessible by programmers of Java, C++, and similar languages.

CSYE 7215. Foundations of Parallel, Concurrent, and Multithreaded Programming. 4 Hours.

Covers all aspects of concurrent program design, development, and implementation utilizing the Java multithreading API/facilities. Topics covered include thread safety and lifetime issues, block structured versus explicit synchronization, intrinsic versus explicit locking, thread pools, liveness issues, deadlock, livelock, race conditions, atomicity, performance and scalability, execution policies, test strategies. Major Java multithreading API/facilities covered include synchronized blocks, wait sets, intrinsic locks and condition variables, synchronized and concurrent collections, executor framework. Comparisons between the Java multithreading API and the Posix Pthreads multithreading standard are provided.

CSYE 7220. Deployment and Operation of Software Applications. 4 Hours.

Introduces the four most popular infrastructure languages—Chef, Puppet, Ansible, and Salt— and codes with them in the same way that we code with Java, Python, C#, and Javascript. IT infrastructure languages and their underlying methods and tools, referred to as DevOps, bridge the gap between software development and software administration. Instead of recruiting CPU cycles on our laptops, we create and manage virtual IT infrastructures on a public cloud. Offers students an opportunity to learn how to manipulate virtual machines, containers, and lambdas and set up assembly lines on public clouds in the fashion of a Model T assembly line. .

CSYE 7224. Engineering Reliable, Scalable, and Maintainable Distributed Systems. 4 Hours.

Covers repeatable, generic software design patterns such as sidecar, ambassador, adapter, event driven, stream and batch processing, containers and container orchestration, replication, partitioning, transactions, consistency, and consensus to help make the development of reliable distributed systems more approachable and efficient. Studies the common language and framework these patterns provide. Microservices, containers, and container orchestration have fundamentally changed how distributed systems are developed. Designed to find ways of thinking about distributed systems—not just how they work, but also why they work, and what questions we need to ask. Offers students an opportunity to decide which kind of technology is appropriate for which purpose and to understand how these patterns can be combined to form the foundation of a sound application architecture.

CSYE 7245. Big-Data Systems and Intelligence Analytics. 4 Hours.

Offers students an opportunity to learn a hands-on approach to understanding how large-scale data sets are processed and how data science algorithms are adopted in the industry through case studies and labs. This project-based course builds on INFO 7390 and focuses on enabling students with tools and frameworks primarily to build end-to-end applications. The course is divided into three parts: building the data pipeline for data science, implementing data science algorithms, and scaling and deploying data science algorithms.

CSYE 7250. Big Data Architecture and Governance. 4 Hours.

Focuses on creating and managing a data-driven enterprise. Geared to current IT technical professionals, data scientists, technical project managers, aspiring IT professionals, and managers who want to understand the complex nature of creating and managing data-driven projects to support the new and legacy data environments. Covers the analysis that is required to design data-driven projects and make appropriate recommendations for the target state of an organization. This analysis is used as input to create a comprehensive road map to achieve the target state and includes current and future uses of data, consumption methods, data sources and categories, and aggregation and quality requirements.

CSYE 7270. Building Virtual Environments. 4 Hours.

Covers the basics of three-dimensional graphics programming using the Unity game engine. Includes a built-in terrain editor; a shader development facility; built-in physics; and advanced lighting, shadows, and audio to build 3D virtual environments and serious games. Javascript and C# can be used for scripting. Assets from various 3D modeling programs can be imported. Facilities to publish to the PC, Mac, iPhone and Wii and support for real-time multiplayer games are available. Requires a final project.

CSYE 7280. User Experience Design and Testing. 4 Hours.

Introduces user experience concepts while working on Web design projects. Offers students an opportunity to build the necessary skill sets to make better decisions when designing contemporary websites that cater to customer needs. Students practice interview techniques to understand user requirements while keeping user experience central to the effort. Uses wireframes and user scenarios to drive the creative design process. Various case studies are introduced and discussed in team settings to emphasize user perspectives. Uses quality assurance and usability testing to drive validation and user-acceptance testing and approvals.

CSYE 7374. Special Topics in Computer Systems Engineering. 4 Hours.

Offers topics of current interest in computer systems engineering. May be repeated without limit.

CSYE 7945. Software Engineering Project. 4 Hours.

Supports teamwork on a large software project under faculty supervision. The projects are drawn from an engineering field, and involve design, systems engineering, manufacturing, planning maintenance, reliability, quality control, risk assessment, project control, evaluation of alternatives, and so on. The project may cover either the whole software development life cycle or a significant part of it.

CSYE 7962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CSYE 7978. Independent Study. 1-4 Hours.

Offers theoretical or experimental work under individual faculty supervision. May be repeated without limit.

CSYE 7990. Thesis. 1-8 Hours.

Offers analytical and/or experimental work conducted under the direction of the faculty in fulfillment of the requirements for the degree. Requires first-year students to attend a graduate seminar program that introduces students to the methods of choosing a research topic, conducting research, and preparing a thesis. Requires successful completion of the seminar program. May be repeated without limit.

Construction Management - CPS (CMG)

Search CMG Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=CMG>)

CMG 6400. Introduction to Construction Management. 4 Hours.

Seeks to provide a foundation in both technical skills and individual written and verbal communication for construction project managers. Since students come to the program from a variety of educational and experience backgrounds, offers students an opportunity to be assessed and brought to the level necessary for successful completion of the program. Topics covered include construction documentation, including specifications and drawings; the preconstruction processes required for planning; and construction operations needed for successful operations and control, including estimating, cost control, and change-order management. Students practice scheduling techniques, progress monitoring, and reporting approaches for projects and are introduced to construction organizations, contractor selection, and project procurement.

CMG 6402. Alternative Project Delivery Methods and Project Controls. 4 Hours.

Offers a comprehensive overview of alternative project delivery systems in public and private sectors. Topics include project life cycle; alternative project design, including building information modeling (BIM); schedule; cost and value management; project and program management; project closeout; and innovative procurement strategies. Also examines international projects, contracts, terminations, defaults, and sustainable and integrated project delivery (IPD) as vehicles to ensure the meeting of project objectives. Uses case studies and real-world examples to identify and practice the leadership skills required for successful project execution.

CMG 6403. Safety, Project Risk, and Quality Management. 4 Hours.

Offers students an opportunity to learn how to develop and manage a risk identification, analysis, and response plan. Students look at project participants and several construction processes with a focus on the safety, risk, and quality impacts on those processes. Covers the latest techniques to ensure that a project provides a safe environment for everyone. Studies the analytical tools necessary to ensure customer satisfaction in the area of quality and examines both quality control and assurance processes.

CMG 6405. Construction Law. 4 Hours.

Explores the statutory and legal context of contracts in construction. Covers business ethics and examines the legal issues that may result in bidding mistakes and construction disputes over such matters as differing expectations regarding specifications and plans, time and schedule impacts, delays and acceleration, change orders, and differing and unforeseen conditions. Explores some areas of warranties and guarantees; joint liability; and contract-dispute resolution, including negotiation, alternative dispute resolution, and litigation.

CMG 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

Cooperative Education (COOP)

Search COOP Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=COOP>)

COOP 3945. Co-op Work Experience. 0 Hours.

Provides students an opportunity for work experience. Requires sophomore standing or above. May be repeated up to five times.

COOP 3946. Co-op Work Experience--Half Time. 0 Hours.

Provides students an opportunity for work experience. Requires sophomore standing or above. May be repeated up to five times.

COOP 3947. Co-op Work Experience Abroad--Half Time. 0 Hours.

Provides students with an opportunity for work experience abroad. Requires sophomore standing or above. May be repeated up to five times.

COOP 3948. Co-op Work Experience Abroad. 0 Hours.

Provides students with an opportunity for work experience abroad. Requires sophomore standing or above. May be repeated up to five times.

COOP 3949. Internship Exchange. 0 Hours.

Offers students an opportunity to participate in an internship experience. May be repeated up to five times.

Cooperative Education - CPS (COP)

Search COP Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=COP>)

COP 1002. Internship. 0 Hours.

Offers students an opportunity to engage in an internship to gain practical experience related to their field of study.

COP 2001. Experiential Learning Projects for Undergraduate Students. 0 Hours.

Offers students an opportunity to apply their curricular learnings in an applied project setting. Working with a sponsor, students refine an applied research topic, perform research, develop recommendations that are shared with a partner sponsor, and create a plan for implementing their recommendations. Seeks to benefit students with a curriculum that supports the development of key business communication skills, project and client management skills, and frameworks for business analysis. Offers students an opportunity to learn from sponsor feedback, review lessons learned, and incorporate suggestions from this review to improve and further develop their career development and professional plan. May be repeated up to two times.

COP 3940. Personal and Career Development. 3 Hours.

Offers students an opportunity to use co-op experience along with this course to clarify their vision of a successful professional and personal future and identify goals to create that vision; identify strengths, weaknesses, and communication and conflict-management preferences; design a career action plan; and develop and practice articulating professional goals, personal brand, and knowledge and experience gained from co-op. Encourages students to engage in a combination of introspection, critical reflection on experiences in the workplace, and with online collaborative learning and group behavior; learn to identify and analyze career and personal development opportunities in the external environment; and practice communication, relationship-building, conflict management, and leadership skills. This companion course to an internship or co-op requires permission of the CPS Office of Cooperative Education.

COP 3944. Co-op Work Experience--Part Time. 0 Hours.

Offers students an opportunity to engage in work experience that relates to their academic field of study. May be repeated up to four times.

COP 3945. Co-op Work Experience--Full Time. 0 Hours.

Offers students an opportunity to engage in work experience that relates to their field of study. May be repeated without limit.

COP 4500. Experiential Learning Preparation. 0 Hours.

Seeks to help students apply their curricular learnings in an applied project setting. Working with a sponsor, students refine an applied research topic, perform research, develop recommendations that are shared with a partner sponsor, and create a plan for implementing their recommendations. Seeks to benefit students with a curriculum that supports the development of key business communication skills, project and client management skills, and frameworks for business analysis. Offers students an opportunity to learn from sponsor feedback, review lessons learned, and incorporate suggestions from this review to improve and further develop their career development and professional plan.

COP 4946. Global Co-op Work Experience - Full Time. 0 Hours.

Offers students an opportunity to engage in a global work experience that relates to their field of study. May be repeated without limit.

COP 5001. Preparing for Experiential Learning. 0 Hours.

Seeks to prepare students for an experiential learning placement. Offers students an opportunity to develop a job search strategy, gain greater understanding of their career field and the skills and traits required, and understand the key components of business professionalism. The goal is that the student should gain a greater understanding of the CPS cooperative education and academic internship policies, procedures, and expectations.

COP 5002. Internship. 0 Hours.

Enables students to engage in an internship to gain practical experience relating to their field of study. May be repeated up to two times.

COP 5003. Experiential Learning Projects for Graduate Students. 0 Hours.

Offers students an opportunity to apply their curricular learnings in an applied project setting. Working with a sponsor, students refine an applied research topic, perform research, develop recommendations that are shared with a partner sponsor, and create a plan for implementing their recommendations. Seeks to benefit students with a curriculum that supports the development of key business communication skills, project and client management skills, and frameworks for business analysis. Offers students an opportunity to learn from sponsor feedback, review "lessons learned," and incorporate suggestions from this review to improve and further develop their career development and professional plan. May be repeated up to three times.

COP 6940. Personal and Career Development. 3-4 Hours.

Offers a companion course to an internship or co-op. Offers students an opportunity to use the work experience along with this course to (1) clarify vision of a successful professional and personal future and identify goals to creating that vision; (2) identify strengths, weaknesses, and communication and conflict-management preferences; (3) design a career action plan; and (4) develop and practice articulating professional goals, personal brand, and knowledge and experience gained from the co-op. Encourages students to engage in a combination of (1) introspection; (2) critical reflection on experiences in the workplace and with online collaborative learning and group behavior; (3) learning to identify and analyze career and personal development opportunities in the external environment; and (4) practicing communication, relationship building, conflict management, and leadership skills. Requires permission of the CPS Office of Cooperative Education.

COP 6944. Co-op Work Experience—Part Time. 0 Hours.

Offers students an opportunity to engage in work experience that relates to their academic field of study. May be repeated up to four times.

COP 6945. Co-op Work Experience—Full Time. 0 Hours.

Offers students an opportunity to engage in work experience that relates to their field of study. May be repeated without limit.

COP 6946. Global Co-op Work Experience—Full Time. 0 Hours.

Offers students an opportunity to engage in a global work experience that relates to their field of study. May be repeated without limit.

COP 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

Counseling and Applied Educational Psychology (CAEP)

Search CAEP Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=CAEP>)

CAEP 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CAEP 2010. Counseling and Applied Educational Psychology in a Global Context. 4 Hours.

Explores education, college student development, school psychology, and counseling in a global context. Students explore these issues internationally as they are exposed to the current professional standards and practice of fields related to counseling and applied educational psychology. Also studies the impact of the culture of the international site on the profession. Taught abroad. May be repeated without limit.

CAEP 2012. Health Psychology: An Introduction to Concepts, Theories, and Research. 4 Hours.

Introduces the field of health psychology, which studies the role of psychology in health, illness, and healthcare. Topics include sustaining and promoting health, as well as experiencing illness and the body. Discusses focusing on people's behaviors, perceptions, emotions, and understandings of health and illness, within the contexts of relationships and culture. Also discusses how the theories and concepts of health psychology are instrumental in health promotion and prevention (including relevance to students' own well-being). Specific themes include the biopsychosocial model of health; stress, coping, and social support; health-promoting and health-risk behaviors; behavior change theories and approaches; gender and health; health disparities; and the relevance of health psychology for health promotion.

CAEP 2020. International Perspectives on Student Development and Higher Education Administration. 4 Hours.

Offers students an opportunity to visit colleges and universities abroad and to observe college student development and higher education administration in a global context. Includes lectures conducted by a Northeastern and host-country faculty and administrators on the history of higher education in the international site, the administration of student affairs/services, student development, and other topics as they relate to universities and the community. May be repeated without limit.

CAEP 2101. Behavioral Assessment and Treatment of Health Problems in the 21st Century. 4 Hours.

Focuses on the application of principles of behavior analysis to address health problems in the 21st century, such as obesity, addiction, and adherence to medical procedures. Offers students an opportunity to develop an understanding of basic behavioral principles and how those principles are applied to assess and treat health problems. Compares and contrasts a behavioral approach with other traditional methods in health psychology. Emphasizes systems of measurement, evaluation (single subject design), and treatment. Studies how a behavioral approach is integrated into a multidisciplinary treatment plan.

CAEP 2105. College Student Mental Health. 4 Hours.

Explores the mental health issues of college student populations, especially the mental health challenges that exist in students prior to college enrollment that may affect their matriculation through college. Explains those mental health issues that arise as a result of being a college student. Includes the mental health advocacy needed by these students as well as the services and activities that exist to address their needs.

CAEP 2106. History and Systems of Psychology. 4 Hours.

Offers an overview of the major people and ideas that have helped to shape the field of psychology. Considers both historical and philosophical influences, as well as systems relevant to Western intellectual thought. Affords students the opportunity to become aware of, and gain knowledge about, some of the assumptions, criteria, and systems shaping past and current theories of psychology.

CAEP 2107. Introduction to School Psychology. 4 Hours.

Introduces the field of school psychology, including the history, foundations, and future of the profession; the different roles and functions; the professional issues and standards; licensing and credentialing issues; ethical and legal issues; and the various associations of school psychologists. Discusses the influences of organization and operation of school systems, policy development, and school climate on children as well as school psychologists.

CAEP 2899. Introduction to College Student Development and Student Affairs. 4 Hours.

Offers students an opportunity to obtain a basic understanding of the role of the student affairs professional and the theories of college student development that serve as a foundation for practice. Emphasizes the importance of cocurricular educational experiences of students attending institutions of higher education as well as leadership development, problem solving, and career exploration in student affairs.

CAEP 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CAEP 2991. Research in Counseling and Applied Educational Psychology. 1-4 Hours.

Offers an opportunity to conduct introductory-level research or creative endeavors under faculty supervision.

CAEP 3480. Counseling Theories and Practice. 4 Hours.

Surveys major theoretical approaches to counseling. Provides training and practice in listening skills to aid in the development of facilitative responses. Combines didactic representations and experiential activities to assist in understanding and implementing a variety of counseling approaches. Requires prior completion of one introductory social science course.

CAEP 3485. Mental Health and Counseling. 4 Hours.

Explores those characteristics that constitute a mentally healthy person, factors in society that impact emotional health, the mind-body relationship, stress, and ways to achieve a higher level of emotional well-being. Offers students the opportunity to work in triads, small groups, and large group discussions. Role-play is utilized where appropriate. Requires prior completion of one introductory social science course.

CAEP 3899. Relationships in College. 4 Hours.

Explores the interpersonal interactions of traditional-age college students with their peers, faculty, roommates, romantic partners, and family. Investigates the implications of relationships on the college student's well-being, growth, and development. Requires students to discuss and analyze the impact of technology on relationships and how it enhances or diminishes effective communication in college. Emphasizes the importance of cultivating relational skills that can be applied in students' postacademic lives.

CAEP 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CAEP 4525. Introduction to Professional Psychology. 4 Hours.

Offers students an opportunity to gain an understanding of the roles and functions psychologists have in different work settings and how psychological theory, techniques, and research can be applied in real-world situations. Studies the several different areas of professional psychology, including counseling psychology, school psychology, clinical psychology, early intervention, applied behavior analysis, and organizational psychology. Students also have an opportunity to learn how to prepare themselves for graduate school and how to put together an impressive application to graduate school programs. Intended for advanced undergraduate students who are majoring in psychology or human services or who have taken several courses in psychology and related areas.

CAEP 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CAEP 4991. Research. 4 Hours.

Offers an opportunity to conduct research under faculty supervision.

CAEP 4992. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

CAEP 5150. Early Intervention: Family Systems. 3 Hours.

Introduces students to the theory and practice of family interventions with a diverse population including infants, toddlers, and preschoolers with special needs. Discusses family systems, developmental, coping, crisis, and ecological theories and practices. Teaches assessment and intervention skills. Integrates theories of exceptionality as they pertain to family systems into course material.

CAEP 5151. Early Intervention: Infant and Toddler Development, Risk, and Disability. 3 Hours.

Introduces students to the major theories of development and their implications for intervention. Presents and discusses infant/toddlers' development, risk, and disability in the areas of cognition, communication, motor skills, social/emotional development, and adaptive skills, and considers variation in development as a result of multiple factors. Is team-taught by professors drawn from school psychology, special education, speech-language pathology, counseling psychology, nursing, and physical therapy.

CAEP 5153. Early Intervention: Assessment and Intervention. 3 Hours.

Covers assessment models and the multidomain tests used in early intervention. Students become familiar with informal and formal instruments used in different areas including cognition speech and language, motor, and social/emotional domains. Explains the process and responsibilities for the writing of individualized service plans (ISPs), as well as variety of intervention models, methods, and strategies to be implemented in natural environments. Is taught by professors drawn from special education, speech-language pathology, counseling psychology, nursing, and physical therapy. Students participate in Northeastern's Global Early Intervention Network. .

CAEP 5200. Motivational Interviewing in a Healthcare Setting. 3 Hours.

Designed for clinicians working or who hope to work in interdisciplinary healthcare settings. In today's rapidly changing healthcare climate, positive health behavior change is a priority. Motivational interviewing (MI) is an important evidenced-based clinical approach useful to healthcare providers trying to help patients reduce smoking or substance use, achieve medication adherence, enhance medical therapy engagement, or manage chronic illnesses. Offers participants an opportunity to learn the foundations of MI as well as practice key MI techniques. The curriculum is based on research describing the conceptualization of MI, its principles, empirical evidence for MI, and methods of MI training.

CAEP 5253. Early Intervention: Assessment and Intervention. 3 Hours.

Covers assessment models and the multidomain tests used in early intervention. Students become familiar with informal and formal instruments used in different areas including cognition speech and language, motor, and social/emotional domains. Explains the process and responsibilities for the writing of individualized service plans (ISPs), as well as variety of intervention models, methods, and strategies to be implemented in natural environments. Is taught by professors drawn from special education, speech-language pathology, counseling psychology, nursing, and physical therapy. Students participate in Northeastern's Global Early Intervention Network.

CAEP 6200. Introduction to Counseling: Theory and Process in an Ecological Context. 3 Hours.

Provides an overview of counseling and psychology from the ecological perspective. Covers the history, theories, and process of counseling across forces within psychology and across individuals (children and adults), groups, and families. Includes an introduction to counseling skills.

CAEP 6201. Introduction to Assessment. 3 Hours.

Introduces testing and assessment in psychology and education including group achievement tests. Covers uses of tests in society, the politics and economics of tests, types of tests, test statistics, reliability, validity, item analysis, test construction, new movements in testing, and applications. Introduces descriptive statistics as a basis for understanding the statistical basis for establishing norms, scales, and for understanding approaches to scoring.

CAEP 6202. Research, Evaluation, and Data Analysis. 3 Hours.

Introduces topics in research and evaluation from a consumer perspective. Covers types of research studies and methodologies, philosophical bases for perspectives, research design, evaluation and outcomes assessment, data analysis techniques, clinical and qualitative approaches, and interpretation of research findings.

CAEP 6203. Understanding Culture and Diversity. 3 Hours.

Works from a broad definition of culture and diversity. In addition to traditional culture and ethnic classifications, examines disability, poverty, and gender as culturally defining factors. Also explores the dynamics of culture in social systems, with the perspective of valuing differences in society and sociocultural forces impinging on culture from the ecological perspective.

CAEP 6204. Assessment of Culturally and Linguistically Diverse Children. 3 Hours.

Studies psychoeducational assessment of English-language learners (ELL), including an ecological perspective of the challenges and strengths of ELLs in U.S. schools; research and theory on second language acquisition and its impact on classroom learning and test scores; measurement of language dominance and proficiency; foundations of bilingual education; IDEA (2004) nondiscriminatory evaluation criteria for special education eligibility; how to address IDEA exclusionary clauses in evaluating ELLs for eligibility for each special education criterion, especially specific learning disabilities and communication impairment; linguistic and cultural considerations in the selection of assessment tools (including cultural validity of tests); linguistic and cultural considerations in the evaluation of evidence for evidence-based intervention and the RTI model; and research and methods regarding assessment of ELLs.

CAEP 6205. Intervention for Culturally and Linguistically Diverse Children. 3 Hours.

Constitutes one of a sequence of courses that seek to foster bilingual school psychology competencies in providing culturally and linguistically sensitive assessment and intervention services to English-language-learner (ELL) children and adolescents. Concurrent with practicum in school settings with culturally and linguistically diverse (CLD) children. Offers students an opportunity to learn how to apply the ecological and multicultural perspectives—as well as the research, knowledge, and skills learned from previous courses—to their practice in schools and to learn and apply knowledge and skills for serving English-language learners with and without disabilities in counseling, consultation, schoolwide intervention, and prevention, including selecting culturally and linguistically sensitive evidence-based interventions for CLDs.

CAEP 6206. Learning Principles. 3 Hours.

Provides an overview of the theories of learning, cognition, and emotion. Introduces the major theories and relates them to applications and interventions in psychology and education.

CAEP 6215. Groups: Dynamics and Leadership. 3 Hours.

Presents an overview of the functions of supervision, consultation, prevention and psychoeducation programs, workshops, staff training, action research, social change, and working in professional and community associations using principles of advanced group development and dynamics.

CAEP 6218. Infant, Child, and Adolescent Development. 3 Hours.

Provides an overview of development from birth through late adolescence. Covers the major theories of human development from a culturally informed, gender-sensitive ecological orientation. Reviews stages and theories of development from an interdisciplinary perspective and related to implications for learning. Examines cognitive, language, social/emotional, play, and physical aspects of development.

CAEP 6220. Development Across the Life Span. 3 Hours.

Identifies and addresses culturally and gender-sensitive developmental issues throughout the life span, from the conventional stages of childhood through the end of life. Discusses ethnic, economic, gender, relational, and sexual identities, as well as health-medical and aging concerns.

CAEP 6222. Human Sexuality. 3 Hours.

Designed for the twenty-first century and the critical issues that have evolved in the field. Includes current information on issues in human sexuality (and acts as a forum for the discussion of current trends), which may include HIV/AIDS, abortion, ethics and morality in genetic engineering, sex education in the school and home, teen sexuality and pregnancy, personal behaviors, social aspects of acquaintance rape, early sexual experiences, divorce, and remarriage. Allows for the development of counseling skills needed to deal with various issues.

CAEP 6235. Vocational, Education, and Career Development. 3 Hours.

Focuses on the interactions of economic needs, work, class, education, and contemporary social trends as part of human development in a sociohistoric ecological context.

CAEP 6242. Psychopathology: Diagnosis and Treatment Planning. 3 Hours.

Identifies categories of human difficulty and abnormal behavior through current DSM terminology. Is based in a cultural and gender competent bio-psycho-social model over the life span. Discusses both preventive and individual interventions for each category. Also introduces treatment planning and treatment guidelines.

CAEP 6247. Child and Adolescent Psychopathology. 3 Hours.

Covers DSM-IV and major forms of psychopathology including the neuroses (obsessional states, hysteria, anxiety states, and phobias), the psychoses (schizophrenia, mania, depression, and paranoia), psychosomatic, sociopathy, conduct disorders, organic disorders, and mental retardation. Discusses the relationship between categories of special education disabilities (emotional impairment, autism, and so on) and DSM-IV.

CAEP 6250. Individual Interventions. 3 Hours.

Focuses on a variety of individually focused interventions: standard techniques used to achieve change goals as well as crisis intervention and prevention. Use of multimodal interventions (for instance, expressive, action) are joined with specific problems that individuals might face. Also addresses crisis intervention, solution-focused treatment planning, and promoting resiliency and activism.

CAEP 6260. Community Counseling Psychology. 3 Hours.

Addresses organizational and systems impact, stressors, and change efforts. Draws from the community, consultation, organizational, prevention, and social psychology literature. Considers understanding of health promotion in social and institutional contexts. Also explores crisis, coping, and social change.

CAEP 6262. Evaluation and Outcomes Assessment of Community, School, and Health-Related Programs. 3 Hours.

Covers theories and approaches to evaluation and outcomes assessment in community and school-based programs. Reviews evaluation questions, target audiences for evaluation and outcomes, the politics and economics of studying program effects, and qualitative approaches.

CAEP 6282. Ethics and Professional Development. 3 Hours.

Addresses professional development and mental health counseling issues. Also considers professional ethics from ACA, APA, and FTI, with emphasis on the professional functioning of counselors. Discusses current issues in the practice and control of mental health. Also addresses the role of professional organizations and state licensing.

CAEP 6283. Brief Therapies. 3 Hours.

Discusses brief forms of therapy and counseling. Addresses therapies with each of the theoretical four forces. Discusses advantages and disadvantages of brief therapy. Considers the fit of the therapy with the person or client system as well as the goals and context. Also explores empirical, ethical, pragmatic, and political viewpoints.

CAEP 6286. Family Counseling Interventions. 3 Hours.

Examines the role and social construction of families. Includes a brief overview of theoretical perspectives and especially considers the more recent implications of feminist and multicultural critiques. Discusses relationship building and specific interventions with families in terms of appropriate use of clinical, ethical, and gender/race-ethnic/class competencies.

CAEP 6287. Group Counseling. 3 Hours.

Covers group design, dynamics, and leadership as well as their application in a range of mental health group activities. Since the conventional theoretical orientations have been covered in the theory course (CAEP 6200), this course approaches group work through a broader perspective. For example, while expressive groups based in a humanistic tradition and insight gained through psychodynamic and cognitive traditions are in the course, such recent developments as adventure and psychoeducation group work are also included.

CAEP 6290. Reality Therapy. 3 Hours.

Deals with the theory and practice of choice theory and reality therapy. Emphasizes the principles of brief therapy, and provides opportunities to develop implementation plans to use on an individual, group, and systems basis. Utilizes a variety of methods including reading, demonstrations, role-playing, and media. Designed for educators and mental health professionals functioning in a variety of educational and healthcare settings.

CAEP 6300. Introduction to College Student Development. 3 Hours.

Covers various theories and models of college student development and the principles for translating theory into practice. Provides understanding of the demographics of college student populations, the integration of cognitive and affective education, and the creation of community on campus. Includes developmental theories and models pertaining to subdominant groups, such as women, African-Americans, Asian Americans, Latinos, Native Americans, international, gays and lesbians, and disabled persons.

CAEP 6301. Planning and Administering Student Affairs. 3 Hours.

Focuses on assessing developmental needs of college students and designing, delivering, and evaluating educational programs that address those needs. Emphasizes understanding diversity within student and staff populations. Surveys all of the services typically offered by student services departments and divisions. Involves guest lecturers who are department heads within the most important types of student services offices.

CAEP 6302. Law and Ethics in Higher Education. 3 Hours.

Provides an overview of the law as it applies to higher education administration. Emphasis is on those areas affecting the student affairs professional. Covers the current state of the law, as well as the appropriate skills and resources to stay current in an ever-changing field. Also studies the ethical standards of student affairs.

CAEP 6303. Financial Aspects of Higher Education. 3 Hours.

Seeks to provide students of higher education administration with information they need to better understand and participate more effectively in the funding, budgeting, and revenue/expenditure processes in higher education. Examines the role of strategic planning and resource allocation in public and private colleges/universities. Also examines various topics, issues, and current trends in the financial arena of higher education.

CAEP 6305. Special Topics in Higher Education. 3 Hours.

Offers various topics each term the course is offered. Topics are determined by significant events and changes in the field. Can be taken for up to six semester hours as long as topics are different. May be repeated without limit.

CAEP 6324. Programmed Learning. 3 Hours.

Reviews the theoretical and experimental foundations of programmed instruction and errorless learning. Emphasizes the detailed analysis of stimulus control, its measurement, and ways to produce it. Current research on discrimination learning and stimulus equivalence are a major focus.

CAEP 6326. Behavioral Concepts and Principles. 3 Hours.

Designed to offer a foundation in the science of behavior. Through a partially self-paced method, offers students an opportunity to learn and demonstrate understanding of the underpinnings of science, their relation to behavior analysis, and the basic principles of behavior. Covers positive and negative reinforcement and punishment, extinction, stimulus control, and motivating operations.

CAEP 6327. Behavior Assessment. 3 Hours.

Provides an in-depth review of observation and measurement techniques in applied behavior analysis. Introduces key elements of behavioral assessment including systematic assessment of preference, and assessment of behavior function through indirect methods, direct methods, and systematic manipulations.

CAEP 6328. Research and Design Methods. 3 Hours.

Reviews principles of operant learning, with an emphasis on basic laboratory research. Studies single-subject experimental design in-depth, emphasizing critical analysis of published research reports and the implementation of these methods in service settings. Requires a feasible experimental design project, with actual or hypothetical data, which must be written in the form of a scientific report.

CAEP 6329. Service Administration. 3 Hours.

Presents a comprehensive overview of general and specific services for individuals with developmental disabilities, from organizational and administrative points of view. Provides in-depth coverage of ethical principles in the design and implementation of behavior analysis services and applied research. Considers issues in staff training, performance management, and program evaluation.

CAEP 6331. Advanced Learning Seminar 1. 3 Hours.

Covers theoretical underpinnings of operant and respondent conditioning, with emphasis on relating principles of behavior to problems of reinforcement, motivation, comparative psychophysics, and physiological psychology.

CAEP 6332. Advanced Learning Seminar 2. 3 Hours.

Continues the review of theoretical underpinnings started in CAEP 6331. Includes an introduction to conceptual issues in behavior analysis, for example, verbal behavior and language development.

CAEP 6334. Applied Programming Seminar 1. 3 Hours.

Focuses on the systematic application of principles of behavior analysis to interventions in applied settings. Allows students to design, test, and evaluate instructional programs for remedial application to behavior problems and to test instructional theory. Emphasizes the relationship between behavioral assessment and behavioral intervention. Provides supervision through the weekly research and data seminar in collaboration with the student's project adviser. May be repeated without limit.

CAEP 6335. Applied Programming Seminar 2. 3 Hours.

Focuses on the practical issues surrounding development of an applied thesis research topic. Students develop their thesis topic and prepare a written proposal for their thesis research. Students present the initial thesis proposal and periodic updates during the weekly seminar. Thesis committee members are invited to attend their students' presentations to provide feedback and critique of the developing proposal. May be repeated without limit.

CAEP 6336. Systematic Inquiry 1. 3 Hours.

Requires each student to collect a comprehensive bibliography on a significant topic in applied behavioral research and complete a thorough written review. Emphasizes the integration and analysis of experimental findings and theoretical foundations of the research area, critical evaluation of current research, and the identification of potentially fruitful future research. Frequent presentation of current research by students helps develop their oral communication skills and prepares them for becoming contributing professionals in the field of behavior analysis.

CAEP 6337. Systematic Inquiry 2. 3 Hours.

Requires each student to collect a comprehensive bibliography on a significant topic in applied behavioral research and complete a thorough written review, which typically serves as the introduction to the student's thesis. Emphasizes the integration and analysis of experimental findings and theoretical foundations of the research area, critical evaluation of current research, and the identification of potentially fruitful future research. Frequent presentation of current research by students helps develop their oral communication skills and prepares them for becoming contributing professionals in the field of behavior analysis.

CAEP 6338. Clinical Practice Supervision. 1-3 Hours.

Offers a seminar for supervision of a clinical experience in practicum, internship, or fieldwork. Meets on campus with instructor/supervisor and complements individual supervision at the practice site. May be repeated for up to 6 total credits.

CAEP 6345. Learning Problems: Educational, Biological, and Ecological Perspectives. 3 Hours.

Focuses on learning problems in relation to developmental tasks and curriculum frameworks including reading and writing. Examines the types and causes of learning problems and individual learning styles from constructivist, neuropsychological, and ecological perspectives. Reviews methods for assessment of physical, emotional, intellectual, and social development in childhood and adolescence. Emphasizes special education legislation and current service delivery programs.

CAEP 6347. Behavior Management. 3 Hours.

Covers theory, research, and practice pertaining to management of behavior in preschool, elementary, and high school classrooms. Presents development of practical behavioral interventions using a systematic problem-solving process (including functional behavioral assessment). Includes skills and techniques of preventing and remediating behavior problems.

CAEP 6350. Introduction to Cognitive Assessment. 3 Hours.

Introduces cognitive assessment and the relationship of cognitive theories to assessment. Also includes practice in administering and interpreting specific tests of cognitive functioning, such as the Wechsler Scales and the Woodcock-Johnson.

CAEP 6352. Personality Assessment. 3 Hours.

Administers and interprets projective tests, behavior rating scales, and personality tests. Offers advanced level of integrating results from different measures in report writing.

CAEP 6353. Curriculum-Based Assessment and Instruction. 3 Hours.

Presents curriculum frameworks (reading, mathematics), developmental sequences (language), socialization, and life skills as areas of learning breakdown. Focuses on procedures for evaluating a child's current level of understanding and performance in one of these areas, determining goals of intervention, formulation of individualized education programs (IEPs), development of instructional plans, and monitoring progress.

CAEP 6354. Social, Emotional, and Behavioral Assessment. 3 Hours.

Uses a problem-solving framework designed to help students to develop skills in identifying common school-based social, emotional, and behavioral problems and designing targeted assessment plans. Offers students an opportunity to gain experience in the administration, scoring, and interpretation of relevant measures designed to assess children's and adolescents' social, emotional, and behavioral functioning; in the synthesis of multisource/multimethod data; and in psychological report writing.

CAEP 6360. Consultation and Program Evaluation. 3 Hours.

Overviews different consultation theories including behavioral, psychodynamic, and systems perspectives. Offers a focus on skill development with respect to a broad-based and pragmatic approach to client-centered behavioral consultation. Uses computer networks and e-mail in client-centered and peer consultation. Offers evaluation of the implementation and outcomes of consultation and related service delivery programs.

CAEP 6365. Seminar in School Psychology. 3 Hours.

Covers the philosophical, historical, technical, and school administrative issues contributing to the professional identity of school psychologists. Emphasizes ethical standards, public policy, and legislation that impact school psychology.

CAEP 6371. Student Affairs/Services and College Student Development in Ghana. 3 Hours.

Examines the administration of student services/affairs and college student development in institutions of higher education in Ghana, West Africa. Explores issues of access, student development, and higher education administration in the context of Ghanaian culture and society. Offers students an opportunity to engage in a comparative analysis of Ghanaian colleges and universities with those of the United States. Also examines college-community collaborations as they relate to addressing the challenges of this developing African country.

CAEP 6375. Substance Use and Treatment. 3 Hours.

Covers use, abuse, and treatment of both legal and illegal psychoactive drug agents. Includes an introduction to psychotropic medications, overview of illicit substance use, differential substance abuse, interventions and treatment, and related social issues.

CAEP 6380. Seminar in Feminist Psychology. 3 Hours.

Looks at sex-gender socialization and role ascription in the development of women and men. Examines feminine and masculine gender role stereotypes and constructs in mental health theory, procedures, and practices. Introduces the variety of feminist standpoints and explores their impacts on the conceptualization of health and healing. Presents major points in feminist therapy and psychology. The student examines selected areas in-depth within this course.

CAEP 6390. History and Systems of Psychology. 3 Hours.

Examines the development of psychological theories in the context of western intellectual development. Attends to the underlying epistemological assumptions and historical and cultural forces on psychology. Also emphasizes some of the potential contributions to psychology of other world civilizations and to paradigmatic strengths and limits.

CAEP 6394. Advanced Multicultural Psychology. 3 Hours.

Provides critical analyses of "universalist" perspective counseling and development theory. Explores a variety of implications for culturally competent psychological work. Addresses process, procedures, and interventions as well as theory and inquiry. Focuses on individual and cultural differences in counseling and professional psychological services.

CAEP 6399. Clinical Skills in Counseling Psychology. 3 Hours.

Develops self-awareness, communication skills, and therapeutic and practice procedures.

CAEP 6400. Prepracticum in School Psychology. 1 Hour.

Requires a minimum of 75 hours of school-based experience. Designed to orient school psychology graduate students to the school psychology profession and the practicum. Offers students an opportunity to understand the role of the school psychologist and the school environment. Seeks to familiarize students with the range of different school psychological services and the range of students who receive services from school psychologists, including students from different cultures and students with and without disabilities. Emphasizes observational learning. Students must complete the entire prepracticum and submit the documentation of its successful completion prior to beginning the practicum experience.

CAEP 6401. Counseling Children and Adolescents in Schools 1. 3 Hours.

Constitutes the first semester of a two-semester integrated course sequence on child and adolescent counseling interventions. Seeks to give students a foundation in the selection, evaluation, and application of empirically supported counseling interventions for children and adolescents. Topics include individual and group counseling techniques as well as specific clinical issues related to school-age children, families, family-school collaboration, and systems.

CAEP 6402. Counseling Children and Adolescents in Schools 2. 3 Hours.

Constitutes the second semester of a two-semester integrated course sequence on child and adolescent counseling interventions. Seeks to give students a foundation in the selection, evaluation, and application of empirically supported counseling interventions for children and adolescents. Topics include individual counseling techniques as well as specific clinical issues related to school-age children, families, and systems.

CAEP 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CAEP 7701. Doctoral Seminar in Counseling Psychology. 1 Hour.

Seeks to advance the student's development as a counseling psychologist based on a scientist-practitioner and ecological model and to ensure that the student is informed regarding the historical and current developments of the discipline of counseling psychology. May be repeated up to three times.

CAEP 7710. Advanced Clinical Assessment. 3 Hours.

Covers contemporary cognitive and personality testing as used in a variety of practice settings. Covers such areas as pain management, risk assessment, and learning styles. PhD students only.

CAEP 7711. Measurement: Advanced Psychometric Principles. 3 Hours.

Offers students an opportunity to gain an understanding of classical and modern test theory as well as to develop the capability to use these theories to develop tests for their own purposes. Topics include test validity, item statistics useful in test construction, score scales and norms commonly used in educational testing, item bias and test bias, and ideas of fairness and equity in educational and psychological testing. Introduces factor analysis as well as the major extensions and alternatives to classical test theory, generalizability theory, and item response theory (latent trait theory).

CAEP 7712. Intermediate Statistical Data Analysis Techniques. 3 Hours.

Emphasizes the use of existing theories and models as a basis for the formation of questions and hypotheses and for designing research to address those questions and hypotheses. Covers the logic of design of research and hypothesis testing, regression, general linear model (GLM), statistical model building and testing, hierarchical regression, and analysis of covariance structures. Emphasizes consideration of power and effects. Requires students to do problems on the computer and/or by hand using data sets assigned in class. Requires prior completion of a course in basic statistics and a course in methods of research design or permission of instructor.

CAEP 7715. Advanced Research and Data Analyses 1. 3 Hours.

Offers the first course in a year-long, two-semester sequence. Studies the relationship between design and analysis in research in the behavioral sciences. Emphasizes the use of existing theories and models as a basis for the formation of questions and hypotheses and for designing research to address them. Covers the logic of design of research, objectivity, and ethical concerns, as well as the role of perspectives on epistemology, such as neopositivism, phenomenology, and pragmatism. Reviews descriptive statistics and correlation techniques to include simple regression and nonparametric methods. Requires students to do problems on the computer and/or by hand using data sets assigned in class. Utilizes SPSS, SAS, and other computer analysis packages including graphic methods of depicting data. Emphasis is on interpretation of the results of quantitative analyses. Emphasizes the analysis of research findings within an ecological context. Student does a research project from a data set and turns in a written report in APA format suitable for publication. Studies how to critique existing published investigations, taking a researcher's perspective. Requires previous graduate work in research methods and statistics. Restricted to PhD students.

CAEP 7716. Advanced Research and Data Analyses 2. 3 Hours.

Investigates techniques and models for exploring research questions and testing hypotheses developed in the first semester. Explores structural and advanced correlational models using linear and nonlinear approaches, multivariate data analysis, psychometric statistical theory and techniques, and qualitative inquiry. Requires considerable hands-on experience with real data sets. Explores qualitative and methodological approaches to ecological analysis of systems and contexts. Requires students to do problems on the computer and/or by hand using data sets assigned in class. Utilizes SPSS and other computer analysis packages including graphic methods of depicting data. Also covers specialized applications (text analysis software, survey design and scoring software, or specialized graphing programs). Students do projects, prepare reports of an analysis from the data set, and turn in a written report in APA format suitable for publication.

CAEP 7720. Advanced Clinical Interventions. 3 Hours.

Considers assessment and intervention from an ecological/systems perspective on a case-by-case basis. Uses individual, group, family, organizational, and community modalities. Emphasizes case conceptualization as a framework for treatment planning and evaluation. Emphasis is on impact of social systems and sociocultural factors. Restricted to PhD students with previous work in group and family counseling.

CAEP 7732. Legal and Ethical Issues in Community and Educational Settings. 3 Hours.

Designed to provide a systematic orientation to the ethical and professional issues faced by mental health practitioners in their teaching, research, and practice in a seminar setting. Addresses APA ethical guidelines, legal aspects of psychological practice including licensing, confidentiality in practice and research, historical perspective, supervision and training issues, and current topics of professional concern in counseling and school psychology practice. Considers relevant court decisions affecting psychological practice with children, adults, and family.

CAEP 7741. Advanced Fieldwork 1. 1,2 Hour.

Offers students training in clinical settings to develop clinical skills in assessment, consultation, and interventions under supervision. Provides support and evaluation of the advanced fieldwork placement that second-year students are involved in throughout the year. Offers a seminar format, which is led by a faculty supervisor who is the official liaison between Northeastern University and the advanced fieldwork sites. The major objectives are an examination and support of clinical work within various assessment and treatment modalities; and an examination of systems issues within placement sites, which include but are not limited to administrative and supervisory issues. Students submit tapes and detailed process notes of sessions, videotape role-playing, and critique the tapes and videos, offering one another feedback in terms of each student's previously stated goals. Group discussion of clinical/systems issues focus on critical analysis and provision of a supportive atmosphere to explore treatment and systems issues. Requires students to practice in the clinical setting a minimum of twenty hours per week. May be repeated once for up to 2 total credits.

CAEP 7742. Advanced Fieldwork 2. 1,2 Hour.

Continues CAEP 7741. Provides students the opportunity, under supervision in a clinical setting, to develop clinical skills in assessment, consultation, and interventions. Designed to provide support and evaluation of the advanced fieldwork placement for second-year students. Uses a seminar format led by a faculty supervisor who is the official liaison between Northeastern University and the advanced fieldwork sites. Seeks to examine and support clinical work and examine systems issues within placement sites, which include but are not limited to administrative and supervisory issues. Students submit tapes and process notes of sessions, videotape role-playing, and critique the tapes and videos in terms of each student's previously stated goals. Focuses group discussion on critical analysis and provision of a supportive atmosphere to explore treatment and systems issues. Requires students to practice in the clinical setting a minimum of twenty hours per week. May be repeated once for up to 2 total credits.

CAEP 7743. Advanced Fieldwork 3. 1,2 Hour.

Continues CAEP 7742. May be taken by students who elect to do additional fieldwork to develop better, or deeper, skills or new skill areas. Requires students to practice in the clinical setting a minimum of twenty hours per week. May be repeated once for up to 2 total credits.

CAEP 7744. Advanced Fieldwork 4. 1,2 Hour.

Continues CAEP 7743. Requires students to practice in the clinical setting a minimum of twenty hours per week. May be repeated once for up to 2 total credits.

CAEP 7750. Biological Bases of Behavior. 3 Hours.

Lays the foundations for an understanding of brain-behavior relations, with an emphasis on implications for the clinician. Topics include basic neuroanatomy, the development of the nervous system over the life span, and hormonal and neuropharmacological aspects of behavioral regulation. Reviews perceptual and motor systems, cognition, emotions, and motivational states from the perspective of their biological underpinnings. Underscores the unfolding of these processes within a psychosocial and cultural context.

CAEP 7755. Cognitive and Affective Bases of Behavior. 3 Hours.

Provides students with an in-depth treatment of the theories of the cognitive and affective bases of behavior and their applications. Reviews the impact of thinking, emotions, affect, and temperament on behavior in the context of the ecological model. Restricted to PhD students.

CAEP 7756. Social Psychology in an Organizational and Ecological Context. 3 Hours.

Conducted as a seminar designed to meet the needs of doctoral students in school and counseling psychology for a course that spans theory and principles of social psychology from early work in the field-in such topics as social pressure, field theory, cognitive dissonance, and attitude formation-to more modern work in expectations, attitudes, and organizational behavior. Surveys basic concerns in social psychology, and considers material related to application in schools, communities, and organizations in which mental health is practiced. For example, in the study of group dynamics, stresses applications to group learning, administrative leadership, and organization theory. Also covers research paradigms, social change, social influence, system consultation, and community issues as they relate to social psychological considerations. Restricted to PhD students.

CAEP 7758. Doctoral Seminar in Contemporary Theories of Psychotherapy. 3 Hours.

Offers a critical examination from an ecological/systems perspective of conceptual developmental and clinical elements of contemporary psychotherapy theories. Emphasis is on object relations, social constructionist, and constructivist theories of personality and therapeutic change. Includes selected theoretical and research readings, lectures in student-led discussion. Evaluates critical issues and future directions of contemporary theoretical schools and considers varied approaches to case examples. The different theoretical approaches are examined through the lenses of gender, class, and cultural adequacy. Restricted to PhD students.

CAEP 7771. Research Team Experience 1. 1 Hour.

Offers the first in a sequence of six semester-long courses designed to give students practical experience in research as part of their doctoral training. The rationale is that to become a researcher requires active research experience. This sequence offers students an opportunity to participate in various stages of ongoing research leading up to and including the design of their own research projects. At each stage, the students are given additional responsibility for conceptualization, design, implementation, analysis, and interpretation of research. Students are encouraged to tie their research to other aspects of their training as appropriate. A faculty mentor provides direct supervision to the students. Restricted to PhD students.

CAEP 7772. Research Team Experience 2. 1 Hour.

Offers the second in a sequence of six semester-long courses designed to give students practical experience in research as part of their doctoral training. The rationale is that to become a researcher requires active research experience. This sequence offers students an opportunity to participate in various stages of ongoing research leading up to and including the design of their own research projects. At each stage, the students are given additional responsibility for conceptualization, design, implementation, analysis, and interpretation of research. Students are encouraged to tie their research to other aspects of their training as appropriate. A faculty mentor provides direct supervision to the students. Restricted to PhD students.

CAEP 7773. Research Team Experience 3. 1 Hour.

Offers the third in a sequence of six semester-long courses designed to give students practical experience in research as part of their doctoral training. The rationale is that to become a researcher requires active research experience. This sequence offers students an opportunity to participate in various stages of ongoing research leading up to and including the design of their own research projects. At each stage, the students are given additional responsibility for conceptualization, design, implementation, analysis, and interpretation of research. Students are encouraged to tie their research to other aspects of their training as appropriate. A faculty mentor provides direct supervision to the students. Restricted to PhD students.

CAEP 7774. Research Team Experience 4. 1 Hour.

Offers the fourth in a sequence of six semester-long courses designed to give students practical experience in research as part of their doctoral training. The rationale is that to become a researcher requires active research experience. This sequence offers students an opportunity to participate in various stages of ongoing research leading up to and including the design of their own research projects. At each stage, the students are given additional responsibility for conceptualization, design, implementation, analysis, and interpretation of research. Students are encouraged to tie their research to other aspects of their training as appropriate. A faculty mentor provides direct supervision to the students. Restricted to PhD students.

CAEP 7777. Doctoral Seminar: Program Planning and Evaluation. 3 Hours.

Offers students an opportunity to develop knowledge and skills in program planning and evaluation with a specific focus on promoting the health of children and adolescents. Focuses on program planning and evaluation within the coordinated school health model and the importance of planning, implementing, and evaluating programs within a community-based participatory research (CBPR) framework. Emphasizes the importance of programs that incorporate the intersection of family, school, and community systems. Builds upon the systematic, problem-solving approach to practice woven throughout the curriculum. Emphasizes participatory and context-sensitive approaches to planning and evaluating programs. Seeks to prepare psychologists to plan and evaluate programs systematically in their future work settings.

CAEP 7778. Doctoral Seminar: Leadership, Consultation, and Supervision. 3 Hours.

Seeks to provide both knowledge and skills necessary to engage in leadership, consultation, and clinical supervision activities with respect to groups and organizations in a doctoral-level course. Focuses on the nexus of knowledge and skills that pertain to leadership, consultation, and clinical supervision, which can be considered “indirect” approaches to improving service delivery. They help set the organizational, problem-solving, and interpersonal conditions for others to actualize their potential to (a) provide services to children, families, and adults; (b) develop and implement applied research programs; and (c) successfully collaborate across family, school, and community systems. Considers the empirical basis for leadership, consultation, and clinical supervision within a multicultural and ecological context.

CAEP 7798. Doctoral Internship 1. 1-3 Hours.

Required of all doctoral students in counseling/school psychology PhD programs. Requires a minimum of forty hours per week for twelve months or twenty hours per week for twenty-four months in an accredited (or equivalent by permission) mental health training setting. In addition to internship site supervision and training seminars, interns attend, in person or online, a university-based seminar and complete case assignments. Restricted to PhD students. May be repeated up to two times for up to 3 total credits.

CAEP 7799. Doctoral Internship 2. 2 Hours.

Continues CAEP 7798. Restricted to PhD students.

CAEP 7962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CAEP 7976. Directed Study. 1-4 Hours.

Allows students to pursue topics of individual interest beyond the scope of formal course work under the direction of faculty. May be repeated without limit.

CAEP 8401. Practicum in Counseling Psychology. 3 Hours.

Includes forty hours of client contact plus supervision. Focuses on developing individual and group skills within mental health and human service agencies.

CAEP 8402. College Student Development Practicum 1. 3 Hours.

Offers the first course in a two-semester sequence that involves placement in a field setting from September to June. The student performs three hundred hours of fieldwork over the course of the academic year. Also requires attendance at a weekly practicum seminar.

CAEP 8403. College Student Development Practicum 2. 3 Hours.

Offers the second course in a two-semester sequence that involves placement in a field setting from September to June. The student performs three hundred hours of fieldwork over the course of the academic year. Also requires attendance at a weekly practicum seminar.

CAEP 8415. Practicum in School Psychology 1. 2 Hours.

Offers supervised school-based field experience coupled with seminar class. Requires passing score on the communication and literacy tests of the Massachusetts Tests for Educator Licensure (MTEL).

CAEP 8416. Practicum in School Psychology 2. 2 Hours.

Offers supervised school-based field experience coupled with seminar class.

CAEP 8417. Intensive Practicum in Applied Behavior Analysis 1. 2 Hours.

Offers students supervised experience that is required in order to sit for the BACB exam. Focuses on offering students an opportunity to acquire new behavior analytic skills related to the BACB Task List. Asks students to demonstrate the necessary skills to be a competent behavior analyst in applied settings. Covers preference assessments, task analysis and other skill acquisition programs, and other teaching strategies.

CAEP 8418. Intensive Practicum in Applied Behavior Analysis 2. 2 Hours.

Continues the work of CAEP 8417 with the primary focus on offering students an opportunity to acquire new behavior analytic skills related to the BACB Task List. Covers functional assessment, behavior reduction programs, conditioned reinforcement, data analysis, and clinical decision making.

CAEP 8501. Internship in School Psychology 1. 3 Hours.

Offers supervised school-based field experience coupled with seminar class.

CAEP 8502. Internship in School Psychology 2. 3 Hours.

Offers supervised school-based field experience coupled with seminar class.

CAEP 8510. Internship in Counseling Psychology 1. 3 Hours.

Provides twenty hours per week in a field setting and a two-hour seminar on campus. In addition to providing supervising seminar, addresses practices, procedures, ethics, and policies in professional practice.

CAEP 8511. Internship in Counseling Psychology 2. 3 Hours.

Provides twenty hours per week in a field setting and a two-hour seminar on campus. In addition to providing supervising seminar, addresses practices, procedures, ethics, and policies in professional practice.

CAEP 8553. Advanced Counseling Practicum. 1,2 Hour.

Offers an elective course for doctoral students in the counseling psychology doctoral program who are completing additional years of supervised practical experience (minimum of 20 hours per week for 600 hours) as part of the training for the PhD degree and in clinical preparation for the APPIC/APA internship match process. Offers students training in clinical settings. Includes a seminar to offer students an opportunity to develop clinical skills in assessment, consultation, and interventions under supervision. Provides support and evaluation of the advanced fieldwork placement in which doctoral students are involved throughout the year. Led by a faculty supervisor who is the official liaison between Northeastern University and the advanced fieldwork sites. May be repeated up to five times for up to 6 total credits.

CAEP 9000. Comprehensive Exam. 0 Hours.

Indicates successful completion of the doctoral comprehensive exam.

CAEP 9990. Dissertation. 0 Hours.

Offers dissertation supervision by individual members of the department. Restricted to PhD students. May be repeated once.

CAEP 9996. Dissertation Continuation. 0 Hours.

Supports the continued development of the dissertation. May be repeated without limit.

Counseling Psychology, Rehabilitation, and Special Education - CPS (CRS)

Search CRS Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=CRS>)

CRS 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

Criminal Justice (CRIM)

Search CRIM Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=CRIM>)

CRIM 1000. Criminal Justice at Northeastern. 1 Hour.

Designed to help students adjust to college life and become fully acquainted with the resources and services offered by the University. Covers various campus services, studies how to access various library resources, and focuses on study skills and time management. Also explores various careers for which the criminal justice major can prepare students.

CRIM 1100. Introduction to Criminal Justice. 4 Hours.

Surveys the contemporary criminal justice system in the United States. Students examine the phases of the criminal justice system beginning with the detection of crimes by the police, the handling of the case through the courts, and, finally, the disposition and sentencing of offenders. Issues and characteristics of each of the phases (police, courts, and corrections) are examined as well as identifying the key actors (police, judges, prosecutors, correctional officers, and so forth) of each phase of the criminal justice system. Also introduces students to the U.S. juvenile-justice system.

CRIM 1300. The Death Penalty. 4 Hours.

Reviews the history of the death penalty in the United States from colonial times through the present. Among Western democracies, the United States stands alone in its continued use of capital punishment as a sanction. Examines the contemporary death penalty and the many controversies surrounding its continued use (focusing on U.S. Supreme Court decisions around the constitutionality of the death penalty). Discusses historical and contemporary controversies around the administration of the death penalty including potential innocence, special populations, methods of execution, race and gender biases, costs, deterrence, and international relations.

CRIM 1400. Human Trafficking. 4 Hours.

Offers an overview of human trafficking in its various forms. Emphasizes understanding the experiences and needs of trafficking victims and the methods of operations of traffickers and their networks across various cultural contexts. The trafficking of persons for sex or labor through force, fraud, or coercion has become an increasingly serious problem in modern society. Federal, state, and local criminal justice authorities have been tasked with the responsibility of identifying and rescuing trafficking victims and prosecuting their perpetrators. Offers students an opportunity to critically evaluate the social and cultural practices that give rise to and support human trafficking in the United States and around the globe.

CRIM 1500. Corruption, Integrity, and Accountability. 4 Hours.

Traces the history, nature, and current effects of corruption using concrete cases and illustrations. Covers international and national laws and standards against corruption (with special emphasis on the U.N. Convention against Corruption and the Foreign Corrupt Practices Act). Discusses efforts to measure corruption, governance, and anticorruption efforts. Focuses on the role of stakeholders from private sector to government, civil society, and individual actors. Corruption affects every aspect of our life and its quality. From bribery and illicit enrichment to obstruction of justice, from abuse of power to clientelism and favoritism, corrupt acts touch global, national, and local communities. Illustrates how fundamental are the values and practice of integrity, responsibility, and accountability.

CRIM 1700. Crime, Media, and Politics. 4 Hours.

Discusses and critiques contemporary portrayals of crime and justice in the arenas of political debates and campaigns; news reports; and films, television shows, and music. Covers current events as they occur in these arenas. To set up these discussions, students have an opportunity to develop critical tool kits for assessing these images of crime and justice by reading and discussing theories, research, and critiques. Additionally, students are expected to read and discuss historical portrayals of crime and justice with the goal of identifying both parallels and differences between these and current events.

CRIM 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CRIM 2000. Co-op Integration Seminar 1. 1 Hour.

Orients students for co-op. Offers an overview of how to prepare résumés, practice interviewing skills, consider what students can/should expect from their first co-op, and discuss what employers' expectations are likely to be of them. Prepares students to integrate what they learned in the freshman diversity course into their first co-op. Students are also instructed on how systematically to prepare a journal during the first co-op on issues related to ethics, values, and diversity.

CRIM 2100. Criminal Due Process. 4 Hours.

Focuses on an historical evaluation of the Fourteenth Amendment of the U.S. Constitution and its use in making rights prescribed under the Bill of Rights applicable to the individual states. Examines constitutional requirements in the administration of criminal justice with particular emphasis on the Fourth, Fifth, and Sixth Amendment requirements and their implications on police practices in the areas of arrests, searches and seizures, right to counsel, and eyewitness identification. Expects students to be familiar with basic concepts and legal language as well as the Court's changing interpretations of the law. Briefing of cases is required.

CRIM 2200. Criminology. 4 Hours.

Describes the nature and extent of crime, explains its causes, and examines the reasons for and effectiveness of society's responses to it. Defines the topic of criminology by discussing the different types of crime. Moreover, to establish the extent of crime in society, measurement issues are addressed. The second half of the course details different theories of criminal causation.

CRIM 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CRIM 2991. Research Practicum. 2-4 Hours.

Involves students in collaborative research under the supervision of a faculty member. Offers students an opportunity to learn basic research methods in the discipline. Requires permission of instructor. May be repeated once for up to 4 total credits.

CRIM 3000. Co-op Integration Seminar 2. 1 Hour.

Continues CRIM 2000. Allows students to reflect on what they learned during their first co-op, and use their journal entries as the basis from which to examine real-life issues of ethics, values, and diversity as they experienced them in the workplace.

CRIM 3010. Criminal Violence. 4 Hours.

Surveys the trends, nature, patterns, and causes of criminal violence. Blending sociological and psychological perspectives on violent criminal behavior, focuses on serial and mass murder, sexual predators, youth and school violence, violence among intimates and family members, as well as the impact of media and entertainment violence. The effectiveness of various criminal justice responses are also examined including intervention strategies, police tactics, gun control, incarceration, and capital punishment.

CRIM 3030. Global Criminology. 4 Hours.

Seeks to strengthen an understanding of crime and its causes from a comparative, cross-national standpoint. In doing so, it places extant definitions of crime and deviance in a cultural context. Explores existing methods of studying crime on a global scale; offers an overview of various types of criminal and deviant behavior that occur in isolated group contexts as well as those crimes that transcend country boundaries. Examines various strategies designed to address these acts of crime on a national as well as transnational level.

CRIM 3040. Psychology of Crime. 4 Hours.

Explores the inner lives of offenders including cognitive, emotional, perceptual, and physiological phenomena. Examines the ecological context of crime, individual and social risk factors for psychological attributes related to offending, how these attributes develop, how they interact with the environment to produce crime, and, most importantly, how knowledge of the psychology of crime can assist in efforts to prevent delinquency or to help offenders desist.

CRIM 3050. Organized Crime. 4 Hours.

Examines the myths and realities surrounding organized crime. Offers an overview of the nature and extent of organized crime, the factors that contribute to it, as well as the origins and opportunities/motives for criminal enterprises. Discusses the impact of organized crime on U.S. society, both in terms of economy and politics. Also examines the interconnections between organized criminals and legitimate organizations as well as analyzes legislative and policy responses.

CRIM 3200. Youth Crime and Justice. 4 Hours.

Introduces students to the history, structure, processes, and philosophies of juvenile justice systems in the United States. Responses to juvenile offenders-ranging from prevention and diversion to institutional corrections and aftercare-are explored in the context of youth policy generally. Focuses on contemporary issues and controversies (system fragmentation, changing conceptions of juvenile offenders, lack of a coherent justice system rationale, racial and gender bias in processing and confinement, and proposals to abolish the juvenile court).

CRIM 3300. Punishment in the Age of Mass Incarceration. 4 Hours.

Examines the concept of punishment and its form, function(s), and enforcement throughout history, with an emphasis on current sentencing policies and procedures and their impact on the corrections system and correctional overcrowding. Explores the operation, structure, clientele, and issues confronting the institutions, agencies, and programs encompassing the corrections system including jails, prisons, and community-based corrections.

CRIM 3400. Corporate Security: Securing the Private Sector. 4 Hours.

Examines the history and evolution of security from a focus on crime prevention to one of loss prevention for business, industry, institutions, and government. Emphasizes the need for analytical, interpersonal, and communications skills in developing cost-effective programs for the protection of assets, personnel, and third parties. Discusses the security/government relationship.

CRIM 3500. Policing a Democratic Society. 4 Hours.

Traces the history, evolution, and organization of the police in the United States. Examines the role of police in society, structure and culture of police organizations, function and activities of the police, and police deviance and accountability. The course objectives are to acquaint students with prior research on the police, examine critically the police as a component of the criminal justice system, explore the complex nature of the profession, and assist those who are considering a policing career to understand the realities of the job.

CRIM 3540. Addiction and Recovery. 4 Hours.

Explores students' personal and cultural perspectives about substance use, abuse, and addiction through the use of readings, films, and case studies. Students evaluate the causes of chemical dependence, and methods of recognition, intervention, and treatment. Offers students the opportunity to investigate the effects of chemical dependency on the family. CRIM 3540 and HUSV 3540 are cross-listed.

CRIM 3600. Criminal Justice Research Methods. 4 Hours.

Introduces the basic concepts involved in conducting research in the areas of the criminal justice system and criminology. Through lectures, group discussions, and readings, familiarizes students with the scientific methods that are necessary for systematic analysis of crime trends, offender behavior, program effectiveness, and public attitudes about crime and justice. In so doing, students become capable of developing an idea, investigating and critiquing how it has been researched, developing a research design, and administering its implementation.

CRIM 3700. Criminal Justice Statistics. 4 Hours.

Offers a basic foundation in statistical methods with an emphasis on applications in criminal justice. Begins with basic descriptive techniques, including tabular and graphical displays of data as well as summary statistics. Next, the course covers significance tests of the difference between sample means or proportions and of the association among variables. Finally, assignments involve analyzing criminal justice data using statistical software.

CRIM 3900. Topics in Criminal Justice and Criminology. 1-4 Hours.

Focuses on topics related to criminal justice to be selected by instructor. May be repeated without limit.

CRIM 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CRIM 4000. Co-op Integration Seminar 3. 1 Hour.

Continues CRIM 3000. Builds upon what students learned in CRIM 3600 and focuses on experiences and research journals from the second co-op. Students discuss their research activities and findings, and begin to do some critical thinking about the nature of organizations. The discussion in this seminar also prepares them for the third co-op experience, in which they keep journals on some other aspect of organizational culture or dynamics. The seminar is pass/fail.

CRIM 4010. Gender, Crime, and Justice. 4 Hours.

Examines the topics of femininities and masculinities and their influence on participants in the criminal justice system. Also explores topics such as gender and criminological theory; the notion of gender and offending; women and men as victims of violence; and women and men as professionals within the criminal justice system. CRIM 4010 and WMNS 4010 are cross-listed.

CRIM 4020. Race, Crime, and Justice. 4 Hours.

Provides students with an overview of the role and treatment of racial/ethnic minorities in the criminal justice system. Covers historical and theoretical frameworks for understanding the relationship between race, crime, and criminal justice. In so doing, students become familiar with trends and patterns in criminal offending by racial/ethnic minorities, as well as system response to such behavior. CRIM 4020 and AFAM 4020 are cross-listed.

CRIM 4040. Crime Prevention. 4 Hours.

Offers an overview of issues related to crime prevention, both from criminological and criminal justice points of view. Examines crime prevention programs that encompass both the individual and community levels, as well as the integration of such levels. Offers students an opportunity to learn current theories of and leading research on the main approaches to preventing crime, including developmental, situational, and community prevention. Focuses on assessing effectiveness of prevention programs and policies.

CRIM 4100. Juvenile Law. 4 Hours.

Introduces the way society responds to juvenile offenders. Topics may include important legislation, fundamental case law, behavioral research studies, philosophy, history, delinquency, abuse and neglect, transfers and waivers, status offenses, and comparative law. Students may be required to observe actual juvenile cases in the Massachusetts Juvenile Court.

CRIM 4120. Courts and Sentencing. 4 Hours.

Examines the role of criminal courts in the United States, the structure and organization of the court system, and the flow of cases from arrest to conviction. Focuses on the key actors in the courtroom—prosecutors, defense attorneys, judges, and court clerks—and the decision-making processes in charging a person with a crime, setting bail, pleading guilty, going to trial, and sentencing. Addresses prospects for reforming courts.

CRIM 4300. Community-Based Corrections. 4 Hours.

Provides an in-depth understanding of the variety of correctional options for law violators that are available within the community. Through lectures, group discussions, presentations, and reading of empirical research, students become knowledgeable about all forms of corrections and correctional facilities outside of jails and prisons, from traditional incarceration programs to the most current programs such as electronic monitoring, house arrest, day treatments, boot camps, and fines. Also discusses the philosophy and effectiveness of different types of community-based corrections while keeping in perspective the impact they have on each component of the criminal justice system.

CRIM 4500. Police Strategy. 4 Hours.

Examines current strategies utilized by U.S. police. Topics include the demand for police service, service delivery, missions and goals, resources and tactics, accountability, ethics, and operational effectiveness measurements. Emphasis is on successfully accomplishing the police mission in a responsible manner and within the many constraints under which officers and departments must operate. Focuses on in-class small-group work centered on a variety of scenarios in which students are charged with creating reasonable, legal, ethical, and effective solutions. A variety of learning formats are applied including written examinations, in-class group projects, a term paper, and written assignments.

CRIM 4630. Political Crime and Terrorism. 4 Hours.

Provides students an understanding of what political crime and terrorism is, the nature and extent of the problem historically and currently, as well as prevention efforts designed to combat political crime and terrorism. Students are exposed to several sources of information on political crime and terrorism including the news media, scholarly sources, and video accounts.

CRIM 4660. Communities and Crime. 4 Hours.

Provides students with an overview of issues related to communities and crime. Examines sociological aspects of community context, behavior, and functioning, and how communities are implicated in both crime-generating and crime-preventing processes. Familiarizes students with historical and contemporary literature surrounding the communities and crime relationship, as well as how the study of human behavior generally, and crime particularly, should examine the interaction of persons and places.

CRIM 4900. Advanced Seminar in Criminology and Criminal Justice. 4 Hours.

Focuses on specialized advanced topic in criminal justice to be selected by instructor. May be repeated without limit.

CRIM 4949. Senior Capstone Seminar. 4 Hours.

Emphasizes study of organizations and organizational change, with focus on the organizations that comprise the criminal justice system and the environmental contexts in which they operate. Various theories of the structure and processes of organizations and the behavior of groups and individuals within organizations are examined to familiarize students with the different perspectives from which organizations can be studied (the bureaucratic model, the “principles of management” orientation, the human-relations approach, the human-resources approach, and systems theory). Also focuses on understanding change within organizations including a study of principles of organizational change and various approaches to planned change.

CRIM 4970. Junior/Senior Honors Project 1. 4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student’s major field. Combined with Junior/Senior Project 2 or college-defined equivalent for 8 credit honors project. May be repeated without limit.

CRIM 4971. Junior/Senior Honors Project 2. 4 Hours.

Focuses on second semester of in-depth project in which a student conducts research or produces a product related to the student’s major field. May be repeated without limit.

CRIM 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CRIM 4991. Research. 4 Hours.

Offers an opportunity to conduct research under faculty supervision.

CRIM 4992. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

CRIM 4993. Independent Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

CRIM 4994. Internship. 4 Hours.

Offers students an opportunity for internship work. May be repeated without limit.

CRIM 5900. Topics in Criminal Justice and Criminology. 4 Hours.

Offers an intensive study of a topic related to criminal justice selected by the instructor. May be repeated up to four times.

CRIM 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CRIM 6964. Co-op Work Experience. 0 Hours.

Provides eligible students with an opportunity for work experience. May be repeated without limit.

CRIM 7200. Criminology. 4 Hours.

Provides an overview of the current understanding of the causes of crime from an interdisciplinary perspective. Focuses on the major theories of crime and causation developed over the past two hundred years. Emphasis is on integrating criminological theory and research, assessing the implications of this knowledge base for policies relating to crime control and prevention. Also presents and discusses the most current data regarding the nature and extent of crime in the United States.

CRIM 7201. Global Criminology. 4 Hours.

Examines how the processes of globalization influence crime and criminal justice around the globe. Analyzes globalization and recent developments in global crime, including global trends in policing and security. Explores the global applicability of dominant criminological theories and transferability of crime control policies. Offers students an opportunity to develop an understanding of international criminal justice, particularly as it pertains to war crimes, crimes against humanity, and the global protection of human rights.

CRIM 7202. The Criminal Justice Process. 4 Hours.

Introduces graduate students to the criminal justice process. Identifies important issues confronting the administration of justice. Offers an overview of the empirical research addressing these challenges. Through engagement with the course materials, exposes students to a variety of theories that explain the functioning of the justice system and predict its outcomes. Offers students an opportunity to identify and consider changes in institutional responses to crime and justice issues that have occurred over time and across cultural contexts.

CRIM 7210. Gender, Crime, and Justice. 4 Hours.

Examines ways in which criminology, the criminal justice system, and the law contribute to the social construction of gender. Investigates process through which biological females are encouraged to become girls and women by cultural assumptions about female deviance, discourses on female crime, the criminal justice system, and legal assumptions about the meaning of equality. Focuses on feminist approaches to criminal justice that parallel the new feminist jurisprudence.

CRIM 7214. Corrections Theory and Practice. 4 Hours.

Reviews the history of our correctional system, said by many to have four central themes (revenge, restraint, reformation, and rehabilitation/reintegration). Defines the role and working relationship of corrections in the greater spectrum of criminal justice, identifies and discusses the issues and problems facing the system today, and evaluates its intended purpose vs. how it actually functions. Explores prison operations, from designing and staffing a prison to responsible reintegration. Discussions regarding the political, social, and economic issues that have impacted correction operations, such as sentencing reform, overcrowding, boot camps, and so on, are taken from the classroom to actual prison settings. Provides an overview of corrections through a blend of theory, practice, and firsthand observations.

CRIM 7224. Law and Psychology. 4 Hours.

Offers a seminar on conceptual, empirical, historical, and professional aspects of selected topics in forensic psychology including such areas as law and psychology, competence to stand trial, criminal responsibility, and the insanity defense. Topics include jury selection, reliability and validity of eyewitness testimony, truth detection methods, and postconviction pleadings.

CRIM 7228. Criminal Violence. 4 Hours.

Investigates and analyzes aggression and violence as forms of individual, group, and societal behavior. Includes an assessment of anthropological, biological, philosophical, political, and sociological theories. Combines student presentations and projects with lectures and tutorials.

CRIM 7232. Juvenile Law. 4 Hours.

Examines the legal relationship between the juvenile offender and the state. Covers case and statutory law as well as constitutional due process standards in juvenile proceedings. Topics include jurisdiction, prejudicial process, waiver of jurisdiction adjudication, disposition and postdispositional issues, as well as the right to treatment.

CRIM 7240. Race and the Criminal Justice System. 4 Hours.

Offers a sociohistorical analysis of the effects of race and ethnicity on legitimate social opportunities, criminal behavior, victimization, and differential judicial processing. Analyzes the impact of assimilation and acculturation on criminal behavior, victimization, and criminal justice processes. Discusses issues resulting from increasing diversity of both the criminal justice workforce and society in general.

CRIM 7250. Victimology. 4 Hours.

Involves a scientific study of crime victims and public policy responses to them. Focuses on the nature and extent of criminal victimization, the dynamics of victim-offender relationships (e.g., incest and domestic violence), theories of victimization, a historical analysis of the victim's role in the criminal justice process, the restorative justice model, and the contemporary victim rights and victim services movement.

CRIM 7262. Evidence-Based Crime Policy. 4 Hours.

Introduces students to the evidence-based paradigm in crime policy. Presents the theory and methods of the evidence-based paradigm, which places systematic research at the center of the policymaking process. Offers students an opportunity to further develop skills in critically assessing leading research findings and policy initiatives in the field of criminology and criminal justice.

CRIM 7270. Crime and Community Context. 4 Hours.

Provides an overview of crime in the context of communities. Covers major theoretical perspectives and introduces students to both major quantitative and ethnographic work on communities. Examines sociological aspects of community context and contrasts aspects of community processes that are implicated in either the generation or the prevention of crime. Considers current criminal justice practices and crime prevention approaches intended to address crime within communities—especially as they interact with neighborhood social processes in ways that deter or facilitate community crime.

CRIM 7308. Seminar in Policing. 4 Hours.

Examines the police function from a multitude of perspectives. Moves beyond analysis of the institution of the public police to explore the broader meaning and role of policing in modern societies. Emphasizes changes in the organization, structure, strategies, and control of policing. Students are expected to critically analyze existing empirical research that sheds light on the effectiveness of the police.

CRIM 7312. Special Topics in Criminology and Public Policy. 4 Hours.

Focuses on a particular aspect of criminology and/or public policy of contemporary interest. This course rotates annually. May be repeated without limit.

CRIM 7316. Advanced Topics in Methods. 4 Hours.

Focuses on particular application methods not covered extensively in other research methods courses. This course rotates annually. May be repeated without limit.

CRIM 7700. Practicum in Teaching. 0 Hours.

Provides weekly meetings for graduate student lecturers and faculty advisers to discuss common concerns and issues arising during the course of teaching. With input from the Center for Effective University Teaching, covers topics such as syllabus preparation, examination preparation and grading, classroom protocol, and student interaction. Required for all doctoral students teaching a class for the first time.

CRIM 7706. Practicum in Writing and Publishing. 2 Hours.

Offers students an opportunity to develop and improve their academic writing skills while preparing a sole-authored article for potential publication. Requires each student to present a paper in-progress and, through an iterative process of review and revision, have it ready to submit to a journal by the end of the semester. Students comment, orally and in writing, on the papers presented by the other students over the course of the semester. There are regular assignments from leading texts on mechanics and style in writing and reflections on the peer-review and publication processes from multiple perspectives. May be repeated once.

CRIM 7710. Criminology and Public Policy 1. 4 Hours.

Provides detailed coverage of theoretical criminology and its implications for public policy. Approaches the understanding of crime from an interdisciplinary perspective, with special attention given to recent theoretical developments. Emphasizes evaluating theory in light of empirical research, understanding the implications of theory and research for programs and policies of crime prevention and control, and evaluating current approaches to crime prevention and control.

CRIM 7711. Criminology and Public Policy 2. 4 Hours.

Continues CRIM 7710. Provides detailed coverage of theoretical criminology and its implications for public policy. Approaches the understanding of crime from an interdisciplinary perspective, with special attention given to recent theoretical developments. Emphasizes evaluating theory in light of empirical research, understanding the implications of theory and research for programs and policies of crime prevention and control, and evaluating current approaches to crime prevention and control.

CRIM 7713. Advanced Research and Evaluation Methods. 4 Hours.

Deals in detail with all aspects of evaluation research. Includes both process and outcomes evaluation models and a discussion of experimental and quasi-experimental designs. Students review both qualitative and quantitative approaches to evaluation design and discuss financial issues in program evaluation. Exposes students to methods to develop an evaluation research proposal.

CRIM 7715. Multivariate Analysis 1. 4 Hours.

Builds upon the concepts of correlation and inference to present analytic procedures involving several variables, including multiple regression, logistic regression, causal analysis, and multiway ANOVA. Emphasizes the application of these methods with criminal justice data sets using statistical software programs.

CRIM 7716. Multivariate Analysis 2. 4 Hours.

Continues CRIM 7715. Covers more advanced multivariate analytic methods. Topics include principal components and factor analysis, discriminant analysis, MANOVA, time series, and cluster analysis. Emphasizes the application of these methods with criminal justice data sets using statistical software programs.

CRIM 7718. Advanced Data Analysis. 4 Hours.

Designed to build upon the foundations provided by CRIM 7715 and CRIM 7716 with the goal of students becoming proficient with selected quantitative multivariate analysis techniques. Topics covered in this course include various general linear models, hierarchical linear models, and survival analysis. Requires substantial computer use as particular emphasis is placed on analyzing data using a variety of statistical programs. This is a PhD-level course.

CRIM 7720. Crime Mapping. 4 Hours.

Studies the process of mapping. Employs a holistic approach to learning how to create and interpret maps, which seeks to provide a much deeper understanding of crime mapping and leave students with a solid foundation of skills that are transferable and scalable. Although this course represents an introduction to crime mapping, the goal is that students completing the course are successful in future mapping endeavors. Focuses on how to create effective maps (start to finish) rather than focusing largely on the various mapping capabilities currently available to researchers.

CRIM 7962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CRIM 7976. Directed Study. 1-4 Hours.

Offers the student the opportunity to bring individual, concentrated attention to a particular topic as arranged and agreed upon in advance by a faculty member and the student. This option is generally recommended when the student desires a more intensive analysis of a particular subject. May be repeated without limit.

CRIM 7978. Independent Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

CRIM 8960. Exam Preparation—Doctoral. 0 Hours.

Offers the student the opportunity to prepare, under faculty supervision, for the PhD qualifying examination.

CRIM 8984. Research. 1-4 Hours.

Offers an opportunity to conduct research under faculty supervision. May be repeated without limit.

CRIM 8986. Research. 0 Hours.

Offers an opportunity to conduct full-time research under faculty supervision. May be repeated without limit.

CRIM 9000. PhD Candidacy Achieved. 0 Hours.

Indicates successful completion of the doctoral comprehensive exam.

CRIM 9990. Dissertation. 0 Hours.

Provides the student with the opportunity, under close faculty guidance, to conduct an original investigation of a criminal justice issue. Each student identifies a faculty chair and two additional faculty members who comprise the student's Dissertation Committee. While the student conducts research and develops a dissertation, the committee provides support and direction and, ultimately, approves the final research product. May be repeated once.

CRIM 9996. Dissertation Continuation. 0 Hours.

Offers continued thesis work conducted under the supervision of a departmental faculty. May be repeated without limit.

Criminal Justice - CPS (CJS)

Search CJS Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=CJS>)

CJS 5978. Independent Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic.

CJS 6005. Legal and Regulatory Issues for Security Management. 3 Hours.

Addresses regulatory issues relating to security management as well as the specifics of historical and ongoing litigation relating to charges of negligent security and negligent supervision.

CJS 6020. Contemporary Issues in Criminal Justice Policy. 3 Hours.

Examines a broad range of problems faced by the criminal justice system in the twenty-first century. By examining issues such as community policing, racial profiling, police use of deadly force, national drug control policy, and sentencing guidelines, offers students an opportunity to recognize the impact of crime on society and the complexities of potential solutions to the crime problem.

CJS 6025. Genocide and War Crimes. 3 Hours.

Exposes students to specific cases of genocide and war crimes and surveys current international-level policies bearing on genocide and war crimes. Assesses responses of international organizations and national governments to such crimes to identify existing difficulties in developing appropriate methods of punishments and prevention of crimes against humanity.

CJS 6030. Organized Crime. 3 Hours.

Surveys the history of organized crime around the world. Introduces the origins and activities of organized crime groups, policies designed to combat organized crime, and explanations for the persistence of organized crime. Also discusses new forms of organized crime.

CJS 6035. Corruption, Integrity, and Accountability. 3 Hours.

Traces the history, nature, causes, and effects of corruption through concrete cases and illustrations. Emphasizes corruption in the justice system, politics, and public administration, as well as international cases. Also covers international and national laws and standards against corruption (with special emphasis on the U.N. convention against corruption and the Foreign Corrupt Practices Act). Following an in-depth discussion of efforts to measure corruption, governance, and anticorruption efforts, the course then focuses on the role of stakeholders, ranging from the private sector to government, civil society, and individual actors.

CJS 6040. Human Trafficking and Exploitation. 3 Hours.

Introduces the phenomenon of human trafficking in the global context. Discusses specific forms and regional variations of human trafficking, including forced labor and sex work. Examines individual and societal effects of human trafficking and assesses formal responses to this type of crime. Also covers the role of global processes in the facilitation of human trafficking.

CJS 6045. Policing Issues around the Globe. 3 Hours.

Surveys current global policing issues and explores the increasing opportunities for and benefits of cooperation between policing organization across national boundaries. Also examines modern policing by comparing police practices around the globe, identifying common challenges in policing across the world, and investigating the challenges faced by an increasingly "internationalized" form of policing.

CJS 6105. Domestic and International Terrorism. 3 Hours.

Includes a general introduction to the overt as well as underlying ideology, history, reasons, and causes of terrorism. Discusses both domestic and international terrorism, with a focus on domestic hate groups, the roles of politics and the media, and counterterrorism. Exposes students to the philosophies of terrorists and terrorism.

CJS 6125. Issues in National Security. 3 Hours.

Examines the various elements of national power and their application in advancing U.S. interests. Offers students an opportunity to develop a recognition of the synergy a multidisciplinary approach affords by analyzing current strategy and policy along with a historical study of the cold war. Seeks to develop an understanding of the integration of grand strategy with resources and to develop and refine students' writing skills.

CJS 6135. Intimate Partner Violence. 3 Hours.

Examines the causes and consequences of intimate partner violence, as well as the latest research regarding the criminal justice response.

CJS 6300. Communities and Crime. 3 Hours.

Focuses on various issues in the study of communities and crime. Offers students an opportunity to understand how neighborhood organization and patterns affect crime and vice versa. Attention is given to both the factors that influence neighborhood-level crime rates, as well as the effects that neighborhood characteristics have on the behavior and outcomes of individuals. Includes policy implications and current practices.

CJS 6315. Administration of the Adult and Juvenile Correction Systems. 3 Hours.

Examines the operation and nature of the U.S. correctional system, including the juvenile justice system as well as the adult correctional system. Covers theories and philosophies of correctional administration and the conditions that generate delinquent behavior as well as current critical issues such as overcrowding, alternatives to incarceration, and efforts to maintain family cohesion.

CJS 6325. Probation and Parole. 3 Hours.

Examines the major developments in probation and parole including current best practices. Explores the rationale for and techniques used in supervising convicted offenders within communities. Considers issues associated with presentence investigation including caseloads, revocation hearings, community support services, and assessing current and future behavior of probationers and parolees. Analyzes the efficacy of community corrections and other forms of in-community social control.

CJS 6330. Youth Justice and Crime. 3 Hours.

Examines the social conditions that generate delinquency and the legal practices intended to control it. Through the discussion of recent research, legislation, and policy documents, students are encouraged to consider the response of the criminal justice agencies to youth crime as well as assess the role of the family, the school, and the community in preventing and controlling juvenile delinquency.

CJS 6340. Substance Abuse and Addictions. 3 Hours.

Provides the criminal justice professional with an overview of relevant issues surrounding the use/abuse of drugs and alcohol. Examines the relationship between substance abuse/addiction and crime. Explores the impact of drug legislation, i.e., school zone, three strikes, mandatory minimum sentences, etc., on police, the courts, and corrections. Investigates current programs and their effectiveness on prevention.

CJS 6400. Administration of Justice. 3 Hours.

Explores the moral, ethical, and philosophical dimensions of what it means to practice, and to lead the practice of, justice. Examines the theoretical, ethical, and constitutional foundations and the social history of American criminal justice institutions. Analyzes the contradictions, controversies, major issues—such as race and justice—ideas, and events that have shaped policy and practice. Also explores the future of justice practice in America.

CJS 6405. Criminological Theory for Criminal Justice Leaders. 3 Hours.

Examines a wide range of criminological theories pertaining to criminal offenders and the correlates of crime. Students are expected to read selections from the leading empirical and theoretical literature on crime and criminality, to involve themselves in group discussions of the reading, and to assess critically the applicability of various theoretical perspectives to selected crime types.

CJS 6415. Legal Decision Making and Leadership. 3 Hours.

Reviews the literature on decision making, especially in the criminal justice system, and utilizes case studies as a way to discuss how legal constraints can affect leadership. While legal procedures, rules, and guidelines must be observed, they are only one set of constraints on active leadership. Decision making in an organizational context requires knowledge of the organization's operation, its culture, and the situations in which decisions are shaped and made individually or collectively.

CJS 6425. Research Methods. 3 Hours.

Surveys the methods and techniques of research and evaluation and reviews various strategies for integrating the findings obtained into agency policy and strategy. Topics include surveying, observation, analysis of archival data, and experimentation. Introduces various evaluation designs. Covers issues such as ethical problems and the design, procedures, and politics of research. The goal of this course is not to produce social scientists but to prepare students to be critical consumers of social science research.

CJS 6430. Risk Management. 3 Hours.

Provides a framework for an organizational leader to improve decision making through a comprehensive understanding of an organization's exposure to risk. Exposes students to skills for conducting these assessments across organizational boundaries and in public-private partnerships. Focuses on how to model, measure, or assess undesirable risks and reduce risks relevant to large organizations with collective public obligations. Emphasizes conducting homeland-security-related assessments across criminal justice disciplines and in public-private security collaborations.

CJS 6435. Program Evaluations. 3 Hours.

Offers students an opportunity to understand the elements of successful program evaluation as well as the threats to validity implicit in program evaluation designs. Identifies the infrastructure, including information needed to implement new programs based on evaluations, and seeks to enable students to assess the utility of evaluations made of programs in their respective fields.

CJS 6440. GIS, Evidence-Based Learning, and Policy. 3 Hours.

Offers students an opportunity to develop an understanding of GIS-assisted mapping, other uses of GIS, as well as the misuse and misinterpretation that often occurs when maps are drawn based on inaccurate information. GIS applications are currently being deployed to gather information and intelligence across a broad spectrum in the public domain. Discusses the ethical and technical aspects of such data-driven approaches.

CJS 6450. Organizational Crisis Management: The Human Factor. 3 Hours.

Provides a blend of perspectives on crisis management, including both sociology and psychology. Offers students an opportunity to study the impact of responding to trauma and tragedy and to gain an understanding of best practices when intervening with individuals or groups who have been victims of trauma and tragedy, including strategies and programs that can mitigate the impact on professional responders. Informs on the approaches to facilitate and improve individual as well as institutional resilience.

CJS 6470. Criminal Justice Capstone . 3 Hours.

Forms the culmination of the student's learning in the Criminal Justice Leadership Program. Serves to synthesize the knowledge gained from each course in the program. Offers students an opportunity to utilize this knowledge to improve their leadership abilities.

CJS 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

Culture (CLTR)

Search CLTR Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=CLTR>)

CLTR 1000. Cultures, Societies, and Global Studies at Northeastern. 1 Hour.

Introduces first-year students in the College of Social Sciences and Humanities to the liberal arts in general. Seeks to familiarize them with their major, to help them develop the academic skills necessary to succeed (analytical ability and critical thinking), to provide grounding in the culture and values of the university community, to help them develop interpersonal skills, and to familiarize them with all skills needed to become a successful university student.

CLTR 1120. Introduction to Languages, Literature, and Culture. 4 Hours.

Examines the rich interconnections between literature and language and the culture that supports them. Discusses the relationship of language to literature and investigates how language and literatures are embedded in culture. Addresses several very broad and important questions, such as the relationship between language and culture; the relationship between language and thought; the definition of cultural relativism; and how ethical dilemmas are expressed in different cultures. Explores the relationship of esthetic and rhetorical traditions in given languages to the culture from which they sprang. In this context, examines the extremely interesting case of American Sign Language and how a gestural language sheds light on these issues.

CLTR 1151. Muslim Writers and the Qur'an (in English Translations). 4 Hours.

Covers selected writers who fairly represent a wide range of Muslim attitudes to the Qur'an. Muslim writers use the Qur'an for political and social criticism, question Qur'anic texts related to the status of women, or question the authenticity of the Qur'an itself. After 9/11, however, Muslim writers in the West have presented characters who find in the Qur'an a source of positive powers. Readings are drawn from works such as the following: Leila Aboulela, *Minaret*; Monica Ali, *Brick Lane*; Gamal Al-Ghitani, *Zayni Barakat*; Tehmina Durrani, *Blasphemy*; Nuruddin Farah, *Maps*; Taha Hussein, *An Egyptian Childhood*; Yusuf Idris, "A House of Flesh"; C. H. Kane, *Ambiguous Adventure*; Hanif Kureishi, *The Black Album* and "My Son the Fanatic"; Naguib Mahfouz, *The Children of the Alley*.

CLTR 1240. Latin American Film. 4 Hours.

Examines contemporary works of cinematography in Latin America, focusing on the culture and imagery of the Spanish-, French-, and Portuguese-speaking peoples of the Western hemisphere, including the United States. Critically engages—from a technical (cinematographic), genre, and sociohistorical perspective—topics of history, memory, and cultural resiliency; colonialism, racism, and patriarchy; dictatorship, revolution, and democratization; and nationalism, dependency, and globalization. Conducted in English; most films are in French, Portuguese, or Spanish with English subtitles.

CLTR 1251. Dante's Inferno and Medieval Italian Culture. 4 Hours.

Introduces an overview of Dante's *Commedia* focusing on the first book, "Inferno," read in English translation. Examines the descending stages of hell; their meanings; and their social, political, and historical relevance for Dante's society. Dante's *Divina Commedia* created a powerful world, one that had a deep meaning for both the author and the reader of that time. But can one so easily understand it as constructed by the *Commedia* in the Middle Ages? Does Dante's world have relevance today as well? Some scholars may say it does more so than ever. If so, how? Through analysis of selected chapters (*Canti*), students have an opportunity to attempt to establish their possible relevance to the modern human condition and perhaps even to themselves.

CLTR 1260. Japanese Film. 4 Hours.

Provides an introduction to Japanese film through works by such great masters as Kurosawa, Mizoguchi, and Ozu, as well as works by new directors from the 1980s and 1990s such as Tami, Morita, and Suo. Studies both form and content; relates major works to Japanese culture. Conducted in English.

CLTR 1261. Caribbean Literature and Culture. 4 Hours.

Provides a comparative introduction to the modern literary traditions of the Spanish-, English, and French-speaking Caribbean. Includes authors such as Carpentier (Cuba), Naipaul (Trinidad), Zobel (Martinique), and Cardenal (Nicaragua). Conducted in English.

CLTR 1500. Modern Chinese History and Culture. 4 Hours.

Introduces modern Chinese history and culture through literary works, films, and historical texts. Examines political, social, and cultural changes in China since 1800: the decline of empire; the New Culture Movement of the 1920s; the rise of nationalism and rural revolution; the changing roles of women; the Cultural Revolution of the 1960s; and China's cinematic, literary, and economic engagement with the world since 1978. Taught in English and open to all undergraduates. CLTR 1500 and HIST 1500 are cross-listed.

CLTR 1501. Introduction to French Culture. 4 Hours.

Explores contemporary France and French mentality through lectures, screenings, readings, and discussions. Topics covered include the modern vs. the traditional family, social reproduction, gender norms, culture and social distinction, the concept of "grandeur," identity, and immigration. Offers students an opportunity to evaluate historical and sociological readings, films, documentaries, and TV commercials; to compare French and American systems; and to consider contemporary human and social behaviors in the face of globalization.

CLTR 1502. Introduction to Arabic Culture. 4 Hours.

Designed to provide students with an in-depth survey of Arabic culture. Familiarizes students with the roots of one of the richest and oldest cultures but also seeks to satisfy their curiosity concerning certain social norms, patterns, and cultural traits in contemporary Arabic societies. Examines cultural manifestations ranging from the hijab (head covering), Jihad (holy struggle), human rights, polygamy, gender relations, public behavior, and many others by providing the historical backgrounds for these customs and traditions as well as exploring how they are now perceived in various Arab societies as well as in the West. Seeks to provide students with an appreciation for this multifaceted culture but most importantly a broad perspective on Arabic culture within the context of the universal human experience.

CLTR 1503. Introduction to Italian Culture. 4 Hours.

Explores the construction of an Italian national cultural identity through a historical and cross-disciplinary perspective from the Middle Ages; the Renaissance; and the modern, post-WWII period. Organized into modules that focus on the major issues related to the idea of unity and division such as north and south divide, regionalism, language pluralism, fascism and dissent, criminal organizations, and migration. Conducted in English.

CLTR 1504. Cultural History of Spain. 4 Hours.

Examines chronologically the forces that have forged Spanish culture and have made Spain the pluralistic society and multinational country it is today. Traces the development of the peoples of the Iberian Peninsula from prehistoric times to the present. Based primarily on the history of ideas, the arts, and architecture, incorporates history, sociology, anthropology, geography, economics, and politics. Conducted in English.

CLTR 1505. Latin American Culture, History, and Politics. 4 Hours.

Offers students an opportunity to learn about Latin American culture through the study of historical episodes such as colonization, independence, and dictatorships. Explores current issues including migration, globalization, and digital media. Examines writings by Latin American authors and selected films from Latin America. Conducted in English.

CLTR 1506. Introduction to Chinese Popular Culture. 4 Hours.

Provides a comprehensive examination of modern Chinese popular culture in the People's Republic of China, Taiwan, and Hong Kong. From film to literature, from music to theatre, this course probes popular culture as it has manifested itself and traces its sociopolitical, aesthetic, and affective impact on modern China, with special attention to negotiations between the elite and the popular discourses.

CLTR 1700. Introduction to Japanese Pop Culture. 4 Hours.

Provides an introduction to Japanese popular culture through critical analysis of mass media such as film, television, comics, and animation. Investigates various social and cultural issues, such as gender, family, and education. Films and videos supplement readings. Conducted in English.

CLTR 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CLTR 2001. World Cultures through Film. 4 Hours.

Introduces the study of world cinema from the past several decades as a form of artistic and cultural expression. Emphasizes the way that different ethnicities and cultures mix and even clash within national boundaries. Readings cover such topics as the postcolonial inheritance, immigration, the boundaries of class, the pressures of modernization, ethnic identities, and historical memory. Examines storytelling in its multicultural aspects and deals with the diverse influences of entertainment cinema and art cinema, as well as measures taken by countries to limit the influx of foreign films in order to protect their own cultural productivity. One overall concern of the course is the place of film in contemporary global culture.

CLTR 2450. Postcolonial Literature. 4 Hours.

Examines the literature and cultures of postcolonial nations in the Caribbean, Africa, and Asia. Designed to familiarize students with the cultural paradigms and transnational experiences of colonialism. Focuses on the variety of artistic strategies employed by writers to communicate contemporary postcolonial themes such as neocolonialism, nationalism, Third-World feminism, and diaspora. CLTR 2450 and ENGL 2450 are cross-listed.

CLTR 2451. Postcolonial Women Writers. 4 Hours.

Examines the literature and cultures of postcolonial nations in the Caribbean, Africa, Asia, and elsewhere through the lens of gender. Designed to familiarize students with the relationships between cultural paradigms associated with gender and transnational experiences of colonialism. Focuses on the variety of artistic strategies employed by writers to communicate the impacts of gender and sexuality on contemporary postcolonial themes such as neocolonialism, nationalism, and diaspora. Writers may include Chimamanda Adichie, Nawal El Saadawi, Marjane Satrapi, Bessie Head, Arundhati Roy, Banana Yoshimoto, Sonia Singh, and Dionne Brand. ENGL 2451, WMNS 2451, and CLTR 2451 are cross-listed.

CLTR 2715. New Media Narratives in Latin America: Local and Global Dimensions. 4 Hours.

Focuses on Latin America as a region of rich technological creativity in the digital media landscape of the 21st century. Explores how social networks, computational technologies, and digital devices are subject to creative hacks that incorporate alternative economies and knowledge models and enact social and artistic movements. Examines how hacks or adaptations of new media traverse the local dimensions of the current global technocultural landscape and invite reflection on the multiplex relationships fostered by digital media around the world. Offers students an opportunity to analyze cultural artifacts and phenomena in Latin America in a comparative global setting and engage in innovative expression by creating reflexive multimedia artifacts of their own, replicating the creative and adaptive uses studied in the class. Taught in English.

CLTR 2850. Apps, Memes, and Bots: Global Literature in the Age of the Internet. 4 Hours.

Introduces students to new and emerging forms of electronic literature like augmented reality applications, participatory narratives, literary apps, memes, and social media bots. Focuses on born digital literature created around the world. Explores the theories and approaches to reading electronic works in a globalized world. Offers students an opportunity to read, critique, and author works of electronic literature. Although a reading knowledge of a second language can enhance the students' experience, the course is fully taught in English.

CLTR 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CLTR 3418. Nationalism. 4 Hours.

Explores contending theories of identity and nationalism—a powerful force in international and domestic politics. Examines topics such as the process of identity creation, the choice of national symbols, how group boundaries are established, the role of identity in conflict and state building, and the debate over nationalism's constructed or primordial nature. POLS 3418 and CLTR 3418 are cross-listed.

CLTR 3500. French Culture and the Arts. 4 Hours.

Designed to provide students with an overview of French culture with a particular focus on its rich artistic heritage as manifested down through history and in popular culture today. Includes such areas as language, art, architecture, cinema, music, literature, urban and landscape design, fashion, folklore, rites, rituals, and customs. Studies the distinctive characteristics of France's many regions in light of their contributions to the vast tapestry that comprises French culture. Conducted in French.

CLTR 3501. Caribbean Literature and Culture. 4 Hours.

Provides a comparative introduction to the modern literary traditions of the Spanish-, English, and French-speaking Caribbean. Includes authors such as Carpentier (Cuba), Naipaul (Trinidad), Zobel (Martinique), and Cardenal (Nicaragua). Conducted in English.

CLTR 3502. Cervantes and His Times. 4 Hours.

Introduces students to Don Quixote de la Mancha, Cervantes' major work as well as Spain's greatest masterpiece and its supreme gift to Western culture. Studies Cervantes' minor works, The Exemplary Novels and Interludes. Examines literary, sociological, philosophical, and historical matters: the development of the novel, genre and narratology, role-playing and representation, and Spain's triumphs and defeats. Deals with the Spanish Inquisition and censorship, and examines themes such as madness, truth and lying, and appearance and reality. Conducted in English.

CLTR 3503. Russian Literature in Translation. 4 Hours.

Surveys and analyzes in English the major works of Russian literature of the nineteenth and twentieth centuries, with emphasis on the historical context. Selected writers include Pushkin, Gogol, Turgenev, Dostoevsky, Tolstoy, and Chekhov.

CLTR 3520. International Perspectives. 4 Hours.

Uses major representative works of fiction from the modern European tradition to introduce students to an array of theoretical and critical perspectives (cognitivism, Marxism, formalism, and identity politics). Major authors include Dostoevsky, Mann, Kafka, Camus, Duras, and Achebe. Team-taught in English by members of the modern language department. Serves as an introduction to literature for language majors, who can get credit in their field of concentration by reading some of the works in the original language.

CLTR 3710. Representing Latin American Cities. 4 Hours.

Examines how several Latin American cities have been imagined, represented, written and sung about, and filmed by studying different cultural artifacts and manifestations. Examines works from the fourteenth century until today (from newspapers and popular poetry to blogs and tweets, from paintings to films, from novels to graffiti, from sports to food) that deal in different ways with the "idea" and "imagination" of the cities from their foundation to the present. This is an interactive course and is taught in Spanish.

CLTR 3715. New Narratives: Latin America after 1989. 4 Hours.

Focuses on film, literature, and new media. This course offers a panoramic view of the Latin American cultural production after 1989, attempting to characterize the variety of styles and trends. Relates the texts and movies to the socio, political, and economic issues of the moment, i.e., implementation of neoliberal democracies, globalization, neocolonialism, resistance, new social movements, etc. Also studies links between Latin America and the United States and between Latin America and Spain. Focuses on texts written by relatively young authors. Taught in Spanish.

CLTR 3720. Literature, Arts, and Poverty in Latin America. 4 Hours.

Focuses on the construction, characteristics, and representation of poverty/the poor in Latin American texts from the thirties and sixties and in the works of contemporary Latin American writers and film directors. Discusses the relation of these works to a "realist tradition" by studying social, political, and cultural aspects of Latin America from the nineteenth and twentieth centuries. Considers whether we are facing a new kind of realism. Also engages the problem of representation, the "role of literature" (ethics and literature), and its relation with politics and the global economy (literature and the market) in the Latin American context. Taught in Spanish.

CLTR 3725. Representing Violence and Human Rights in Latin America. 4 Hours.

Studies the idea of violence and how it relates to the social, economic, and political situation in Latin America. Students watch films and documentaries and read novels, testimonies, short stories, and poems of several artistic movements to study how violence is represented/visualized in these texts. Also addresses the topics of historical memory and human rights by using basic theoretical texts about the concept of violence, memory, and human rights. Studies four moments in recent Latin American history: Mexico 1968, Shining Path and Peru in the 1980s and 1990s, the genocide in Guatemala, and the dictatorships in the Southern Cone. Taught in Spanish.

CLTR 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CLTR 4550. From Knights to Revolution. 4 Hours.

Introduces major works of French literature from the Middle Ages up through the eighteenth century. Textual analysis, examination of the social and historical context of these works, and explanations of literary terms and devices through readings and class discussions are designed to contribute to the understanding and appreciation of this body of French literature.

CLTR 4551. Modern French and Francophone Literature. 4 Hours.

Introduces major works of French literature from the nineteenth century on. Textual analysis, examination of the social and historical context of these works, and explanations of literary terms and devices through readings and class discussions are designed to contribute to the understanding and appreciation of this body of French literature. .

CLTR 4555. French Poetry. 4 Hours.

Provides students with a survey of French poetry through the ages, focusing on representative works of the major French poets. Studies poems in their literary and historical context with an examination of various aspects of French versification. Conducted in French.

CLTR 4560. Masterpieces of Spanish Literature: 18th–20th Century. 4 Hours.

Surveys the literature of eighteenth-, nineteenth-, and twentieth-century Spain. Includes the literary movements of romanticism, realism, and the Generation of '98. Conducted in Spanish.

CLTR 4561. Masterpieces of Spanish Literature: 12th–17th Century. 4 Hours.

Traces the development of Spanish literature from the Middle Ages (las jarchas, El poema del Cid, El libro de buen amor, La Celestina) through the Renaissance and Baroque periods or Golden Age (Garcilaso de la Vega, the picaresque novel, the mystics, Cervantes, Lope de Vega, Calderon). Conducted in Spanish.

CLTR 4565. Spanish Golden Age. 4 Hours.

Examines plays by the outstanding dramatists of the seventeenth century in Spain: Lope de Vega, Calderón de la Barca, Tirso de Molina, Ruiz de Alarcón, and others. Conducted in Spanish. .

CLTR 4655. Latin American Literature. 4 Hours.

Offers an overview of the major trends in Latin American narrative, poetry, drama, and essays, from Bernal Diaz through Borges and Bolaño. Studies broad cultural and political contexts, especially the Cold War period and the impact of neoliberalism. Conducted in Spanish.

CLTR 4850. The Splendid Century. 4 Hours.

Presents a study of the golden age of French literature in seventeenth-century France, spanning the baroque and classical periods, and evoking the grandeur of the era of Louis XIV and Versailles. Readings cover a rich and diverse body of literature encompassing poetry, theatre, philosophy, the novel, and epistolary writing. The authors studied include Corneille, Racine, Moliere, Descartes, Pascal, and La Rochefoucauld. Conducted in French, with English permitted.

CLTR 4860. Age of Enlightenment. 4 Hours.

Studies the eighteenth century in France: the Enlightenment. It was an age of challenge to established authority, institutions, and modes of thought. This intellectual and political vitality is reflected in works of Marivaux, Fontenelle, Montesquieu, and Voltaire. It is followed by the awakening of the Romantic sensibility as found in such authors as Diderot, Rousseau, and Bernardin de St. Pierre. Conducted in French, with English permitted. .

CLTR 4870. Romantic Heritage. 4 Hours.

Treats French Romanticism and its aftermath from a literary and cultural standpoint. Examines Romanticism in poetry and drama, as well as its continuation into the realist novel. Readings include the works of Lamartine, Hugo, Balzac, and Flaubert. Also explores the development of the Parnassian and Symbolist movements. Readings include the works of Baudelaire, Verlaine, Rimbaud, and Mallarmé, precursors of all modern literature. Conducted in French, with English permitted.

CLTR 4944. Cultural Engagement Abroad. 4 Hours.

Designed for a language-based Dialogue of Civilizations. Complements the intensive language course that students take while on a language-based Dialogue. Offers students an opportunity to obtain an in-depth knowledge of the contemporary culture(s) of the country of the Dialogue and how that culture differs from or is similar to contemporary American cultural values and practices. In addition to regular in-class lectures and activities, offers structured opportunities to engage in dialogue with businesspeople, scholars, educators, artists, government officials, journalists, students, senior citizens, and/or local residents about their perspectives on various topics and issues. May be repeated up to three times.

CLTR 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CLTR 4992. Directed Study. 1-4 Hours.

Offers students a way of going beyond work given in the regular curriculum; may also enable students to complete major or minor requirements in certain situations. Priority is given to language majors and to juniors and seniors. May be repeated without limit.

Culture - Literature (LITR)

Search LITR Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=LITR>)

LITR 1260. Caribbean Literature and Culture. 4 Hours.

Provides a comparative introduction to the modern literary traditions of the Spanish-, English, and French-speaking Caribbean. Includes authors such as Carpentier (Cuba), Naipaul (Trinidad), Zobel (Martinique), and Cardenal (Nicaragua). Conducted in English.

LITR 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

LITR 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

LITR 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

LITR 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

Cybersecurity (CY)

Search CY Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=CY>)

CY 2550. Foundations of Cybersecurity. 4 Hours.

Presents an overview of basic principles and security concepts related to information systems, including workstation security, system security, and communications security. Discusses legal, ethical, and human factors and professional issues associated with cybersecurity, including the ability to differentiate between laws and ethics. Offers students an opportunity to use a substantial variety of existing software tools to probe both computer systems and networks in order to learn how these systems function, how data moves within these systems, and how these systems might be vulnerable. Covers security methods, controls, procedures, economics of cybercrime, criminal procedure, and forensics.

CY 2991. Research in Cybersecurity. 1-4 Hours.

Offers an opportunity to conduct introductory-level research or creative endeavors under faculty supervision.

CY 3740. Systems Security. 4 Hours.

Introduces the fundamental principles of designing and implementing secure programs and systems. Presents and analyzes prevalent classes of attacks against systems. Discusses techniques for identifying the presence of vulnerabilities in system design and implementation, preventing the introduction of or successful completion of attacks, limiting the damage incurred by attacks, and strategies for recovering from system compromises. Offers opportunities for hands-on practice of real-world attack and defense in several domains, including systems administration, the Web, and mobile devices. Presents the ethical considerations of security research and practice. .

CY 4170. The Law, Ethics, and Policy of Data and Digital Technologies. 4 Hours.

Describes the legal and ethical issues associated with collection, use, disclosure, and protection of digital information. Emphasizes legal infrastructure relating to privacy, data ethics, data security, hacking, automation, and intellectual property. Articulates the basic set of rules and rights that are relevant to data practices and protection, evaluates how these rules apply in context, and critically analyzes their efficacy and social impact. .

CY 4740. Network Security. 4 Hours.

Studies topics related to Internet architecture and cryptographic schemes in the context of security. Provides advanced coverage of the major Internet protocols including IP and DNS. Examines denial of service, viruses, and worms, and discusses techniques for protection. Covers cryptographic paradigms and algorithms such as RSA and Diffie-Hellman in sufficient mathematical detail. The advanced topics address the design and implementation of authentication protocols and existing standardized security protocols. Explores the security of commonly used applications like the Web and e-mail. .

CY 4770. Cryptography. 4 Hours.

Studies the design of cryptographic schemes that enable secure communication and computation. Emphasizes cryptography as a mathematically rigorous discipline with precise definitions, theorems, and proofs and highlights deep connections to information theory, computational complexity, and number theory. Topics include pseudorandomness; symmetric-key cryptosystems and block ciphers such as AES; hash functions; public-key cryptosystems, including ones based on factoring and discrete logarithms; signature schemes; secure multiparty computation and applications such as auctions and voting; and zero-knowledge proofs. .

CY 4930. Cybersecurity Capstone. 4 Hours.

Provides the culmination of the learned principles and methodologies for identifying and addressing cybersecurity issues in organizations. Offers students an opportunity to work in small groups to identify and scope a current cybersecurity problem/challenge. Requires students to submit a written proposal about the project, complete with motivation, literature research, and reasons for the study; create a work plan to develop a solution to include the development and identification of the data necessary to properly solve the problem/challenge; and create a final report.

CY 4940. Research Projects on National Security. 4 Hours.

Engages students in national cybersecurity/information systems security problems. Offers students an opportunity to learn how to apply research techniques, think clearly about these issues, formulate and analyze potential solutions, and communicate their results. Working in small groups under the mentorship of external mentors from government and industry, each student has an opportunity to formulate, carry out, and present original research on current cybersecurity/information assurance problems of interest to the nation. As part of this research, students are required to submit a written proposal about the project, complete with motivation, literature research, and reasons for the study; create a work plan for the research problem; and create a final report.

CY 5001. Cyberspace Technology and Applications. 3 Hours.

Covers primary technologies and skills needed to develop Windows and Linux systems administration. Orients techniques and tools to serve as instruments of security administrators and cybersecurity professionals. Offers students an opportunity to train in the administration of operating systems, computer communications, and scripting through the use of practical hands-on labs running on virtual machines hosted in cloud computing environments. Also provides an overview of virtualization technologies and cloud computing models. .

CY 5002. Concrete Mathematics. 3 Hours.

Offers students an opportunity to obtain a systematic understanding of mathematics necessary for mastering cyberspace tools and methods. Seeks to train students in mathematical concepts and the pragmatic use of these concepts in the field of information assurance and cybersecurity. Covers theory and hands-on exercises. Combines lectures with computer-based examples and assignments. Students not in the information assurance ALIGN program may require instructor approval for enrollment. .

CY 5004. Introduction to Cyberspace Programming 1. 3 Hours.

Offers students an opportunity to obtain a systematic understanding of cyberspace programming languages and methods. Seeks to train students in Python using command-line interface-based editors and compilers, as well as integrated development environments, with industry-standard operating systems running on virtual machines. Trains students by implementing programming principles and methods, spanning the evolution of computer systems. Combines lectures with multiple computer-based exercises. Students not in the information assurance ALIGN program may require instructor approval for enrollment.

CY 5010. Foundations of Information Assurance. 4 Hours.

Presents an overview of basic principles and security concepts related to information systems, including operating system security, communications and network security, and software security. Introduces information security via concepts of confidentiality, integrity, and availability. Discusses ethical, legal, and privacy ramifications while reviewing various laws such as the Patriot Act, GLBA, and Global Data Privacy regulation. Covers security methods, controls, procedures, economics of cybercrime, criminal procedure, and forensics. Describes the use of cryptography as a tool, software development processes, and protection. Seeks to build a common cross-disciplinary understanding in the foundations of information assurance and cybersecurity.

CY 5040. Introduction to Cyberspace Programming 2. 4 Hours.

Offers students an opportunity to obtain a systematic understanding of cyberspace programming languages and methods. Trains students in Python, C, and assembly languages using command-line-interface-based editors and compilers; integrated development environments, with industry-standard operating systems running on virtual machines; and the implementation of programming principles and methods spanning the evolution of computer systems.

CY 5061. Cloud Security. 2 Hours.

Introduces the fundamentals of cloud computing while segueing into understanding its various security challenges, threat models, and data privacy issues in regard to compliance and legal decisions. Examines the strategies to implement security controls, perform risk assessments, handle incident detection and response, while emphasizing maintaining a business-minded security life cycle for cloud-based environments.

CY 5062. Introduction to IoT Security. 2 Hours.

Aims to provide a foundation for understanding the main issues associated with information security in a widely connected world in the context of Internet of Things (IoT). Emphasizes the vulnerabilities and threats of the IoT-based systems. Offers students an opportunity to learn the essentials of the IoT technologies and the underlying mechanisms for protecting information.

CY 5120. Applied Cryptography. 4 Hours.

Surveys the principles and the practices of cryptography. Overviews the core cryptographic algorithms: symmetric encryption schemes (e.g., DES and AES); public key cryptosystems (e.g., RSA and discrete logarithm); and hash functions (e.g., the SHA family). Discusses core information assurance building blocks, such as authentication, digital signatures, key management, and digital certificates. Finally, applies these concepts to important security architectures, including the IP network stack (e.g., IPsec and SSL/TLS), the cellular system, and broadcast media. Restricted to students in the College of Computer and Information Science and in the College of Engineering or by permission of instructor.

CY 5130. Computer System Security. 4 Hours.

Offers a practical overview of enterprise computer security, operating systems security, and related topics. Applies concepts such as authentication, access control, integrity, and audit to the modern operating system. Discusses and demonstrates system, process, memory, and file system-level defenses—and the attacks against them. Also discusses topics in data security and virtualization. Uses hands-on labs to reinforce skills and provide practical experience.

CY 5131. Lab for CY 5130. 0 Hours.

Offers small-group laboratory format to cover lab requirements in CY 5130.

CY 5150. Network Security Practices. 4 Hours.

Explores issues involved in the security of computer networks. Topics include firewalls, viruses, virtual private networks, Internet security, and wireless security. Includes case studies and laboratory exercises. Restricted to students in the College of Computer and Information Science or by permission of instructor.

CY 5151. Lab for CY 5150. 0 Hours.

Offers a small-group laboratory format to cover lab requirements for CY 5150.

CY 5200. Security Risk Management and Assessment. 4 Hours.

Creates the opportunity for competency in the development of information security policies and plans including controls for physical, software, and networks. Discusses different malicious attacks, such as viruses and Trojan horses, detection strategies, countermeasures, damage assessment, and control. Covers information system risk analysis and management, audits, and log files. Uses case studies, site visits, and works with commercial products.

CY 5210. Information System Forensics. 4 Hours.

Designed to allow students to explore the techniques used in computer forensic examinations. Examines computer hardware, physical and logical disk structure, and computer forensic techniques. Conducts hands-on experiences on DOS, Windows operating systems, Macintosh, Novell, and Unix/Linux platforms. Builds on basic computer skills and affords hands-on experience with the tools and techniques to investigate, seize, and analyze computer-based evidence using a variety of specialized forensic software in an IBM-PC environment.

CY 5211. Lab for CY 5210. 0 Hours.

Offers a small-group laboratory format to cover lab requirements for CY 5210.

CY 5240. Cyberlaw: Privacy, Ethics, and Digital Rights. 4 Hours.

Describes the legal and ethical issues associated with information security including access, use, and dissemination. Emphasizes legal infrastructure relating to information assurance, such as the Digital Millennium Copyright Act and Telecommunications Decency Act, and emerging technologies for management of digital rights. Examines the role of information security in various domains such as healthcare, scientific research, and personal communications such as email. Examines criminal activities such as computer fraud and abuse, desktop forgery, embezzlement, child pornography, computer trespass, and computer piracy.

CY 5250. Decision Making for Critical Infrastructure. 4 Hours.

Focuses on the art and science of security program management leadership in the context of critical infrastructure protection programs. Includes selected readings, review of decision-making models in crisis, lectures and insights from accomplished leaders in infrastructure protection, and examination of the students' own unique background and experiences. Trains students on the interaction of vulnerabilities, threats, and countermeasures and how to apply this knowledge to the protection of critical infrastructure using research and analysis of national and global strategies, historical and current legislation, and policies. Also seeks to give students a working knowledge of federal, state, and private-sector critical infrastructure protection resources and programs.

CY 5770. Software Vulnerabilities and Security. 4 Hours.

Seeks to help students to become aware of systems security issues and to gain a basic understanding of security. Presents the principal software and applications used in the Internet, discussing in detail the related vulnerabilities and how they are exploited. Also discusses programming vulnerabilities and how they are exploited. Examines protection and detection techniques. Includes a number of practical lab assignments as well as a discussion of current research in the field.

CY 5976. Directed Study. 1-4 Hours.

Seeks to provide cybersecurity (CY) students with the training experience of working on a specific IA project under the direction of an CY instructor. The instructor provides students with a plan of seminar sessions, including lectures, research, and development of project deliverables and with direction to complete the course. May be repeated without limit.

CY 5978. Independent Study. 2-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit. .

CY 5984. Research. 2-4 Hours.

Offers an opportunity to conduct research under faculty supervision. May be repeated without limit.

CY 6120. Software Security Practices. 4 Hours.

Explores the fundamentals of software security issues from a practical perspective. Takes a deeper dive into the low-level mechanisms used in a variety of most prevalent software security issues and discusses some of the industry best practices needed to address the issues. Offers students an opportunity to learn both an attacker's and defender's perspectives when it comes to software security issue exploitation, detection, and mitigation. Incorporates a number of practical C and assembly coding and lab assignments. Includes an overview of some of the state-of-the-art software security issue exploitation and mitigation techniques used in the field. .

CY 6121. Lab for CY 6120. 0 Hours.

Offers a small-group laboratory format to cover lab requirements for CY 6120.

CY 6200. Special Topics in IT Security Governance, Risk, and Compliance. 1-4 Hours.

Offers various topics in IT security governance, risk, and compliance. May be repeated for up to 8 total credits.

CY 6240. Special Topics in Privacy Law. 1-4 Hours.

Offers various topics in privacy law. May be repeated for up to 8 total credits.

CY 6720. Machine Learning in Cybersecurity and Privacy. 4 Hours.

Covers a range of theoretical and applied topics related to machine learning uses in security and privacy. Examines vulnerabilities of machine learning and deep learning algorithms and the challenges of securing these systems in real-world applications. Machine learning and AI have enabled a number of critical applications— such as machine translation, speech recognition, and precision medicine—with large positive impact to our daily lives.

CY 6740. Network Security. 4 Hours.

Studies the theory and practice of computer security, focusing on the security aspects of multiuser systems and the Internet. Introduces cryptographic tools, such as encryption, key exchange, hashing, and digital signatures in terms of their applicability to maintaining network security. Discusses security protocols for mobile networks. Topics include firewalls, viruses, Trojan horses, password security, biometrics, VPNs, and Internet protocols such as SSL, IPSec, PGP, SNMP, and others.

CY 6750. Cryptography and Communications Security. 4 Hours.

Studies the design and use of cryptographic systems for communications and other applications such as e-commerce. Discusses the history of cryptographic systems, the mathematical theory behind the design, their vulnerability, and the different cryptanalytic attacks. Topics include stream ciphers including shift register sequences; block ciphers, such as DES and AES; public-key systems including RSA, discrete logarithms; signature schemes; hash functions, such as MD5 and SHA1; and protocol schemes including identification schemes, zero-knowledge proofs, authentication schemes, and secret sharing schemes. Discusses key management problems including Needham-Schroeder protocols and certificates. .

CY 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

CY 7900. Capstone Project. 4 Hours.

Draws together candidates from diverse backgrounds (technical, legal, and/or law enforcement) in a collaborative activity to address one or more security issues from an integrated perspective. Requires a project proposal, generally industrially oriented, to be submitted and accepted prior to the semester in which the project is to be undertaken.

CY 7962. Elective. 2-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit. .

CY 8660. Research Project in National Information Security. 4 Hours.

Engages students in national cybersecurity/information systems security problems. Offers students an opportunity to learn how to apply research techniques, think clearly about these issues, formulate and analyze potential solutions, and communicate their results. Working in small groups under the mentorship of technical clients from government and industry, each student has an opportunity to formulate, carry out, and present original research on current cybersecurity/information assurance problems of interest to the nation. Requires permission of instructor. May be repeated once. .

CY 8982. Readings. 1-4 Hours.

Offers selected readings under the supervision of a faculty member. May be repeated without limit.

CY 9990. Dissertation. 0 Hours.

Offers selected work with the agreement of a thesis supervisor.

CY 9996. Dissertation Continuation. 0 Hours.

Continues work with the agreement of a thesis supervisor. May be repeated without limit.

Data Analytics (DA)

Search DA Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=DA>)

DA 5020. Collecting, Storing, and Retrieving Data. 4 Hours.

Studies how to build large-scale information repositories of different types of information objects so that they can be selected, retrieved, and transformed for analytics and discovery, including statistical analysis. Analyzes how traditional approaches to data storage can be applied alongside modern approaches that use nonrelational data structures. Through case studies, readings on background theory, and hands-on experimentation, offers students an opportunity to learn how to select, plan, and implement storage, search, and retrieval components of large-scale structured and unstructured information repositories. Emphasizes how to assess and recommend efficient and effective large-scale information storage and retrieval components that provide data scientists with properly structured, accurate, and reliable access to information needed for investigation.

DA 5030. Introduction to Data Mining/Machine Learning. 4 Hours.

Introduces the fundamental techniques for data mining, combining elements from CS 6140 and CS 6220. Discusses several basic learning algorithms, such as regression and decision trees, along with popular data types, implementation and execution, and analysis of results. Lays the data analytics program foundation of how learning models from data work, both algorithmically and practically. The coding can be done in R, Matlab or Python. Students must demonstrate ability to set up data for learning, training, testing, and evaluating.

Data Science (DS)

Search DS Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=DS>)

DS 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

DS 2000. Programming with Data. 2 Hours.

Introduces programming for data and information science through case studies in business, sports, education, social science, economics, and the natural world. Presents key concepts in programming, data structures, and data analysis through Python and Excel. Integrates the use of data analytics libraries and tools. Surveys techniques for acquiring and programmatically integrating data from different sources. Explains the data analytics pipeline and how to apply programming at each stage. Discusses the programmatic retrieval of data from application programming interfaces (APIs) and from databases. Introduces predictive analytics for forecasting and classification. Demonstrates the limitations of statistical techniques.

DS 2001. Data Science Programming Practicum. 2 Hours.

Accompanies DS 2000. Applies topics from the course through various experiments, readings, and a project in a variety of contexts.

DS 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

DS 2991. Research in Data Science. 1-4 Hours.

Offers an opportunity to conduct introductory-level research or creative endeavors under faculty supervision.

DS 3000. Foundations of Data Science. 4 Hours.

Introduces core modern data science technologies and methods that provide a foundation for subsequent Data Science classes. Covers: working with tensors and applied linear algebra in standard numerical computing libraries (e.g., NumPy); processing and integrating data from a variety of structured and unstructured sources; introductory concepts in probability, statistics, and machine learning; basic data visualization techniques; and now standard data science tools such as Jupyter notebooks.

DS 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

DS 4200. Information Presentation and Visualization. 4 Hours.

Introduces foundational principles, methods, and techniques of visualization to enable creation of effective information representations suitable for exploration and discovery. Covers the design and evaluation process of visualization creation, visual representations of data, relevant principles of human vision and perception, and basic interactivity principles. Studies data types and a wide range of visual data encodings and representations. Draws examples from physics, biology, health science, social science, geography, business, and economics. Emphasizes good programming practices for both static and interactive visualizations. Creates visualizations in Excel and Tableau as well as R, Python, and open web-based authoring libraries. Requires programming in Python, JavaScript, HTML, and CSS. Requires extensive writing including documentation, explanations, and discussions of the findings from the data analyses and the visualizations.

DS 4300. Large-Scale Information Storage and Retrieval. 4 Hours.

Introduces data and information storage approaches for structured and unstructured data. Covers how to build large-scale information storage structures using distributed storage facilities. Explores data quality assurance, storage reliability, and challenges of working with very large data volumes. Studies how to model multidimensional data. Implements distributed databases. Considers multitier storage design, storage area networks, and distributed data stores. Applies algorithms, including graph traversal, hashing, and sorting, to complex data storage systems. Considers complexity theory and hardness of large-scale data storage and retrieval. Requires use of nonrelational, document, key-column, key-value, and graph databases and programming in R, Python, and C++.

DS 4400. Machine Learning and Data Mining 1. 4 Hours.

Introduces supervised and unsupervised predictive modeling, data mining, and machine-learning concepts. Uses tools and libraries to analyze data sets, build predictive models, and evaluate the fit of the models. Covers common learning algorithms, including dimensionality reduction, classification, principal-component analysis, k-NN, k-means clustering, gradient descent, regression, logistic regression, regularization, multiclass data and algorithms, boosting, and decision trees. Studies computational aspects of probability, statistics, and linear algebra that support algorithms, including sampling theory and computational learning. Requires programming in R and Python. Applies concepts to common problem domains, including recommendation systems, fraud detection, or advertising.

DS 4420. Machine Learning and Data Mining 2. 4 Hours.

Continues with supervised and unsupervised predictive modeling, data mining, and machine-learning concepts. Covers mathematical and computational aspects of learning algorithms, including kernels, time-series data, collaborative filtering, support vector machines, neural networks, Bayesian learning and Monte Carlo methods, multiple regression, and optimization. Uses mathematical proofs and empirical analysis to assess validity and performance of algorithms. Studies additional computational aspects of probability, statistics, and linear algebra that support algorithms. Requires programming in R and Python. Applies concepts to common problem domains, including spam filtering.

DS 4440. Practical Neural Networks. 4 Hours.

Offers a hands-on introduction to modern neural network ("deep learning") tools and methods. Covers the fundamentals of neural networks and introduces standard and new architectures from simple feed forward networks to recurrent neural networks. Also covers stochastic gradient descent and backpropagation, along with related fitting techniques. Emphasizes using these technologies in practice, via modern toolkits. Specifically introduces Keras (together with TensorFlow) and PyTorch, which are illustrative of static and dynamic network implementations, respectively. Reviews applications of these models to various types of data, including images and text.

DS 4900. Data Science Senior Project. 4 Hours.

Designed to help students develop a sophisticated understanding of data collection, integration, storage, statistical analysis, visualization, and machine-supported analysis and modeling. Requires students to analyze a substantial data set using statistical and visual methods and to build machine-learning models to discover patterns in the data. Results must be communicated in writing. Requires substantial programming in R, Python, Java, or C++.

DS 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

DS 4991. Research. 4 Hours.

Offers an opportunity to conduct research under faculty supervision. .

DS 4992. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. May be repeated without limit.

DS 4993. Independent Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. May be repeated without limit.

DS 4994. Internship. 4 Hours.

Offers students an opportunity for internship work. May be repeated without limit.

DS 4996. Experiential Education Directed Study. 1-4 Hours.

Draws upon the student's approved experiential activity and integrates it with study in the academic major. Restricted to those students who are using it to fulfill their experiential education requirement. May be repeated without limit.

DS 4997. Data Science Thesis. 4 Hours.

Offers students an opportunity to prepare an undergraduate thesis under faculty supervision. .

DS 4998. Data Science Thesis Continuation. 4 Hours.

Focuses on student continuing to prepare an undergraduate thesis under faculty supervision. .

DS 5010. Introduction to Programming for Data Science. 4 Hours.

Offers an introductory course on fundamentals of programming and data structures. Covers lists, arrays, trees, hash tables, etc.; program design, programming practices, testing, debugging, maintainability, data collection techniques, and data cleaning and preprocessing. Includes a class project, where students use the concepts covered to collect data from the web, clean and preprocess the data, and make it ready for analysis.

DS 5020. Introduction to Linear Algebra and Probability for Data Science. 4 Hours.

Offers an introductory course on the basics of statistics, probability, and linear algebra. Covers random variables, frequency distributions, measures of central tendency, measures of dispersion, moments of a distribution, discrete and continuous probability distributions, chain rule, Bayes' rule, correlation theory, basic sampling, matrix operations, trace of a matrix, norms, linear independence and ranks, inverse of a matrix, orthogonal matrices, range and null-space of a matrix, the determinant of a matrix, positive semidefinite matrices, eigenvalues, and eigenvectors.

DS 5110. Introduction to Data Management and Processing. 4 Hours.

Discusses the practical issues and techniques for data importing, tidying, transforming, and modeling. Offers a gentle introduction to techniques for processing big data. Programming is a cross-cutting aspect of the course. Offers students an opportunity to gain experience with data science tools through short assignments. Course work includes a term project based on real-world data. Covers data management and processing—definition and background; data transformation; data import; data cleaning; data modeling; relational and analytic databases; basics of SQL; programming in R and/or Python; MapReduce fundamentals and distributed data management; data processing pipelines, connecting multiple data management and analysis components; interaction between the capabilities and requirements of data analysis methods (data structures, algorithms, memory requirements) and the choice of data storage and management tools; and repeatable and reproducible data analysis.

DS 5220. Supervised Machine Learning and Learning Theory. 4 Hours.

Introduces supervised machine learning, which is the study and design of algorithms that enable computers/machines to learn from experience or data, given examples of data with a known outcome of interest. Offers a broad view of models and algorithms for supervised decision making. Discusses the methodological foundations behind the models and the algorithms, as well as issues of practical implementation and use, and techniques for assessing the performance. Includes a term project involving programming and/or work with real-life data sets. Requires proficiency in a programming language such as Python, R, or MATLAB.

DS 5230. Unsupervised Machine Learning and Data Mining. 4 Hours.

Introduces unsupervised machine learning and data mining, which is the process of discovering and summarizing patterns from large amounts of data, without examples of data with a known outcome of interest. Offers a broad view of models and algorithms for unsupervised data exploration. Discusses the methodological foundations behind the models and the algorithms, as well as issues of practical implementation and use, and techniques for assessing the performance. Includes a term project involving programming and/or work with real-life data sets. Requires proficiency in a programming language such as Python, R, or MATLAB.

DS 5500. Information Visualization: Applications in Data Science. 4 Hours.

Offers students an opportunity to develop effective communication skills with data by drawing from different disciplines including physics, biology, health science, social science, geography, business, and economics. Introduces principles of effective oral and written communication and a wide range of visual data encodings and representations. Covers the foundational principles for visual representations, including human vision and perception and basic interactivity. A semester-long project requires students to translate the domain science or technology problem into the language of data science; design, evaluate, implement, and deploy both static and interactive visualizations of data and data analysis results; translate the results into the language of the original science or technology problem; communicate the findings in oral and written form; and provide constructive criticism of other examples of data communication and visualization.

DS 6050. Seminar in Data Science. 4 Hours.

Offers students an opportunity to learn how to approach data analysis problems in a systematic manner and to learn how to design data analysis pipelines, as well as how to implement them at scale in the context of real-world problems. Data science is at the intersection of statistics, machine learning, and software development. Data analysis problems are solved in a series of datacentric steps: data acquisition, data cleaning, data transformation, data modelling, and data visualization.

DS 7995. Project. 1-4 Hours.

Offers students an opportunity to participate in a direct data science project under the supervision of a faculty member. May be repeated once for a total of 8 credits.

Deaf Studies (DEAF)

Search DEAF Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=DEAF>)

DEAF 1500. Deaf People in Society. 4 Hours.

Focuses on Deaf communities as linguistic and cultural minorities. Topics include perspectives on Deaf communities, attitudes toward Deaf people and sign languages, technology and communication, the contributions of Deaf people to society, professional and social organizations of and for Deaf people, Deaf clubs as a locus of Deaf culture, communication issues, perspectives on legislation affecting the Deaf community, legislative and political concerns of the Deaf community, and the impact of educational options for Deaf children.

DEAF 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

DEAF 2500. Deaf History and Culture. 4 Hours.

Surveys the history and culture of the American Deaf community and Deaf people in the Western world. Focuses on educational, political, and technological forces and events that have positively and negatively affected the American Deaf community. Focuses on the American Deaf community as a linguistic and cultural minority. Also examines contemporary values and factors that shape and define the American Deaf community and compares and contrasts American Deaf cultural values with those of American society in general.

DEAF 2700. ASL Linguistics. 4 Hours.

Introduces the basic issues in linguistics by examining the structural properties of American Sign Language and comparing it with other languages having similar properties. Includes phonology (formational properties of signs), morphology (word formation, rules, derivation, inflection, complex verbs, classifiers, and verb modulations), semantics (the meaning structure of signs), and syntax (the structure of ASL utterances in terms of old vs. new information and the structure of ASL narratives).

DEAF 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

DEAF 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

DEAF 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

Digital Media - CPS (DGM)

Search DGM Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=DGM>)

DGM 5978. Independent Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic.

DGM 6105. Visual Communications Foundation. 4 Hours.

Introduces the basic principles and concepts inherent in visual language systems. Covers fundamentals such as visual perception, composition, spatial relationships, color, form, repetition, texture, structure, abstraction, and figure-ground relationships. Student projects focus on visual problem solving with an emphasis on understanding of context, content, and the development of original forms.

DGM 6108. Programming Foundations for Digital Media. 4 Hours.

Offers students an opportunity to learn the fundamentals of programming in a multimedia environment. Emphasizes planning and production for interactive digital media. Using a scripting language as a base, covers how scripting relates to design and programming fundamentals that link logic to action. Topics include graphical user interfaces; user interaction; and algorithmic manipulation of text, graphics, sound, and video.

DGM 6109. Lab for DGM 6108. 2 Hours.

Accompanies DGM 6108. Covers topics from the lecture course through various tutorials and problem-solving exercises.

DGM 6122. Foundations of Digital Storytelling. 4 Hours.

Introduces the fundamentals of character and story development through practical applications in a variety of digital media, from text and storyboarding to sound, moving image, and interactive environments. Offers students an opportunity to become familiar with narrative sequencing and story development, experience the critical role of narrative in linear media, and apply these skills in nonlinear and experimental forms. Students work both individually and collaboratively to develop projects that explore creative storytelling.

DGM 6125. Time-Based Media. 4 Hours.

Introduces the creative potential of time-based media—data that changes with respect to time. Explores concepts of sequencing, transformation, and motion through time and space. Offers students an opportunity to explore the potential of video, 2D, animation, motion graphics, and sound design through hands-on assignments.

DGM 6140. Sound Design. 4 Hours.

Explores the history, theory, and practice of sound design, the creation of aural environments, special effects, dialogue, and music for a variety of traditional and digital media, including film, TV/video, animation, theatre, radio, interactive games, and the Internet. Films such as *The Matrix*, *Citizen Kane*, and *Star Wars* serve as the basis for developing a core knowledge of sound design concepts, particularly the development of critical listening skills. Topics cover “spotting,” digital audio editing and recording, sample libraries, aesthetics of design, music composition, script interpretation, critical listening, professional collaboration, sound and music technology, digital audio production, and production organization. Offers students an opportunity to master core skills, enabling them to communicate effectively with directors, producers, and/or creative artists in the media and entertainment industries.

DGM 6145. Information Technology and Creative Practice. 4 Hours.

Explores interdisciplinary methodologies that promote creativity and stimulate innovative thinking. Information technology (IT) has formed a powerful alliance with art and design to establish the existing new domain of information technology and creative practices (ITCP). The result is an astonishing variety of significant cultural and economic forms ranging from innovative product designs to interactive art installations. Uses case studies and emphasizes the design, planning, and implementation of innovative prototypes.

DGM 6168. Usability and Human Interaction. 4 Hours.

Surveys the theory and practice of human-computer interaction and the development of user interfaces. Through both analysis and design projects, students have an opportunity to learn cutting-edge approaches to usability research and evaluation, testing methods, and how to design systems that meet end-user needs. Topics covered include behavioral and cognitive foundations of interaction design, principles of good design for interaction, basic user research techniques, and the process of user-centered design.

DGM 6217. Typography for Interactivity. 4 Hours.

Explores the basic principles of typographic design, particularly as applied to screen-based media. Topics include screen legibility and resolution, hierarchy and scale, and typographic form and style.

DGM 6230. Digital Media Entrepreneurship. 4 Hours.

Focuses on the personal characteristics necessary to become a successful entrepreneur, as well as on the processes of evaluating an idea, assessing the market, and implementing a new venture, whether inside an organization or as an independent startup. Teaching methods include case study, guest speakers with entrepreneurial experience, lectures, and team projects that develop feasible business plans. Offers students an opportunity to evaluate their potential as entrepreneurs by learning how to identify and evaluate business opportunities, develop a business concept and marketing plan, assess and obtain the required resources, manage the growth of new ventures, and plan for exit strategies.

DGM 6268. Usable Design for Mobile Digital Media. 4 Hours.

Offers students an opportunity to apply the user-centered, human-computer interaction (HCI) skills covered in DGM 6168 to mobile digital media experiences such as game, entertainment, and social media applications. Considers digital media design, aesthetics, and user behavior in mobile-based environments in the creation of a satisfying and engaging experience. Offers students an opportunity to understand best design practices on a mobile platform by applying HCI methods such as iterative design and the evaluative methods of heuristic evaluation and play testing.

DGM 6279. Project Management for Digital Media. 4 Hours.

Introduces the project management life cycle for technology-based products and applications. Beginning with project initiation and assembling a team, offers students an opportunity to apply project management principles to all aspects of planning and managing a project, including scheduling and budgeting. Major topics include managing a team, including setting goals for creatives; managing assets; documentation; deadlines and client expectations; and balancing continuous improvement and rapid prototyping against the need to manage the scope of work.

DGM 6280. Managing for Digital Media. 4 Hours.

Surveys evolving best practices in creative industry management. Begins with the recognition that managing in an environment of innovation and creative media requires a radical rethinking of traditional managerial paradigms. Agile response to technological change requires strategic alternatives in company goals, priorities, and direction. Intellectual content and creativity are difficult to value within classic financial models. New devices and social networks demand responsive action in internal and external communications. Correctly valuing the performance of highly creative people can be key in maintaining or gaining a leadership position. Uses case studies, presentations, and team-based analysis to examine these challenges and discuss effective responses.

DGM 6285. Interactive Marketing Fundamentals. 4 Hours.

Introduces the exploration of messaging in current and evolving media outlets, the digital marketing mix, the growing promise of mobility, and the possibilities and pitfalls of marketing in social media. Marketing has been deeply challenged by the move from traditional to digital channels, as print and TV give way to Web sites and mobile devices as primary centers of information and entertainment. Explores Web analytics, in particular search engine marketing (SEM) and search engine optimization (SEO).

DGM 6290. Social Media and Brand Strategy Implementation. 4 Hours.

Offers students an opportunity to develop the context for working with marketing professionals to implement strategy in a variety of social media, from blogs to social networking sites, and from game worlds to content communities. Social media environments have become a prime target for product and personal marketing, advertising, and supporting a brand image. But their differences from passive media and even standard websites have made it more difficult to apply traditional thinking to these digital media channels. Utilizes lectures, research, projects, and case studies.

DGM 6308. Intermediate Programming for Digital Media. 4 Hours.

Offers students an opportunity to extend the basic proficiency in scripting languages gained in DGM 6108 to more sophisticated programming tasks using an industry-standard scripting language such as JavaScript. Covers the use of arrays and objects to structure data and apply object-oriented and event-driven programming principles to create sophisticated interactivity.

DGM 6317. Screen-Based Publication Design. 4 Hours.

Introduces the theory and practice of designing books, magazines, and interactive hybrid narratives for touch screens. Offers students an opportunity to become familiar with grids, style sheets and templates, and output to a variety of e-publishing tools as they explore the differences in designing content for the Web, tablets, and smartphones.

DGM 6322. Advanced Digital Storytelling. 4 Hours.

Builds on concepts introduced in DGM 6122. Explores the ideation and production of more complex, nonlinear interactive narratives. Working intensively in a team setting, offers students an opportunity to explore ways to further integrate a variety of narrative elements into immersive experiences.

DGM 6400. Game Design Fundamentals. 4 Hours.

Provides the foundation for all of the other courses in the graduate specialization and/or certificate in game design. Offers students an opportunity to learn the basic principles of game design through the creation of board and card games, and through video-game prototyping. Also offers an opportunity to develop skills, including graphic and written communication, rules logic, group dynamics, and basic programming logic.

DGM 6403. Game Engine Fundamentals. 4 Hours.

Offers students an opportunity to apply their prior experience in DGM 6400 to multiplatform game development and rapid prototyping using an industry-standard game design engine. Game engines provide quick-start platforms and industry-standard solutions for developing video games.

DGM 6405. Game Development. 4 Hours.

Introduces video game programming using a game engine. Building on their work from DGM 6400, students have an opportunity to create single-player computer games using industry-standard scripting languages. Projects focus on sound design, two-dimensional design and animation, or three-dimensional design and animation. Students can develop projects as individuals or as part of a team.

DGM 6410. Game Design Technology Lab. 4 Hours.

Offers students an opportunity to explore recent technological advances in game design, including networked multiplayer gaming, 3D gaming, and alternative user interfaces such as cameras and motion/location-sensing devices. Student teams are encouraged to round out their game-design portfolios by developing a sophisticated videogame demo that focuses on a specific theme and technology.

DGM 6430. Screenwriting: Linear and Interactive. 4 Hours.

Introduces and builds on basic elements of traditional scriptwriting. Offers students an opportunity to develop their creative writing skills by developing a screenplay for either a film/video production or an interactive/immersive project. Emphasizes dialogue, dynamic role-playing, story generation, and character development for actors and animated characters. Requires proficiency in English or a TOEFL writing score of 27 or above.

DGM 6435. Digital Video Production. 4 Hours.

Using digital video cameras, students are introduced to field production skills and basic content editing. Students are encouraged to implement and experiment with ideas developed in DGM 6122 as they complete short videos. Through hands-on practice and discussion, as well as the viewing of classic documentary and fiction film/video examples, students have an opportunity to further explore composition of the frame and meanings produced from inter-shot and sequence relationships.

DGM 6440. Editing in the Digital Studio. 4 Hours.

Uses virtual studio spaces to introduce and develop student comfort with non-linear digital editing. Offers students an opportunity to understand the basic principles of composition, pacing, titling, timecodes and video effects. Working with their own material, existing video clips, animations, still images and audio feeds, students are encouraged to experiment with different styles, methods, and output to gain a comprehensive understanding of the medium. DGM 6506 or prior experience with digital video editing is strongly recommended.

DGM 6450. Animation Basics. 4 Hours.

Explores the creative potential of animation. Exposes students to animation processes and techniques through lectures, demonstrations, and hands-on assignments. Provides a historical survey of animation art. Emphasizes using the computer to creatively develop concepts while learning the fundamental skills of constructing images and forms. Students collaborate on projects during the first half of the course and work individually on final projects.

DGM 6451. Web Development. 4 Hours.

Focuses on intermediate to advanced concepts and techniques for development of professional Web environments. Offers students an opportunity to explore different development strategies, including client-side interactions using AJAX libraries (such as JavaScript, PHP, and MySQL) compared with client/server methods, webpage presentation layer vs. interactive layer, and the use of WYSIWYG (what you see is what you get) tools vs. plain-text coding.

DGM 6461. Interactive Information Design 1. 4 Hours.

Focuses on the fundamental principles of interactive design to develop meaningful interactive experiences. Offers students an opportunity to develop skills in structuring and organizing information, recognizing and establishing content relationships, and building usable navigation. Explores a variety of tools and technologies to deliver varied media material for screen-based use.

DGM 6463. Interactive Information Design 2. 4 Hours.

Builds on the content and explorations of DGM 6461. Explores complex information organization and delivery problems while seeking to advance the students' experience with interactive design and programming environments.

DGM 6471. Designing Infographics. 4 Hours.

Explores a variety of methods that help to translate raw data into accessible visual presentations that can inform, clarify, educate, and persuade. A powerful aspect of Internet technologies is how readily they provide access to information. However, that information often resides in opaque technical formats, making it hard to understand and disseminate.

DGM 6501. Web Creation Boot Camp. 2 Hours.

Offers students an opportunity to gain basic competency in the design and coding of an attractive, effective, static website. Covers basic web design technology, including webpage structure, markup languages (HTML and CSS), basic rules for image preparation, and site development and management using an industry-standard text editor. This course is an intensive workshop.

DGM 6506. Introduction to Digital Video. 2 Hours.

Uses industry-standard software to introduce editing and compression techniques critical for effective participation in digital video production and editing courses. Offers students an opportunity to become comfortable editing a short video for content, preparing it for posting on the Web, and/or including it in an interactive media project.

DGM 6508. Game Development Intensive. 4 Hours.

Offers students an opportunity to apply the experience gained in DGM 6108 to programming for game development. Game engines provide quick-start platforms and industry-standard solutions for developing video games. The Unity 3D game engine is used for multiplatform game development and is also a rapid prototyping tool for the Wii, PlayStation, and iOS devices. Begins at the introductory Unity level.

DGM 6510. 3-D Modeling. 4 Hours.

Introduces the fundamentals of three-dimensional computer animation. Class lectures and demonstrations are followed by substantial hands-on exploration. Offers students an opportunity to gain fundamental skills for polygon modeling and UV surfacing. Projects progress from creating simple geometric objects to realistic organic characters.

DGM 6511. Web Creation Bootcamp 2. 2 Hours.

Offers an intensive workshop designed to build on the foundations of web creation built in DGM 6501. Offers students an opportunity to work intensively with web software and web technologies such as xHTML, PHP, and JavaScript to design websites with layered imagery, basic interactivity, and more complex layouts.

DGM 6515. Introduction to After Effects. 2 Hours.

Introduces the creation and manipulation of motion graphics and time-based visual effects using the After Effects environment. Offers students an opportunity to acquire the basic knowledge required for DGM 6540.

DGM 6516. Virtual and Augmented Reality (VR/AR). 2 Hours.

Explores trends and technologies driving virtual reality and augmented reality (VR/AR) video production. Through a blend of class discussions and hands-on practice, offers students an opportunity to conceptualize, produce, and deliver high-quality immersive VR videos, apply AR in video production, and understand applications of this technology for a variety of fields.

DGM 6520. Lighting for the Camera. 4 Hours.

Emphasizes essential lighting theory and techniques. Understanding lighting is the key to a professional photographic or video shoot. Topics include lighting equipment; lighting sources and arrangement; color temperature; lighting for indoor, outdoor, and location shooting; as well as the editorial use of lighting to create tone and communicate narrative. Offers students an opportunity to create projects in different lighting environments and for different purposes to experience a wide range of lighting problems and solutions.

DGM 6521. Web Creation for Content Management Systems. 2 Hours.

Expands on the foundations of web creation with an emphasis on developing for content management systems such as WordPress. Offers students an opportunity to work intensively to use web technologies to build on these open-source software models' core capabilities. Requires basic knowledge of cascading style sheets (CSS) and beginner knowledge of PHP.

DGM 6525. Research Methods for Global User Experiences. 4 Hours.

Focuses on a structured approach to user research methodology for the design of interactive applications. Emphasizes user research and interpretation for products and services that will be marketed to individuals spanning cultures with radically different customs and communication. Applies field methods such as interviewing, observation, and questionnaire design through the lens of intercultural psychology and communication patterns, cultural neutrality, and culture-centric design.

DGM 6530. Character Animation. 4 Hours.

Provides an in-depth investigation of 3-D animation. Offers students an opportunity to continue development of realistic characters created in DGM 6510 and to develop intermediate skills for weight mapping and rigging, as well as midlevel proficiency with animation editors. Projects focus on creating animations that emphasize realistic deformation and movement.

DGM 6535. Rigging Principles and Techniques. 4 Hours.

Offers animation students the opportunity to apply realistic motion effects to a complete, intuitive character rig. Convincing animation of 3D characters and objects requires rigging—the setup and scripting of a range of structural controls. Explores character preparation and motion control; kinematics; realistic motion effects, including textures such as fur and hair; and environmental elements, such as fluids, fire, and explosions.

DGM 6540. Compositing. 4 Hours.

Investigates compositing and special FX techniques. Student teams have an opportunity to utilize green screen studio to capture live-action video footage that is seamlessly combined with computer-generated environments and characters that they create. Offers students an opportunity to develop original narratives that are suitable for exploring course objectives.

DGM 6545. Documentary and Nonfiction Production. 4 Hours.

Offers students interested in documentary filmmaking an opportunity to learn the research, story structure, and production skills necessary to bring a nonfiction video narrative from preproduction through postproduction and refine their work from rough to final cut. Using scenes and examples from notable documentaries to inspire and illustrate technique, students research topics, find subjects, conduct interviews, practice techniques of cinema vérité and B-roll, and work with archival footage to complete one major nonfiction project.

DGM 6550. Search Engine Optimization: Strategy and Implementation. 4 Hours.

Connects the search engine optimization (SEO) process to marketing and social media strategy by introducing students to the concepts behind consumer search behavior, search engine algorithms, and SEO analysis using tools such as Google Analytics. A website's frequency ranking in a content search critically impacts its visibility and, ultimately, viability. Seeks to provide foundational guidance on topics such as organic search tactics, website optimization, and keyword research and selection. .

DGM 6880. Portfolio. 2 Hours.

Offers an intensive seminar designed to help students develop a digitally based portfolio to meet professional standards in their area. Offers students an opportunity to examine existing work, to consider new projects, and to learn to present and package their process and ideas effectively. May be repeated once.

DGM 6882. Animation Reel. 1-4 Hours.

Offers students an opportunity to develop a portfolio reel that may be suitable for submission to potential employers. Emphasizes sound integration and efficient use of polygonal structures. Focuses on student-generated projects; weekly goals are determined by aesthetic and technical demands of student objectives.

DGM 6890. Thesis Proposal Development. 2 Hours.

Offers students an opportunity to understand thesis goals and process, with a view toward developing strong project ideas, an effective and realistic development path, and a well-written preliminary proposal.

DGM 6892. Capstone Project Preparation. 2 Hours.

Offers students an opportunity to understand capstone goals and process. Emphasizes developing strong team skills; identifying and leveraging individual strengths; and managing stakeholder relationships, project scope, and deliverables.

DGM 6943. Integrative Experiential Learning. 3,4 Hours.

Offers students an opportunity to apply the principles, tools, and processes of digital medial to real-world problems in profit and nonprofit organizations through a customized variety of experiential options. These opportunities may range from participation in the co-operative education program to Experiential Network (XN) projects.

DGM 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

DGM 7962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions.

DGM 7978. Independent Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic.

DGM 7980. Capstone. 6 Hours.

Offers students an opportunity to demonstrate competency in core digital media topics and concentration-based learning outcomes through the development of a research-based project.

DGM 7990. Thesis. 4-6 Hours.

Offers students an opportunity to complete a digital media project, researched and proposed by the student and directed by one or more members of the faculty. The thesis project can be an individual endeavor or the result of a collaboration involving two or more students in the program.

DGM 7996. Thesis Continuation. 0 Hours.

Offers continuing thesis supervision by members of the department.

Earth and Environmental Sciences (ENVR)

Search ENVR Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=ENVR>)

ENVR 1000. Marine and Environmental Sciences at Northeastern. 1 Hour.

Intended for first-year students in the College of Science. Introduces students to liberal arts; familiarizes them with their major; develops the academic skills necessary to succeed (analytical ability and critical thinking); provides grounding in the culture and values of the University community; and helps to develop interpersonal skills—in short, familiarizes students with all skills needed to become a successful university student.

ENVR 1101. Environmental Science. 4 Hours.

Focuses on the complex array of topics that collectively form the discipline of environmental science. Emphasizes the problems facing today's natural, human-managed, and coupled human/natural ecosystems and the solutions to those problems. Studies the human dimensions of environmental science, including culture, politics, worldviews, ethics, and economics, particularly within the context of global climate change. Offers students an opportunity to learn to analyze data as a means of exploring relationships among societal and ecological drivers affecting economic, ecological, and socioeconomic stability; to learn how the scientific method is used to separate fact and data from opinion; and to apply these methods to explore the causes and solutions to global climate change.

ENVR 1103. Age of Dinosaurs. 4 Hours.

Utilizes evidence from the sedimentary rock record to evaluate and to interpret significant biological and physical events in Mesozoic earth history. Changes in the Earth's landscape due to variations in climate, plate tectonics, and sea level provide the background for detailed consideration of Mesozoic life. Emphasizes the evolutionary history of dinosaurs and provides detailed data for testing hypotheses of evolutionary mechanisms, paleobiogeography, functional anatomy, ecology and community structure, and extinction and extinction models.

ENVR 1104. Natural Disasters and Catastrophes. 4 Hours.

Provides an overview of what we know about the causes, locations, and effects of some of the most important natural disasters such as earthquakes, floods, and hurricanes. Also examines how loss of life and property damage can be minimized by implementing geologic knowledge. Briefly examines less common but possibly more devastating catastrophes such as large volcanic eruptions, large meteorite impacts, and rapid climate change.

ENVR 1110. Global Climate Change. 4 Hours.

Analyzes Earth's modern climate system and natural climate change over Earth's 4.5-billion-year history. Examines ongoing and future climate change. Includes expected impacts of the predicted climate changes as well as mitigation and adaptation options.

ENVR 1112. Environmental Geology. 4 Hours.

Investigates geologic processes such as flooding, volcanic eruptions, and earthquakes, as well as strategies for safer land use incorporating geologic information. Exercises completed and discussed in class offer hands-on experience with evaluating geologic factors that impact land use and formulating hazards mitigation strategies. Offers students an opportunity to increase their understanding of problems resulting from the interaction of humans with the geologic environment and how we can more appropriately interact with it.

ENVR 1120. Oceans and Coasts. 4 Hours.

Explores the marine and coastal realm and the problems that arise from the human-marine relationship. Begins by studying the history of the ocean and ends with how to create a more sustainable marine world. Topics covered include ocean and estuarine circulation, climate change and ocean response, and the plant and animal life thriving in different parts of the ocean. Includes reading and analyzing the scientific literature, developing and presenting research projects, and group work.

ENVR 1145. Volcanoes. 4 Hours.

Offers students an opportunity to understand how volcanoes work, why volcanoes occur, where volcanoes occur, and what their impacts have been throughout human history and prehistoric times. Also address strategies for safer land use around active volcanoes.

ENVR 1200. Dynamic Earth. 4 Hours.

Offers a systematic study of the materials and systems comprising the earth. Emphasizes the processes that form, transport, alter, and destroy rocks, as well as the nature and development of landscape. Plate tectonics theory is introduced as a guiding paradigm in geology.

ENVR 1201. Lab for ENVR 1200. 1 Hour.

Accompanies ENVR 1200. Covers exercises pertaining to mineral and rock identification and topographic and geologic map interpretation. Required for environmental geology and geology majors.

ENVR 1202. History of Earth and Life. 4 Hours.

Traces biological and environmental development of the earth over the past 4.6 billion years using evidence preserved in the rock record. A primary goal is to understand how geoscientists interpret earth history by learning how to test hypotheses and develop explanations for events that occurred far in the geologic past. Examination of major earth systems, the biosphere, lithosphere, atmosphere and hydrosphere, reveals how they interact to control the origin of earth, the origin and evolution of life, the causes and effects of extinction, plate tectonics and mountain building, and climate change over earth history.

ENVR 1203. Interpreting Earth History. 1 Hour.

Focuses on students using sedimentary rocks, fossils, and geologic maps and stratigraphic sections to record and to interpret events in earth history.

ENVR 1450. Introduction to Sustainability Science. 4 Hours.

Explores the fundamental concepts of sustainability by breaking down the supporting science. Offers students an opportunity to understand the interactions among social and environmental systems by focusing on six major themes; dignity, people, prosperity, planet, justice, and partnership. Discusses topical ideas including pollution and health, water resources, food production, and energy. Integrates the interdisciplinary nature of sustainability science by applying best practices to your field of study. Uses case studies to exemplify the core principles of the course. Pulls knowledge from local examples of sustainability in practice in New England and garners an appreciation for how these principles are researched and applied across the globe. Students who do not meet course restrictions may seek permission of instructor. .

ENVR 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ENVR 2310. Earth Materials. 4 Hours.

Describes the physical and chemical characteristics of common rock-forming minerals and geologic processes that form rock and soils in the igneous, sedimentary, and metamorphic environments. Focuses on commonly encountered minerals, soil, and rock types and how these are used to interpret past and present earth processes. This is a writing-intensive course with a required term paper.

ENVR 2311. Lab for ENVR 2310. 1 Hour.

Accompanies ENVR 2310. Cover topics from the course through various experiments.

ENVR 2330. Field Methods in Global Change. 4 Hours.

Endeavors to teach basic field methods in global change science through a suite of hands-on field projects based in the Emerald Necklace park system adjacent to Northeastern's Boston campus. Offers students an opportunity to learn basic skills in generating primary scientific data (i.e., abstracting data directly from nature), thereby functioning as a pillar for higher-level course work and research within the MES majors. Exposes students to fundamental content (e.g., fluvial geomorphology, biogeochemistry of natural waters, environmental pollution, sedimentology/stratigraphy) and skills (e.g., hypothesis generation and testing, topographic survey, map making, sedimentary coring, sampling and analysis of natural waters, producing scientific illustrations/graphs/videos, scientific writing) in global change science. .

ENVR 2340. Earth Landforms and Processes. 4 Hours.

Focuses on the origin and evolution of landscape features by processes operating at or near the earth's surface. Exercises introduce interpretation of air photos, topographic maps, remotely sensed data, and digital elevation models.

ENVR 2341. Lab for ENVR 2340. 1 Hour.

Accompanies ENVR 2340. Covers topics from the course through various experiments.

ENVR 2500. Biostatistics. 4 Hours.

Offers an overview of traditional and modern statistical methods used to analyze biological data using the free and open-source R programming environment. Lectures describe core statistical approaches and discuss their suitability for understanding patterns that arise at different levels of biological organization, from cellular processes to whole ecosystems. Supervised lab sessions offer students an opportunity to develop the R programming skills required to analyze the complex datasets that often emerge when addressing cutting-edge questions in biology. Topics include basic probability and sampling theory, experimental design, null hypothesis significance testing, t-tests and ANOVA, correlation and regression, Monte Carlo simulations, likelihood, generalized linear models, model selection, and information theory.

ENVR 2501. Lab for ENVR 2500. 1 Hour.

Accompanies ENVR 2500. Offers supervised lab sessions demonstrating how topics covered in the lectures can be addressed in the R programming environment.

ENVR 2900. Special Topics in Environmental Studies. 4 Hours.

Studies various topics on environmental issues. May be repeated without limit.

ENVR 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ENVR 3125. Global Oceanic Change. 4 Hours.

Explores major changes in physical, biological, and chemical properties of the ocean over geological and human timescales. Includes origin and early evolution of the oceans; sea-level change; global warming; ocean acidification; the role of plate tectonics in driving long-term oceanic change; the role of atmospheric carbon dioxide in driving short-term oceanic change; tipping points in the oceans; snowball earth theory; marine pollution; oil exploration; and social, economic, and political implications of global oceanic change. Themes include differentiating drivers of change across multiple temporal and spatial scales; evaluating change from different and sometimes conflicting perspectives (social, economic, political, environmental); differentiating local and global change; and establishing linkages between physical, chemical, and biological processes in the ocean. Requires prior completion of one laboratory science course or permission of instructor.

ENVR 3150. Food Security and Sustainability. 4 Hours.

Discusses the science of sustainable agriculture, fisheries, and aquaculture. Examines the issues related to nutrition and hunger, food safety, and food production in the face of a changing climate with a scientific lens. Using the FAO Global Food Security and Strategy document and other peer-reviewed literature, compares the food issues in the United States with those in the developing world, including sub-Saharan Africa and Southeast Asia. Explores the many issues related to food production and environmental sustainability—including fertilizer use, GMOs, and pollution—and local examples of sustainable food production. Discusses the ways in which we can potentially remedy many of the issues involved in providing food for more than 7 billion people worldwide.

ENVR 3151. Food Sustainability in the Mediterranean - Abroad. 4 Hours.

Focuses on the Mediterranean diet, which serves as the framework for this course. Discusses the scientific evidence supporting/refuting this diet, then observes the food systems that comprise the diet. Uses museum evidence to deduce the composition of ancient diets and compares this to dietary changes over time using interviews with village locals. Explores production of olive oil, vegetables, and grains and discusses how industrial farming affects traditional agriculture and human health. Also focuses on fish and shellfish production with visits to aquaculture and marine research facilities to discuss how best to include seafood in the human diet while preserving a diverse marine environment. Through comprehensive writing and discussion, offers students an opportunity to more clearly understand the history of food in this region.

ENVR 3200. Water Resources. 4 Hours.

Offers students who wish to work in the area of water resources an opportunity to understand the issues related to water's availability and behavior at the Earth's surface. Topics covered include (1) the hydrologic cycle, including global and regional patterns of water movement; (2) characteristics of surface and groundwater systems, including the linkage between streams, rivers, lakes, wetlands, groundwater, and the sea; (3) water management issues and regulations that have been enacted to control the use of water as a resource; (4) water quality measures for surface water and groundwater; and (5) examples of water use conflicts and emerging water issues. Case studies include examples from California, New England, New York, the southwestern United States, China, Africa, and the Middle East.

ENVR 3201. Coastal Sustainability: Ecology and Coupled Human-Natural Systems in Southeast Asia. 4 Hours.

Accompanies ENVR 3202. The majority of the Earth's population now lives in coastal cities, where people not only depend on ocean resources but are also experiencing ever-increasing threats from the ocean environment, especially global climate change. Explores the mechanisms by which coastal communities in Southeast Asia (Hong Kong and Malaysia) are facing these expanding challenges, including their impacts on coastal ecosystems. Using a comparative approach, explores the diverse challenges facing coastal societies. Offers students an opportunity to gain an in-depth understanding of coupled human-natural systems in Southeast Asia. Prior completion of an introductory course in ecology or environmental sciences is recommended.

ENVR 3202. Coastal Sustainability: The Blue Economy of the Gulf of Maine. 4 Hours.

Accompanies ENVR 3201. Examines the status of the the Gulf of Maine (GOM) and its future trajectory from a scientific and societal perspective. The GOM is the heart of the Blue Economy in New England and the Canadian Maritime provinces. Historically, cod drove the economies of GOM communities. Now lobster, coastal development, international shipping, wild scallops, aquacultured salmon and mussels, and coastal technology are transforming the region. But the GOM is under threat from global warming, sea-level rise, eutrophication, and invasive species, as coastal cities like Boston, Portland, and Halifax seek resilient sustainable solutions to these challenges. Prior completion of an introductory course in ecology or environmental sciences is recommended.

ENVR 3300. Geographic Information Systems. 4 Hours.

Studies how to use a geographic information system (GIS). Explores the practical application of GIS to support scientific and social inquiry, analysis, and decision making. Topics include spatial data collection; data accuracy and uncertainty; cartographic principles and data visualization; geographic analysis; and legal, economic, and ethical issues associated with using GIS. Investigates case studies from geology, environmental science, urban planning, architecture, social studies, and engineering. Provides extensive hands-on experience with a leading commercial GIS software package. Offers students an opportunity to conceive their own research problem that can be addressed using GIS and reach conclusions that are summarized in a professional report. Students who do not meet course prerequisites may seek permission of instructor.

ENVR 3301. Lab for ENVR 3300. 1 Hour.

Accompanies ENVR 3300. Covers topics from the course through various experiments.

ENVR 3410. Environmental Geochemistry. 4 Hours.

Offers students who wish to work in the geosciences or environmental science and engineering fields, including on the land, in freshwater, or the oceans, an opportunity to understand the geochemical principles that shape the natural and managed environment. Seeks to provide a context for understanding the natural elemental cycles and environmental problems through studies in atmospheric, terrestrial, freshwater, and marine geochemistry. Topics include fundamental geochemical principles; environmental mineralogy; organic and isotope geochemistry; the global carbon, nitrogen, and phosphorous cycles; atmospheric pollution; environmental photochemistry; and human-natural climate change feedbacks. ENVR 3410 and CHEM 3410 are cross-listed. .

ENVR 3418. Geophysics. 4 Hours.

Studies the basic techniques of reflection and refraction seismology and earthquake analysis; gravity and magnetic surveying methods; radioactive decay principles and Earth's heat flow; and how information from these methods are used to interpret the nature and age of the Earth's surface and interior. Emphasizes near-surface exploration, data collection methods, data analysis, and using data to constrain mathematical models of the subsurface distribution of geologic units.

ENVR 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ENVR 4500. Applied Hydrogeology. 4 Hours.

Covers the origin, distribution, and flow of groundwater in permeable sediments and bedrock; hydrological and geological characteristics of aquifers; regional flow systems emphasizing rock structure, stratigraphy, and other aspects of the geological environment; principles of hydrogeologic mapping and analysis; and introduces well testing and well hydraulics. Uses methods of collecting data about the physical distribution and properties of water and its interaction with geologic materials in the subsurface, including its chemical composition, and mathematical models to interpret the direction and velocity of groundwater flow. Considers remediation strategies for dealing with contaminated water in the subsurface.

ENVR 4501. Lab for ENVR 4500. 1 Hour.

Accompanies ENVR 4500. Covers topics from the course through various experiments.

ENVR 4504. Environmental Pollution. 4 Hours.

Surveys pollution in our atmosphere, on land, and in our oceans. Offers students an opportunity to develop the skills to understand the sources, processes, and fate of environmental contaminants in surface and groundwater, soils, sediment, and biota, with special focus on organic contaminants. Links environmental chemistry with ecotoxicology through an understanding of bioaccumulation, food web models, and risk assessment. Uses case studies and real-world scenarios to illustrate important concepts. Emphasizes innovative solutions for pollution remediation. Discusses current pollution issues and how to clearly communicate these issues to a broad audience. Students who do not meet course prerequisites may seek permission of instructor.

ENVR 4505. Wetlands. 4 Hours.

Presents an interdisciplinary overview of the physical, biological, and cultural aspects of wetlands. Topics covered include definitions, classification systems, origins, human use, and natural processes of wetland environments. Offers students an opportunity to learn about wetland hydrology, soils, and vegetation and their relationship to ecosystem processes, societal values, and management. Includes reading and analyzing the scientific literature and conducting in-class activities.

ENVR 4515. Sustainable Development. 4 Hours.

Focuses on the development of communities in an environmentally sustainable way and on the division of natural resources within these communities and the global system. Defines and discusses “sustainable development” and its global role today. Exposes students to a history of developmental methods while learning about the interconnectedness of development and the environment. Encourages students to draw conclusions about the environmental impacts of these methods and to consider more equitable uses of natural resources.

ENVR 4563. Advanced Spatial Analysis. 4 Hours.

Provides an in-depth evaluation of theoretical, mathematical, and computational foundations of geographic information systems (GIS). Topics include spatial information theory, database theory, mathematical models of spatial objects, and GIS-based representation. Examines advanced concepts and techniques in raster-based GIS and high-level GIS modeling techniques. May be repeated without limit.

ENVR 4900. Earth and Environmental Science Capstone. 1 Hour.

Designed for students enrolled in concert with an approved 500–600-level environmental studies course (check with department office for up-to-date listings). Faculty help students to identify topics for individual research tailored to students’ interests and the course content. Provides an opportunity for reflection about what the student has learned in the major, in their NU Core course work, and experiential learning. Required components include writing with revision and an oral presentation at a departmentwide capstone seminar late in the semester.

ENVR 4970. Junior/Senior Honors Project 1. 4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student’s major field. Combined with Junior/Senior Project 2 or college-defined equivalent for 8-credit honors project. May be repeated without limit.

ENVR 4971. Junior/Senior Honors Project 2. 4 Hours.

Focuses on second semester of in-depth project in which a student conducts research or produces a product related to the student’s major field. May be repeated without limit.

ENVR 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ENVR 4992. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

ENVR 4993. Independent Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

ENVR 4996. Experiential Education Directed Study. 4 Hours.

Draws upon the student’s approved experiential activity and integrates it with study in the academic major. Restricted to those students who are using the course to fulfill their experiential education requirement. May be repeated without limit.

ENVR 4997. Senior Thesis. 4 Hours.

Offers students an opportunity to prepare an undergraduate thesis under faculty supervision.

ENVR 5115. Advanced Topics in Environmental Geology. 4 Hours.

Examines selected topics in geology through an understanding of the basic processes, materials, and evolution. Topics include basin analysis, landform evolution, volcanology, or regional geology. May be repeated without limit.

ENVR 5190. Soil Science. 4 Hours.

Provides a description and evaluation of the physical, chemical, and biological properties of soils. Includes soil formation, soil types, and processes that occur in soil including the importance of these processes for the soil productivity and management of soil. Also covers sources, reactions, transports, and fates of chemical species in soils and associated water and air environments, as well as the chemical behavior of elements and compounds and the phenomena affecting natural and anthropogenic materials in soils.

ENVR 5201. Geologic Field Seminar. 4 Hours.

Studies aspects of geology/environmental science associated with a particular field setting, in the classroom, followed by an intensive field investigation. Examples include carbonate petrology and reef ecology, then field studies in the Bahamas; glacial geology and volcanology, followed by field studies in Iceland; or stratigraphy of the U.S. Southwest, with field studies in the Grand Canyon. Focuses on using field observations and field data to interpret modern and ancient geologic processes. May be repeated without limit.

ENVR 5202. Environmental Science Field Seminar Abroad. 4 Hours.

Offers an intensive environmental science field study experience associated with a particular off-campus geographic setting, such as Iceland, Newfoundland, Bahamas, etc. Offers students an opportunity to learn the principles of field study, to learn to recognize and record significant data, and to reach conclusions about a range of field-based problems being studied. May be repeated without limit.

ENVR 5210. Environmental Planning. 4 Hours.

Examines aspects of surface runoff from geomorphic and hydrologic perspectives. Develops methods for description and calculation of major river and drainage basin processes and applies the results to the planning process. Examines human modification of these systems—including urbanization, dams, and channelization—and applies this information to an understanding of regulatory processes. This is a writing-intensive course.

ENVR 5240. Sedimentary Basin Analysis. 4 Hours.

Presents the analysis of sedimentary basins based on detailed study of sedimentary petrology, sedimentary structures, and stratigraphic sequences and fossils.

ENVR 5241. Lab for ENVR 5240. 1 Hour.

Accompanies ENVR 5240. Lab work uses geologic sections, suites of sedimentary rocks and thin sections, and drill cores and bore hole logs to interpret and analyze the geologic history and environmental and economic potential of sedimentary basins.

ENVR 5242. Ancient Marine Life. 4 Hours.

Begins with a survey of major events, processes, and important invertebrate phyla preserved in the fossil record. This knowledge of paleontology is then utilized to evaluate evolutionary principles and the nature of function and adaptation in the history of life. Organization of populations into paleocommunities and their relationships to changes in environments through time permit the assessment and evaluation of paleoecology in Earth history.

ENVR 5243. Lab for ENVR 5242. 1 Hour.

Accompanies ENVR 5242. Introduces invertebrate fossil morphology by study of fossil specimens of all major groups. Principles of paleoecology and evolutionary theory are illustrated by analysis of suites of fossil specimens.

ENVR 5260. Geographical Information Systems. 4 Hours.

Examines geographical information systems (GIS), a way to input, store, analyze, and display spatial data (data with a geographic location). Introduces the major components and applications of this exciting new tool. Consists of two lectures and one laboratory period a week. Laboratory exercises introduce methods of data analysis as well as practical issues of how to manipulate various GIS software packages.

ENVR 5270. Glacial and Quaternary History. 4 Hours.

Examines the environmental conditions conducive to forming glaciers, the processes of ice movement, glacial erosion, modes of deposition, and the resulting landforms created under and around glaciers. Introduces the natural climate change of the ice age cycles and the major events of the Quaternary period.

ENVR 5271. Lab for ENVR 5270. 1 Hour.

Accompanies ENVR 5270. Covers topics from the course through various experiments.

ENVR 5984. Research. 1-4 Hours.

Offers an opportunity to conduct research under faculty supervision. May be repeated without limit.

ENVR 6102. Environmental Science and Policy Seminar 2. 4 Hours.

Critically explores fundamental and modern theory, methodologies, and practices for conserving and managing coupled social-ecological systems (SES). Focuses on science and policy of environment management through the lens of coupled SES. Historically, the majority of studies focused on human-environment interactions have typically involved measuring and describing the negative impacts of human populations and development on natural ecosystems. More recently, however, environmental science and practice have experienced a paradigm shift to where now humans and the natural environment are recognized as tightly coupled systems. From an SES perspective, humans continue to shape the structure and function of ecosystems through both stressors and stewardship. However, a key advancement is the recognition that people and their behavior are directly influenced by structure, function, and services of ecosystems.

ENVR 6150. Food Security and Sustainability. 4 Hours.

Explores the science of sustainable food production around the world and examines the issues related to nutrition and hunger, food safety, and food production. Discusses issues such as population growth, climate change, and sustainability, which are presented as thematic topics. Also discusses issues such as soil health, genetically modified (and engineered) foods, water use, governmental food guidelines, and human health. Pulls focus on the thematic topics from scientific literature but also includes additional sources of information, such as gray literature, media coverage, documentaries, and popular nonfiction. Explores local examples of sustainable agriculture, including incentives in food security and sustainability in New England.

ENVR 6500. Biostatistics. 4 Hours.

Offers an in-depth overview of statistical methods used to analyze data, with a focus on the biological sciences as well as nonbiological applications. Covers probability theory, Bayes' theorem, hypothesis testing, derivations of statistical distributions, models used for inference with categorical and/or continuous data, linear models, model selection, information theory, and nonparametric methods in statistics. Offers students an opportunity to learn how to apply models to data in supervised lab sessions in the R programming environment.

ENVR 6501. Lab for ENVR 6500. 1 Hour.

Accompanies ENVR 6500. Introduces the core principles for programming in R, key functions, and application to real datasets.

ENVR 6900. Topics: Networks and Biology. 4 Hours.

Studies the properties of diverse biological networks. Covers foundational computational methods for analyzing, visualizing, and performing statistical investigations of networked data. From social networks and cities, to ecosystems and evolution, methods from network science provide powerful tools for understanding and investigating the natural and modern world. Offers students an opportunity to develop material for a postdoctoral fellowship application around research and training in network science, learn about and present on topics related to multilayer networks, and write a short review paper on how networks are (or could be) used in their field. Expects successful students to gain pragmatic instruction on grant writing; navigating the publication process; computational, mathematical, and statistical methods; talk delivery; and mentorship training.

ENVR 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

Earth and Environmental Sciences - CPS (GEO)

Search GEO Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=GEO>)

GEO 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

Earth and Environmental Sciences - CPS Specialty (EVRN)

Search EVRN Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=EVRN>)

EVRN 1101. Environmental Science. 4 Hours.

Focuses on the complex mix of interlocking problems that are reaching crisis levels on Earth. Topics include population, resources, environmental degradation, and pollution. Focuses on food and land resources; air, soil, and water resources and pollution; and energy alternatives. Some emphasis is placed on culture, politics, worldviews, ethics, and economics.

Earth Sciences - CPS (ESC)

Search ESC Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=ESC>)

ESC 1100. The Geosphere: Physical and Historical Geology. 3 Hours.

Examines the dynamic processes that continually create the Earth. Examines the internal structure, resulting tectonic movements, volcanism and seismic activity, rock and mineral genesis, and chemical and physical weathering shaping Earth's surface through time. Stresses the scientific basis for our understanding of the physical earth.

ESC 1150. The Atmosphere. 3 Hours.

Examines Earth's atmospheric structure and applies laws of physics to describe and explain broad climate and circulation patterns and local weather events that maintain or can disrupt ecosystems as heat energy and water move through Earth's spheres.

ESC 1200. The Hydrosphere: Oceanography, Ground and Surface Water. 3 Hours.

Examines the physical structure, biological provinces, and varying chemistries of Earth's ocean and other water resources. Topics range from El Nino/Southern Oscillation to lake eutrophication.

ESC 1250. The Environment and Society. 3 Hours.

Surveys Western attitudes toward the natural world, the development of the conservation movement, environmental crisis of the 20th century, and the sustainability movement. Investigates how environmental degradation and protection efforts differentially affect various social groups. Examines political, economic, and social trends that frame current policy debates. The backdrop of broader societal trends such as urbanization, demographic changes, and globalization provide understanding for current legal and policy positions.

ESC 1300. Science, Technology, and Society. 3 Hours.

Examines the nature of scientific inquiry within the social context. Examines the impact of scientific discoveries and technological advances in the context of sustainability. Offers students an opportunity to explore exponential technologies, visions of the future, and the limits of prognostication with respect to their career fields and with an eye to impacts of society in general.

ESC 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ESC 2100. Planetary Science. 3 Hours.

Covers the origin and context of Earth. Topics include the structure of our solar system, structure of the sun and cycles of solar activity on Earth systems, atmospheric and geologic processes in our solar system, current explorations, and future issues.

ESC 2200. Natural Disasters: Evaluating Risk, Minimizing Loss. 3 Hours.

Integrates material from the core courses regarding a scientific understanding of how the Earth interacts violently with human-created environments. Focuses on actual vs. perceived risk and mitigation techniques.

ESC 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ESC 3100. Introduction to Geographical Information Systems. 3 Hours.

Offers a hands-on introduction to the use of a geographic information system (GIS). Topics include spatial data collection; data accuracy and uncertainty; cartographic principles and data visualization; geographic analysis; and the legal, economic, and ethical issues associated with the use of a GIS.

ESC 3220. Water on and Underground: Geochemistry and Hydrology. 3 Hours.

Examines biogeochemical cycles affecting freshwater resources, including the fundamentals of aquatic chemistry. Using the principles of hydrology, the movement of water through the Earth system is measured and forecast, especially as it pertains to flooding.

ESC 3230. Soils and Sustainability. 3 Hours.

Discusses the genesis, structure, classification systems, chemical and biological components, and processes of soils. Explores degradation issues and management of these issues.

ESC 3240. Energy: Sources and Issues. 3 Hours.

Examines carbon fuels, nuclear, wind, solar, and geothermal sources of energy from multiple disciplinary perspectives, including scientific, geopolitical, and economic.

ESC 3250. Urban Ecology. 3 Hours.

Presents the unique environmental problems and opportunities of more than half of the world's population, who live in urban areas. Sustainability issues include urban forestry, agriculture and waste management, with global and local examples presented. There is substantial writing in this writing-intensive course.

ESC 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ESC 4955. Project. 1-4 Hours.

Reviews the theory and practice of environmental permitting and environmental assessment. Topics include major federal and state environmental regulations, the environmental permitting process, risk assessment and management, and environmental compliance. May be repeated without limit.

ESC 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

Ecology, Evolution, and Marine Biology (EEMB)

Search EEMB Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=EEMB>)

EEMB 1101. Foundations in Ecology and Evolutionary Biology. 4 Hours.

Introduces students to the foundational principles of ecology and evolutionary biology. Merges traditional lectures on foundational topics in ecology and evolutionary biology (adaptation, mechanisms of evolution, community and ecosystems ecology) with explorations of local field sites and an introduction to field ecology. Students spend several weeks of the semester designing and implementing independent field research projects, through which they are exposed to the foundation of scientific inquiry, including hypothesis testing, collecting, managing, and analyzing data, and presenting their findings.

EEMB 1102. Lab for EEMB 1101. 1 Hour.

Accompanies EEMB 1101. Covers topics from the course through various experiments.

EEMB 1105. Foundations in Ecological and Evolutionary Genomics. 4 Hours.

Introduces students to the foundational principles of molecular ecology with an emphasis on applications of high-throughput sequencing techniques to answer questions in ecology and evolutionary biology. Covers foundational topics in ecological and evolutionary genomics (central dogma, structure of nucleic acids, genetic variation, tools in molecular ecology, understanding genomes, and genomics). Practical skills development includes clean technique and proper bench skills; basic command line programming; understanding, quantifying, and analyzing sequence variation; and visualizing genomic data for formal scientific presentations.

EEMB 1106. Lab for EEMB 1105. 1 Hour.

Accompanies EEMB 1105. Covers topics from the course through various experiments. Focuses on providing firsthand experience using tools from molecular ecology to test ecological and/or evolutionary hypotheses.

EEMB 1145. Beginning Scuba. 1 Hour.

Focuses on basic skin diving and scuba diving skills, with emphasis on safety. Requires lab fee. Requires ability to pass a swim test and basic comfort in the water.

EEMB 1450. Introduction to Marine Biology. 4 Hours.

Surveys the tremendous diversity of marine organisms in the context of the major marine ecosystems in which they are found. Explores interactions among organisms and how the physical and chemical environment influence marine organisms. Links changes on land to declines in organism numbers and diversity and explores the benefits humans gain from our relationship with the marine environment. Offers opportunities to investigate recent advances and understanding of marine organisms and their environments.

EEMB 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

EEMB 2290. Ecology and Evolution of Behavior. 4 Hours.

Studies fundamental biological principles at behavioral, ecological, and evolutionary levels. Covers ethology, ecology, genetics, and comparative psychology, all within the conceptual framework of evolutionary theory. Explores both scientific practice and progress through readings, discussion, and projects. Illustrates the process by which biologists study questions about the evolutionary origin of behavior through a series of in-class activities, computer modeling assignments, interpretation of graphical data, collection and statistical analyses of behavioral data, as well as the generation and presentation of research. Does not focus on the neurological basis of behavior. Offers students an opportunity to become critical thinkers, critical readers, and to attain tools to interpret the world in a unique way. Requires permission of advisor.

EEMB 2302. Ecology. 4 Hours.

Offers students an opportunity to learn about the environmental and biological processes that control the distribution and abundance of species and controlling factors that operate on individuals, populations, and communities. The lecture and laboratory introduce a set of generalizable concepts that are of fundamental importance to plant and animal life on the land and in the sea and provide hands-on experiential learning that reinforce concepts covered in lecture. Offers students an opportunity to become proficient in the following: (a) understanding research results the primary literature; (b) conducting a research experiment; (c) interpreting the results of in-class research; (d) communicating results as manuscript.

EEMB 2303. Lab for EEMB 2302. 1 Hour.

Accompanies EEMB 2302. Covers topics from the course through various experiments.

EEMB 2400. Introduction to Evolution. 4 Hours.

Introduces evolutionary thinking, including contemporary examples of evolution. To understand the evolution of Charles Darwin's "endless forms most beautiful," the course adopts an integrative approach that includes information from ecology, genetics, molecular biology, biogeography, and paleobiology. Considers mechanisms of evolutionary change—how does it happen? Examines adaptation, the process by which attributes of an organism change to enhance fitness and the evolutionary history of life on our planet—what was the first living thing, how does speciation occur, what have we learned about evolution of life in the distant past, and how did humans evolve. Includes student presentations and analysis of scientific literature.

EEMB 2420. Fisheries Biology, Policy, and Conservation. 4 Hours.

Focuses on the study and management of economically valuable fish species. Studies the basic biology and ecology of fisheries species, quantifying and modeling their population biology to their interactions with each other and the environment. Requires students to read and analyze the scientific literature, to complete worksheets and writing assignments, and to develop and present research projects. Covers traditional stock assessment methods as well as how fisheries science and management has evolved more recently to integrate community- and ecosystem-level information. Reviews fisheries and how fishers are managed, their involvement in the management process, and the future fisheries in the United States and elsewhere.

EEMB 2616. Invertebrate Zoology. 4 Hours.

Surveys the tremendous diversity of invertebrates, emphasizing their form and function in ecological and evolutionary contexts. Explores functional morphology, systematics, phylogenetic relationships, ecology, and economic importance of the major invertebrate phyla. Discusses comparisons among phyla to enhance understanding of evolutionary relationships.

EEMB 2617. Lab for EEMB 2616. 1 Hour.

Accompanies EEMB 2616. Covers topics from the course through various experiments.

EEMB 2618. Vertebrate Zoology. 4 Hours.

Explores functional morphology, systematics, ecology, and phylogenetic relationships of the major vertebrate phyla.

EEMB 2619. Lab for EEMB 2618. 1 Hour.

Accompanies EEMB 2618. Covers topics from the course through various experiments.

EEMB 2700. Marine Biology. 4 Hours.

Examines biological aspects of natural ocean ecosystems and the physical processes that regulate them. Covers distributions, abundances, and interactions of marine organisms; interactions between organisms and the transformation and flux of energy and matter in marine ecosystems; and aspects of physiology related to marine species distributions, abundances, and roles. Students generate, evaluate, discuss, and present data from primary research and apply their knowledge of the scientific method and biological concepts through the creation of a written grant proposal.

EEMB 2701. Lab for EEMB 2700. 1 Hour.

Accompanies EEMB 2700. Covers topics from the lecture course through discussions and experiments.

EEMB 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

EEMB 3120. Physical Biology of Marine Organisms. 4 Hours.

Introduces principles from the physical sciences (fluid and solid mechanics, mass and heat transfer theory) applied to the analysis of form, function, ecology, and evolution of marine organisms. Topics covered include suspension and deposit feeding in invertebrates, allometry of metabolic processes, drag and lift in sessile organisms, locomotion of nekton (fishes, marine mammals) and plankton, diffusive limitations to metabolic transactions in marine invertebrates and algae, thermal transactions in intertidal organisms, the biology of the benthic boundary layer, and the properties of biomaterials and biological structures. Presents engineering methods and measurement techniques applicable to biomechanical investigations.

EEMB 3450. Physiological Adaptations to the Environment. 4 Hours.

Explores the evolutionary mechanisms by which organisms adapt physiologically to survive, and thrive, in diverse, often seemingly "hostile," habitats. Examines paleo- and modern examples of adaptation with the goal of predicting species success or failure as our planetary environment changes rapidly. Topics include adaptation of cellular metabolism, adaptations to variable oxygen availability and to changes in pH, the roles of water and microsolutes in regulation of the internal environment of cells, and the effects of temperature on cellular function and the biogeographic distribution of organisms. Includes student presentations and analysis of scientific literature. Requires junior or senior standing; sophomores admitted by permission of instructor; EEMB 2400 or ENVR 2400 recommended but not required.

EEMB 3455. Ecosystems Ecology. 4 Hours.

Focuses on the foundational principles of ecosystems ecology. Examines the flow of energy and materials through both the biosphere (plants, animals, and microbes) and the geosphere (soils, atmospheres, and oceans) and the role that humans are playing in altering these key fluxes. Studies elemental cycles that are critically important for human and environmental sustainability—including carbon, nitrogen, and phosphorus—and examines similarities and differences in these cycles and flows while drawing on examples from both terrestrial and marine systems. Seeks to understand how changes in ecosystem structure ultimately affect ecosystem function and how this translates into the important services ecosystems provide.

EEMB 3460. Conservation Biology. 4 Hours.

Explores conservation biology, an interdisciplinary science that focuses on conservation of biological diversity at multiple levels. Emphasizes the causes and consequences of biodiversity loss and demonstrates how ecological and evolutionary principles are applied to conservation problems. Covers sustainability; climate change; introduced species; conservation of threatened and endangered species; and pollution, disease, and habitat restoration using examples from marine, aquatic, and terrestrial systems. Offers students an opportunity to read, discuss, evaluate, and present data from primary research through written assignments and oral debates and to apply this knowledge to conservation issues. Emphasizes critical thinking, problem solving, and recognizing multiple perspectives.

EEMB 3465. Ecological and Conservation Genomics. 4 Hours.

Offers an overview of ecological and conservation genetics, an interdisciplinary science that focuses on understanding the processes that determine genetic diversity at the individual to population level. Focuses on fundamental concepts in evolutionary ecology and population and quantitative genetics, then applies those concepts to solving real-world problems in conservation science. Covers harvested populations, inbreeding, climate change, introduced species, conservation of threatened and endangered species, adaptation, and habitat restoration. Exposes students to multiple sides of these issues and the science that underpins them. Offers students an opportunity to develop the R programming skills required to analyze the complex data sets that often emerge when addressing cutting-edge questions in genetics. Includes writing and coding exercises and mathematical derivations. Emphasizes critical thinking and problem solving.

EEMB 3466. Disease Ecology. 4 Hours.

Covers the fundamentals of disease ecology and evolution. Focuses on how disease can impact the physiology of organisms and how this can, in turn, alter communities and ecosystems. Topics include mathematical theory on host-pathogen interactions; empirical studies of human, wildlife, insect, and plant host populations; emerging infectious diseases; effects on host behavior; host-parasite coevolution; multihost and multipathogen systems; and anthropogenic effects on disease. Includes writing exercises, with a special emphasis on critical thinking and problem solving.

EEMB 3470. Coastal Ecology and Sustainability. 4 Hours.

Designed to provide an integrated exposure to issues surrounding the ecology and sustainability of coastal and estuarine systems, with a particular focus on urban harbors. Exposes students to both the diversity and complexity of coastal habitats that exist both locally (salt marshes and seagrass beds) and globally (mangroves) and the mechanisms of estuarine and coastal functioning (geomorphology, biogeochemistry, microbial ecology, food webs, fisheries). Considers the ecosystem services provided by coastal systems and how those services are altered through human pressures.

EEMB 3471. Lab for EEMB 3470. 1 Hour.

Accompanies EEMB 3470. Emphasizes hands-on experience in monitoring water quality in the greater metropolitan Boston area. Specifically focuses on “one outfall pipe per student” where students select a different combined storm water drainage pipe that delivers water into Boston area rivers. Exposes students to a suite of different water quality measurements typically used in coastal monitoring, including measuring nutrients, studying indicators of fecal contamination, and quantifying bacterial loads. Operates in partnership with the Massachusetts Water Resources Authority, local municipalities, and watershed associations so that the data students generate can be used to enhance ongoing monitoring efforts.

EEMB 3475. Wildlife Ecology. 4 Hours.

Discusses wildlife ecology and management, mainly focusing on terrestrial species. Topics include habitat use, behavior, wildlife conservation, parasites and pathogens, wildlife sampling, and wildlife management. Offers students an opportunity to participate in activities in which they look at and interpret wildlife data. Course format includes group work, analyzing the scientific literature, and in-class activities.

EEMB 3555. Networks and Natural Systems. 4 Hours.

Covers the properties of diverse biological networks and explores foundational computational methods for analyzing, visualizing, and performing statistical investigations of networked data. From social networks and cities to ecosystems and evolution, methods from network science provide powerful tools for understanding and investigating the natural and modern world. Moving beyond description, a key objective of the course is to synthesize the diversity of biological networks and investigate how scientists have uncovered remarkable regularities in networked systems by applying approaches from scaling theory to biological networks. Based on a series of case-studies, focuses on how to elucidate the structure and function of biological networks using empirical data. Requires scientific programming.

EEMB 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

EEMB 4000. Applied Conservation Biology. 4 Hours.

Studies landscape-scale conservation in Transylvania and the Carpathian Mountains of Romania. Working intensively with Foundation Conservation Carpathia, explores efforts to build Europe’s largest national park. Offers students an opportunity to learn from local conservation leaders, collect data, and develop plans to help launch the “Yellowstone of Europe.” Focuses on large carnivore conservation (brown bears, lynx, and wolves); sustainable agriculture; resource management in a country formerly under communist rule; and balancing urban and rural conservation needs. Explores Romania’s rich cultural heritage in Sighisoara, a UNESCO World Heritage Site, and Vacaresti Nature Park, a constructed urban wetland in the heart of Bucharest. Requires prior completion of one laboratory science course or permission of instructor.

EEMB 4001. Landscape and Restoration Ecology. 4 Hours.

Topics include ecosystem processes, spatial patterns, disturbance, species distributions, invasive species, and habitat loss. Offers students an opportunity to participate in activities in which they look at and interpret spatial data. Course format includes group work, analyzing the scientific literature, and in-class activities.

EEMB 4010. Mammalogy. 4 Hours.

Surveys the mammals of the world, including their evolution, morphology, physiology, behavior, and ecology. Students conduct a research project in which they investigate the morphology, evolution, ecology, and behavior of a species and present their findings to the class. Includes reading and analyzing the scientific literature and conducting in-class activities.

EEMB 4548. Sociobiology. 4 Hours.

Studies sociobiology, a field of biology that strives to understand the biological basis of social behavior in animals. Sociobiology is a multidisciplinary science, meshing together ethology (animal behavior), ecology, genetics, population biology, and comparative psychology, all within the conceptual framework of evolutionary theory. Why do animals live in societies? Why do animals cooperate and sometimes show extreme forms of altruism? What are the costs and benefits of group living? Reviews studies on nonhuman animals that demonstrate sociobiological principles by using a series of in-class activities, computer-modeling assignments, interpretation of graphical and tabulated data, collection and statistical analyses of behavioral data, as well as the generation and presentation of research.

EEMB 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

EEMB 4992. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

EEMB 5130. Ecological Dynamics. 4 Hours.

Offers a comprehensive overview of mathematical and computational concepts needed to construct (meta)population, (meta)community, and (meta)ecosystem models. Focuses on how to mathematically derive and model processes (growth, trophic and nontrophic species interactions, dispersal, and environmental variability) to understand patterns of population abundance and species diversity. Emphasizes the mathematical tools required to analyze the dynamical behavior of ecological models (stability, invasion, graphical, and numerical analyses) and validate model predictions using empirical data (via maximum likelihood and optimization methods). Sophomores admitted by permission of instructor.

EEMB 5131. Lab for EEMB 5130. 1 Hour.

Accompanies EEMB 5130. Offers supervised lab sessions designed to show how the topics covered in the lectures can be addressed in industry-standard programming environments.

EEMB 5303. Marine Biology Careers Seminar. 1 Hour.

Covers the information and tools needed to begin pursuing career opportunities in marine biology. Encourages students to explore a variety of career paths, construct résumés, contact potential employers for their internship and permanent positions. Presents invited speakers from state and federal agencies, and from private consulting firms, to talk about their work and career track.

EEMB 5504. Biology of Corals. 3 Hours.

Focuses on the biology of Scleractinian reef-building corals and associated anthozoans found in coral reef ecosystems. Topics include systematics, anatomy, physiology, and population biology of corals, with an emphasis on the latest techniques employed by coral molecular biologists and physiologists.

EEMB 5506. Biology and Ecology of Fishes. 3 Hours.

Presents an examination of the systematics, functional morphology, and behavioral, larval, and community ecology of reef fishes through lectures. Field and laboratory experiments focus on morphology, behavior, and community ecology of reef fishes.

EEMB 5508. Marine Birds and Mammals. 2 Hours.

Studies principles of classification, anatomy, physiology, behavior, and evolution of seabirds and marine mammals. Also addresses conservation and protection of animals and essential habitat. Includes field trips to observe local species.

EEMB 5509. Lab for EEMB 5508. 1 Hour.

Accompanies EEMB 5508. Covers topics from the course through various experiments.

EEMB 5512. Tropical Terrestrial Ecology. 1 Hour.

Studies the animals, plants, and ecosystems of the new world tropics, with the community structure and diversity of terrestrial Jamaican habitats as an example. Includes field trips to lowland forests, carbonate caves, and the Blue Mountain mist-montane forest. The issue of land use and development vs. conservation is a recurring theme.

EEMB 5516. Oceanography. 4 Hours.

Offers an integrated overview of physical, chemical, biological, and geological processes operating in the world ocean. Seemingly unrelated topics like plate tectonics, oscillating currents and waves in the atmosphere, the activities of microbes and phytoplankton, and land-use practices in the middle of the continent have global reach and interact with each other in surprising yet understandable ways. Examines how new technologies have allowed stunning insights into global weather and climate, the deep sea, biodiversity, and how the biogeochemistry of the oceans can be measured and understood. Presents data use and analysis and formal reasoning used in marine science. Views the ocean as a "system of systems" where integration of experience from disparate disciplines is key.

EEMB 5517. Lab for EEMB 5516. 1 Hour.

Accompanies EEMB 5516. Offers experiential field and laboratory exercises in oceanography. The New England rocky intertidal, subtidal, wetlands, barrier islands, and dunes provide opportunities for field exercises in marine geology, physical oceanography, and marine ecology. Investigates processes affecting changes in the global ocean, such as ocean acidification; temperature stress in organisms; hydrodynamic drag and lift; suspension feeding; and the ecophysiology of reef corals, boreal invertebrates, and macroalgae.

EEMB 5518. Ocean and Coastal Processes. 2 Hours.

Examines the coupling between physical and biological processes on coral reefs and adjacent habitats. Focuses on biophysical, oceanographic, and benthic-pelagic processes acting in coral reef and associated nearshore ecosystems. Specific topics include oceanographic forcing mechanisms, organismal biomechanics, hydrodynamics, and nutrient dynamics.

EEMB 5520. Coral Reef Ecology. 2 Hours.

Examines the ecology and paleoecology of coral reefs. This course highlights the ecological importance of coral reefs and associated nearshore communities, ecosystem function, changes in reef biotas through geologic time, and the causes and consequences of reef degradation worldwide.

EEMB 5522. Experimental Design Marine Ecology. 4 Hours.

Includes introduction to and application of observational methods in three local marine habitats, experimental design, statistical analysis, R statistical computing and graphics software, and principles of marine ecology. Combines lecture, hand-on research experience, and computer laboratory and includes reading and analyzing the scientific literature and developing research projects. At the end of the semester, students are expected to demonstrate an integrative mastery of course topics by writing a scientific manuscript about a class experiment. Seeks to prepare students for practicing ecology in new environments and to provide students with the foundational knowledge necessary for pursuing more complex concepts in experimental design, statistical analysis, and marine ecology.

EEMB 5523. Lab for EEMB 5522. 1 Hour.

Accompanies EEMB 5522. Covers topics from the course through various experiments.

EEMB 5528. Marine Conservation Biology. 3 Hours.

Examines several critical issues facing marine ecosystems, including invasive species, marine pollution and eutrophication, fisheries impacts, physical alteration of habitats, and global climate change. Offers students an opportunity to spend field time surveying intertidal and subtidal habitats within the San Juan Islands and Friday Harbor Marine Reserve and to conduct independent research projects.

EEMB 5532. Physiological and Molecular Marine Ecology. 3 Hours.

Explores the physiological responses of marine organisms to variations in environmental factors. Uses complementary techniques, including molecular and physiological approaches, to determine genetic relationships at the species and population level and elucidate the mechanistic basis of organismic responses to environmental conditions at the level of genes and gene products.

EEMB 5534. Marine Invertebrate Zoology and Botany. 4 Hours.

Surveys the major groups of marine invertebrates, algae, and plants, in addition to their ecological roles and relationships. Offers students an opportunity to learn to identify these groups and understand the mechanisms they use to survive and adapt to changing oceans. Topics include ecological and evolutionary importance, ecosystem engineering, adaptive physiology, and climate change effects. Emphasizes interrelationships among major taxa. Hands-on learning includes field identification; visits to intertidal and subtidal marine environments; and specimen dissection, preparation, and cataloging. Offers students an opportunity to improve skills in reading and discussing scientific literature, experimental design, and scientific communication. Restricted to Three Seas students only; not open to students who have taken EEMB 5500 or EEMB 5502.

EEMB 5535. Lab for EEMB 5534. 1 Hour.

Accompanies EEMB 5534. Covers topics from the course through various experiments.

EEMB 5536. Ocean and Coastal Sustainability. 3 Hours.

Offers students advanced training in the expanding field of sustainability, with a combined focus on the practical aspects of systems management and the theoretical understanding of whole-systems design and resiliency. Seeks to train future leaders capable of creating innovative solutions to sustainability issues at local and global levels. Key interdisciplinary themes discussed include the social and political aspects of ocean and coastal sustainability (i.e., education and communication), sustainable development and ecosystem stability, the impacts of climate change on ocean and coastal resilience, and the economic and entrepreneurial possibilities in the field of sustainability. Restricted to Three Seas students only.

EEMB 5589. Diving Research Methods. 2 Hours.

Presents experimental design, sampling methodology, statistical analysis, techniques, and the use of underwater equipment to conduct subtidal research.

EEMB 6465. Ecological and Conservation Genomics. 4 Hours.

Provides an overview of ecological and evolutionary genomics. Covers foundational mathematical concepts in population in quantitative genetics, from individual loci up to whole genomes. Concepts covered include Hardy-Weinberg equilibrium, F statistics, signatures of natural selection in genomes and methods for detecting them, analysis of quantitative genetic evolution, hybridization, and gene expression. Also covers modern statistical methods used to analyze genomic data using the free and open source R programming environment. Builds knowledge through reading of the primary literature and advanced problem sets. The final project requires students to complete a novel data analysis of an open source genomics data set and write a research paper.

EEMB 6470. Coastal Ecology and Sustainability. 4 Hours.

Offers an integrated exposure to issues surrounding the ecology and sustainability of coastal marine systems, with a particular focus on urban harbors. Exposes students to both the diversity and complexity of coastal habitats that exist locally (salt marshes and sea grass beds) and globally (mangroves) and the mechanisms of estuarine and coastal ecosystem functioning (geomorphology, biogeochemistry, microbial ecology, food webs, fisheries). Throughout the course, students focus on translating the basic science of coastal ecology into relevant sustainability practices.

EEMB 7101. Seminar in Marine and Environmental Sciences. 2 Hours.

Offers students an opportunity to lead critical discussions of recent and classic papers from the literature in marine and environmental sciences. Discusses papers' strengths and weaknesses from the perspective of scientific communication, including the design and presentation of data in figures and tables, the role of synthesis in justifying new concepts, and how terminology and jargon evolve. Students also have an opportunity to write occasional reviews of these papers as if they had just been submitted to a journal for consideration. A goal is to develop peer-review skills so graduate students can see themselves as future potential reviewers for journals, conference proceedings, and grant proposals. Incorporates feedback and discussion of what constitutes a valuable peer review.

EEMB 7102. Seminar in Ecology and Evolutionary Biology. 2 Hours.

Offers an overview of major concepts in the fields of ecology and evolution and how these concepts can be synthesized under a common framework. The first half of the course is organized according to major areas of evolutionary biology, from quantitative genetics to population genetics and phylogenetics and their synthesis. Quantitative genetics, population genetics, and phylogenetics have been historically separate fields and have only recently been synthesized through genomics. Note that quantitative genetics is a field that studies the evolution of phenotypes and requires no genetic information. The second half of the course introduces major concepts in ecology and is designed to introduce students to the major historical underpinnings of community ecology so as to understand the utility (or lack thereof) of these concepts for modern ecology.

EEMB 7103. Seminar in Sustainability Sciences. 2 Hours.

Explores key papers that have shaped modern theory, methodologies, and practices of sustainability science. Sustainability science hinges on integrating social and ecological sciences to assess the sustainability of human-environment interactions. From the social science dimension, many past studies focused on understanding how values, beliefs, and social norms shape human behavior. From an ecological perspective, much work focused on the influence of various institutional arrangements on resource and environmental sustainability. Importantly, a coupled natural-human or social-ecological systems (SES) perspective focuses on the inherently dynamic nature of these systems and interactions.

EEMB 7104. Seminar in Geosciences. 2 Hours.

Exposes graduate students pursuing a PhD in marine and environmental sciences to classical and recent high-impact papers in the fields of recent and deep earth history, landform evolution, microbes and their role in global biogeochemical cycling, nutrient stoichiometry, the global carbon cycle, geochemical proxies, evolution of ocean chemistry, oceanic acidification, the role of organisms in sediment and rock production, and geochemical paleoproxies. Examines applications of the above disciplines to mitigating the impacts of anthropogenic impacts on the Earth system. This is a guided readings course.

EEMB 7674. Marine Biology Research Project. 1 Hour.

Offers an opportunity to design and implement a scientifically rigorous independent research project that builds upon current knowledge from the primary literature, under the supervision of a faculty advisor from the program. Students conduct research at any of the program's locations and are then required to analyze data using rigorous statistical methods, write a journal-style research paper, and present their results in a research seminar. .

EEMB 8101. Readings in Marine Sciences. 2 Hours.

Designed to prepare PhD students with a concentration in marine sciences for a career in their field by offering an opportunity to learn fundamental aspects of the discipline through readings. Each student works with their Northeastern committee members at their first committee meeting to identify one reading topic per committee member. Committee members provide guidance for the student's readings around their topic. Students meet with each committee member throughout the semester to discuss the readings, ask questions, and clarify any aspects of their topics.

EEMB 8102. Readings in Ecology and Evolutionary Biology. 2 Hours.

Designed to prepare PhD students with a concentration in ecology and evolutionary biology for a career in their field by offering an opportunity to learn fundamental aspects of the discipline through readings. Each student works with their Northeastern committee members at their first committee meeting to identify one reading topic per committee member. Committee members provide guidance for the student's readings around their topic. Students meet with each committee member throughout the semester to discuss the readings, ask questions, and clarify any aspects of their topics.

EEMB 8103. Readings in Sustainability Sciences. 2 Hours.

Designed to prepare PhD students with a concentration in sustainability for a career in their field by offering an opportunity to learn fundamental aspects of the discipline through readings. Each student works with their Northeastern committee members at their first committee meeting to identify one reading topic per committee member. Committee members provide guidance for the student's readings around their topic. Students meet with each committee member throughout the semester to discuss the readings, ask questions, and clarify any aspects of their topics.

EEMB 8104. Readings in Geosciences. 2 Hours.

Designed to prepare PhD students with a concentration in geosciences for a career in their field by offering an opportunity to learn fundamental aspects of the discipline through readings. Each student works with their Northeastern committee members at their first committee meeting to identify one reading topic per committee member. Committee members provide guidance for the student's readings around their topic. Students meet with each committee member throughout the semester to discuss the readings, ask questions, and clarify any aspects of their topics.

EEMB 8982. Readings. 1-4 Hours.

Assigns students independent readings on selected topics in ecology, evolution, and marine biology. May be repeated without limit.

EEMB 8984. Research. 1-4 Hours.

Offers students an opportunity to conduct research. May be repeated without limit.

EEMB 8986. Research. 0 Hours.

Offers students an opportunity to conduct full-time research under faculty supervision. May be repeated without limit.

EEMB 9000. PhD Candidacy Achieved. 0 Hours.

Indicates successful completion of the doctoral comprehensive exam.

EEMB 9990. Dissertation. 0 Hours.

Offers theoretical and experimental research for the PhD degree. May be repeated once.

EEMB 9996. Dissertation Continuation. 0 Hours.

Offers dissertation supervision by members of the department. May be repeated without limit.

Economics (ECON)

Search ECON Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=ECON>)

ECON 1000. Economics at Northeastern. 1 Hour.

Intended for freshmen in the College of Social Sciences and Humanities. Introduces freshmen to the liberal arts in general; familiarizes them with their major; helps them develop the academic skills necessary to succeed (analytical ability and critical thinking); provides grounding in the culture and values of the University community; and helps them develop interpersonal skills—in short, familiarizes students with all skills needed to become a successful university student.

ECON 1115. Principles of Macroeconomics. 4 Hours.

Introduces macroeconomic analysis. Topics include the flow of national income, economics growth and fluctuation, the role of money and banking, and monetary and fiscal policies. Emphasizes the development of conceptual tools to analyze the economic problems facing modern society.

ECON 1116. Principles of Microeconomics. 4 Hours.

Focuses on development of basic theory of demand, supply, and market price. Explores applications to selected microeconomic problems, such as basic monopoly and competition, and other issues that relate to the role of the pricing system in resource allocation and income distribution.

ECON 1125. Recitation for ECON 1115. 0 Hours.

Provides small-group discussion format to cover material in ECON 1115.

ECON 1126. Recitation for ECON 1116. 0 Hours.

Offers small-group discussion format to cover material in ECON 1116.

ECON 1230. Healthcare and Medical Economics. 4 Hours.

Enables students to recognize the relevance of economics to health and medical care and apply economic reasoning to understand health-related issues better; to understand the mechanism of healthcare delivery in the United States within broad social, political, and economic contexts; to explore the changing nature of health and medical care and its implications for medical practice, medical education and research, and health policy; and to analyze public policy in health and medical care from an economic perspective.

ECON 1240. Economics of Crime. 4 Hours.

Covers economic analysis of crime and the criminal justice system. Topics include theoretical and empirical analysis of the economic causes of criminal behavior, the social costs of crime and its prevention, and the design of enforcement policies.

ECON 1260. Contested Issues in the U.S. Economy. 4 Hours.

Covers many of the contested economic issues that the United States faces as a nation—the size of government, the national debt, the war on drugs, national healthcare, taxation, and many more. An important social system in any society is the economic system—the allocation of scarce resources. In the large and complex economy of the United States, there is controversy over what goods and services are produced and how they are distributed. To understand the nature and causes of these issues requires a course where theory is a tool of analysis, not the focus. Economics is not value free. Attention is given to the role of ethics and how our moral values shape policy. Course topics vary from semester to semester.

ECON 1281. Economics of the Creative Industries. 4 Hours.

Presents an overview of the economic aspects of creative industries. Examines the production and consumption of creative goods and services. Topics include consumer demand, economic models of nonprofit and for-profit production of creative goods, competition and market structure, artists and other creative workers as members of the labor force, productivity issues in the performing arts, government support for the creative sector, and the role and impact of public and private subsidies.

ECON 1291. Development Economics. 4 Hours.

Covers ideological biases in economics; origins of the Industrial Revolution; the evolution of global disparities, and how markets, imperialism, and racism affected this process; theories of growth: neoclassical, institutional; growth and structural change; growth and demographic change; growth, income distribution, and welfare; development policies: import-substitution vs. outward-orientation; growth based on primary exports and the socialist experience and transition to capitalism.

ECON 1293. European Economic History. 4 Hours.

Covers European economic history from ancient times to the twentieth century. A brief survey of early Greek and Roman economic life provides the context for more in-depth analysis of medieval, mercantilist, and modern economic institutions. Emphasis is on the role of technology, trade, and natural resources in the development of modern European economies.

ECON 1915. Introductory Selected Topics in Macroeconomics. 4 Hours.

Covers selected topic matter in the field of macroeconomics. The specific topic is chosen by the instructor. May be repeated up to three times.

ECON 1916. Introductory Selected Topics in Microeconomics. 4 Hours.

Covers selected topic matter in the field of microeconomics. The specific topic is chosen by the instructor. May be repeated up to three times.

ECON 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ECON 2315. Macroeconomic Theory. 4 Hours.

Presents several theoretical approaches to the study of short-run economic instability and long-run growth. Uses conceptual and mathematical tools to examine what economists believe to be the major determinants of fluctuations in employment and price level, as well as the rate of economic growth. The theoretical models are used to evaluate the operation and impact of various macroeconomic policy tools.

ECON 2316. Microeconomic Theory. 4 Hours.

Examines supply-and-demand analysis, various elasticity concepts and applications, theories of demand and production, and derivation of cost curves. Analyzes pricing and output behavior in the several market structures with their welfare and the pricing of resources.

ECON 2350. Statistics. 4 Hours.

Discusses basic probability, descriptive statistics, estimation techniques, statistical hypotheses, sampling, analysis of variance, correlation, and regression analysis in the context of economics. Computer applications are an integral part of the course.

ECON 2560. Applied Econometrics. 4 Hours.

Examines research methods used by practicing economists. Discusses typical problems from applied areas of economics including choice of modeling framework, problems of data collection, review of estimation techniques, interpretation of results, and development of static and dynamic adaptive policy models. A research paper utilizing computer applications is an integral part of the course.

ECON 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ECON 3290. History of the Global Economy. 4 Hours.

Covers ideological biases in economics; the extent of global disparities around 1800; evolution of global disparities since 1800; evolution of international integration and international trading and monetary regimes, 1800–2000; theories explaining global disparities: classical, neoclassical, Marxian, neo-Marxian, and structuralist; import-substituting industrialization: Latin America, Asia, and Africa; international debt crises: nineteenth and twentieth centuries; the new global regime; structural adjustment: GATT (General Agreement on Tariffs and Trade) and WTO (World Trade Organization); and socialist interlude: a socialist experience and transition to capitalism.

ECON 3292. Economic History of the Middle East. 4 Hours.

Provides an historical account of the economies of the Middle East from the sixth century C.E. to the present. Conceives of the area between the Nile and Oxus as forming the core of the Middle East; besides the core, the region includes Turkey and North Africa. Identifies the major economic and demographic trends in the region, or segments of the region, to examine the ecological bases of the economies and the connection between political history and the economic trends and to understand the ways in which economies of the region articulated with other major economic regions including Europe, West Africa, and the economies of the Indian Ocean. Studies the systems of government and laws, agriculture, commerce, and manufacturing.

ECON 3404. International Food Policy. 4 Hours.

Offers an overview of the rationale for and types of food policies in developing countries. Uses a food systems approach to cover economic and political dimensions of food policy. Emphasizes food security, nutrition, poverty alleviation, and environmental issues. Discusses and analyzes the dynamics of change in the role of government; food value chains; and institutions and governance and their implications for local, regional, and global food systems.

ECON 3405. A Critique of Capitalism. 4 Hours.

Examines the origins, workings, successes, and failures of capitalism, defined as an economic system where capital is mostly privately owned and markets generally solve economic problems. Examines, in addition, several variants of private-ownership economies including slavery, feudalism, land-tenancy, putting-out system, and self-employment. Also examines some alternatives to capitalism, such as command socialism, market socialism, worker-ownership of capital, cooperatives, Islamic economy, and Christian economy.

ECON 3406. Critical Perspectives on Economics. 4 Hours.

Examines the assumptions, concepts, theories, tools, and tests employed by neoclassical economics; identifies the biases and limits of these methods; and explores alternative economic approaches that might overcome these failings. Also develops an ethical critique of markets, the profit motive, corporations, efficiency, innovation, and economic growth. Offers students an opportunity to develop critical perspectives on neoclassical economics and other approaches to economics.

ECON 3410. Labor Economics. 4 Hours.

Emphasizes an economic analysis of the labor market, the labor force, and wages and earnings. Explores the differences that have existed and currently exist in the labor market with regard to race, ethnicity, and gender and the theories behind why they have existed and continue to exist. Covers supply, development, and efficient use of human resources; demand for labor by businesses and industries; wage inequality and its determinants; changing occupational and industrial structure; nature, causes, and incidence of unemployment; economic impact of unions; and influence of related labor-market institutions and relevant public policies including minimum wages, wage subsidies, and earned-income tax credits; health and safety regulations (OSHA); and antidiscrimination and affirmative action policies and programs.

ECON 3412. Women's Labor and the Economy. 4 Hours.

Introduces economic models of dating, marriage, divorce, and childbearing with the goal of understanding the dramatic changes in family structure that have occurred over the past 60 years. Focuses on women's behavior in the labor force: the labor force participation and poverty and antipoverty programs (as the majority of America's poor are in families headed by women). Discusses theories, evidence, and policy remedies for wage differences between men and women with emphasis on policy topics such as pro-marriage and fertility initiatives, welfare reform, the earned income tax credit, affirmative action, the marriage tax, parental leave, and childcare support.

ECON 3414. Economics of Human Capital. 4 Hours.

Explores theoretical and empirical treatment of economic issues related to investments in human capital including formal education (preschool through postsecondary), vocational education, on-the-job training, work experience and government-sponsored employment and training programs, and their impacts on individuals and society. Emphasizes studies of public policies to promote human capital investments including cost-effectiveness analysis and benefit-cost analysis for determining the effectiveness of investments in literacy, education, and training from a private and social standpoint.

ECON 3420. Urban Economic Issues. 4 Hours.

Studies urban growth and development, focusing on economic analysis of selected urban problems such as housing, poverty, transportation, education, health, crime, and the urban environment. Discusses public policies related to such problems.

ECON 3422. Economics of Transportation. 4 Hours.

Covers transportation and land-use patterns; externalities; special costs and social benefits of various modes of transportation, ownership, regulations, and financing of various modes of transportation; and economics of new technology in transportation.

ECON 3423. Environmental Economics. 4 Hours.

Applies the tools of economics to environmental issues. Explores taxonomy of environmental effects; externalities; the commons problem; taxation, regulations, marketable permits, and property rights as a solution; measuring benefits of cleaner air and water, noise abatement, and recreational areas; global issues including tropical deforestation and acid rain; and the relevance of economics to the environmental debate.

ECON 3424. Law and Economics. 4 Hours.

Focuses on how an understanding of the law is furthered by an awareness of the economic background against which it operates. Draws from economic principles, developing concepts such as efficiency, property rights, regulation, and income distribution. Uses mathematical notation to model the incentives created by various legal rules. Solutions to cost minimization and utility maximization problems reveal whether particular laws induce economic agents to act in a manner consistent with the social optimum. Applications of these ideas may include health and safety, the environment, the legal services and insurance industries, and zoning and land use, among others.

ECON 3425. Energy Economics. 4 Hours.

Introduces theoretical and empirical perspectives on energy demand and energy supply. Energy is vital to modern economies. Emphasizes the role markets play in determining how to use energy and its sources and the scope for public policy to address market imperfections. Discusses oil, natural gas, coal, nuclear power, and renewable energy (such as hydro-, wind, and solar power). Covers the public policy issues around greenhouse gas emissions and energy security.

ECON 3440. Public Finance. 4 Hours.

Presents an overview of the economics of government and the role of public policy. Develops guidelines to determine which economic activities are best performed by government and which are not. Also examines the impact of tax policies on efficiency, economic growth, and equity. Topics include market failures, public choice, the personal income tax, the corporate tax, sales tax, and taxation of capital and wealth, and options for reform of the tax structure. Major spending programs such as social security and education and healthcare are analyzed.

ECON 3442. Money and Banking. 4 Hours.

Covers the nature and functions of money, credit, and financial markets in the modern international economy. Analyzes financial markets and institutions, central banking, and the effects of interest and foreign exchange rates on the real economy.

ECON 3460. Managerial Economics. 4 Hours.

Explores the application of economic principles to the solution of managerial decision-making problems in areas such as demand estimation, cost estimation and control, pricing and marketing strategies, employee incentives, financing of capital investments, and responses to government regulation and taxation. Case studies and simulation models are typically used as pedagogical tools.

ECON 3462. Bubbles, Busts, and Bailouts: Market and Regulatory Failures in the Financial Crisis. 4 Hours.

Investigates economic and financial bubbles together with the busts and bailouts that usually follow. Analyzes how and why bubbles form in markets such as housing and stocks, emphasizing the financial crisis of 2007–2008 but covers others as well. Also examines the lasting effects on markets and the economy from the collapse of such bubbles and the need for bailouts and other policies that are often used. Applies a range of perspectives to identify the market failures and regulatory failures that can cause bubbles—failures of assumptions about information, about incentives, and about oversight. Includes perspectives from microeconomics, behavioral economics, finance, and public policy.

ECON 3470. American Economic History. 4 Hours.

Covers the economic history of the United States from the colonial period to the present. Includes studies of the development of major economic institutions and the effects of technological change. Examines economic reasons for the spread of an industrial market economy in the nineteenth century and the successes and failures of this economy in the twentieth century.

ECON 3481. Economics of Sports. 4 Hours.

Investigates what economics has to say about sports as an economic activity: what tools of economic analysis apply to sports, whether sports require different economic tools, what the evidence has to say about key questions. Focuses on professional team sports, although some attention is paid to college sports and to individual professional sports.

ECON 3490. Public Choice Economics. 4 Hours.

Studies public choice economics—the scientific analysis of government behavior—and is divided into two parts: institutional political economy and social choice theory. Public choice economics applies this neoclassical economic analysis to political issues such as rent seeking, tax reform, logrolling, voting behavior, the function of government, the intersection between public and private interests, and federalism. The point of departure from political science is that economists have based this analysis on the assumption that utility functions do not change once a person enters the realm of public service and that the argument of their utility functions is still their own self-interest and not the interest of the social system in which they operate.

ECON 3520. History of Economic Thought. 4 Hours.

Traces the evolution of Western economic thought. Covers several important periods and schools of economic thought including mercantilism, physiocracy, classical, Marxist, neoclassical, and Keynesian. Emphasizes the relationship between historical changes in society and economic thought, focusing on changes in the types of questions economists ask and the analytical tools they use.

ECON 3915. Intermediate Selected Topics in Macroeconomics. 4 Hours.

Covers selected topic matter in the field of macroeconomics. The specific topic is chosen by the instructor. May be repeated up to five times.

ECON 3916. Intermediate Selected Topics in Microeconomics. 4 Hours.

Covers selected topic matter in the field of microeconomics. The specific topic is chosen by the instructor. May be repeated up to five times.

ECON 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ECON 4634. Comparative Economics. 4 Hours.

Describes the uniqueness of modern market economies in terms of social institutions that serve limited economic ends. Begins with a presentation of traditional economic analyses of the advantages and disadvantages of market economies. Examines these theories in light of evidence from economic anthropology regarding the evolution of market institutions and from the problems encountered in contemporary transitional economies as they move from command to market institutions.

ECON 4635. International Economics. 4 Hours.

Covers Ricardian and neoclassical theories of trade; trade policies; tariffs, quotas, voluntary export restraints, and customs union; global trade regime; GATT (General Agreement on Tariffs and Trade) and WTO (World Trade Organization); balance-of-payments accounts; foreign exchange markets; monetary and portfolio balance approaches to external balance; fixed or flexible exchange rates; and international monetary system.

ECON 4640. Financial Economics. 4 Hours.

Introduces students to the theory of investments, including the principles of risk and return, the theory of portfolio selection, asset pricing models such as the capital asset pricing model (CAPM) and arbitrage pricing theory (APT), valuation of stocks, bond pricing and the term structure of interest rates, and options (what they are and how to use them). Geared toward nonbusiness majors who are interested in a rigorous course in finance.

ECON 4650. Economic Growth and Applications. 4 Hours.

Explores the theory as well as the empirics of economic growth. Emphasizes international comparisons of economic performance in terms of aggregate income and long-run growth. Presents the neoclassical model of economic growth as well as endogenous growth theory. Covers econometric application of the growth models. Topics include the role of ideas and technology, population dynamics, government policy, culture, the environment, income inequality, international trade, democracy, international aid, foreign investment, and the rule of law. One of the purposes of this class is to allow economics majors to apply and extend their knowledge of macroeconomic theory and applied econometrics.

ECON 4653. Mathematics for Economics. 4 Hours.

Introduces basic tools of mathematics, matrix algebra, differential and integral calculus, and classical optimization, with special reference to economic applications. Computer applications are an integral part of the course.

ECON 4680. Competition Policy and Regulation. 4 Hours.

Presents an analytic framework and empirical study of how the structure of industries and the conduct of sellers affect performance. Includes examples and case studies from both the “old economy” and the “new economy.” Examines antitrust as a public policy designed to promote better market performance.

ECON 4681. Information Economics and Game Theory. 4 Hours.

Offers an advanced course on the economics of information, including moral hazard and adverse selection; game theory; and mechanism design. Formally considers alternative solution concepts, such as Nash equilibrium and rationalizability for simultaneous move and sequential move games under complete information about payoffs and preferences, as well as solution concepts, such as Bayesian-Nash equilibrium to analyze selection, screening, and incentives in games of incomplete or asymmetric information. Covers optimal incentives or mechanism design, including the optimal design of contracts, auctions, and other mechanisms. Prior exposure to game theory recommended.

ECON 4692. Senior Economics Seminar. 4 Hours.

Incorporates aspects of real-world and academic experiences of students into an analytical context, enabling students to demonstrate their ability to apply economic concepts, methodology, and data to economic issues and problems of personal and philosophical significance.

ECON 4915. Advanced Selected Topics in Macroeconomics. 4 Hours.

Covers selected topic matter in the field of macroeconomics. The specific topic is chosen by the instructor. May be repeated without limit.

ECON 4965. Undergraduate Teaching Experience 1. 4 Hours.

Offers an opportunity for qualified undergraduate students to serve as undergraduate teaching assistants. Requires various assignments closely directed by the assigned course instructor. These may include holding office hours, light grading, maintaining the records for the course, proctoring—but not solely administering—exams and quizzes, holding recitation/tutorial sessions, and (very) limited lecturing or leading class discussions. Requires minimum overall GPA of 3.333 and grade of A– or better in course assignment; permission to enroll is further subject to the availability of an appropriate course assignment and instructor.

ECON 4970. Junior/Senior Honors Project 1. 4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student’s major field. Combined with Junior/Senior Project 2 or college-defined equivalent for 8 credit honors project. May be repeated without limit.

ECON 4971. Junior/Senior Honors Project 2. 4 Hours.

Focuses on second semester of in-depth project in which a student conducts research or produces a product related to the student's major field. May be repeated without limit.

ECON 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ECON 4991. Research. 4 Hours.

Offers an opportunity to conduct research under faculty supervision.

ECON 4992. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May not be substituted for requirements leading to a BA or BS in economics. Requires approval of department chair. May be repeated without limit.

ECON 4994. Internship. 4 Hours.

Offers students an opportunity for internship work. May be repeated without limit.

ECON 4996. Experiential Education Directed Study. 4 Hours.

Draws upon the student's approved experiential activity and integrates it with study in the academic major. Restricted to those students who are using the course to fulfill their experiential education requirement. May be repeated without limit.

ECON 5105. Math and Statistics for Economists. 4 Hours.

Offers an intensive study of the statistical methods and techniques and mathematical fundamentals necessary for quantitative economics. Statistical topics include descriptive statistics, probability theory, fundamentals of estimation and hypothesis testing, and regression and correlation analysis. Mathematical topics include linear algebra and differential and integral calculus. Computer applications are an integral part of the course.

ECON 5110. Microeconomic Theory. 4 Hours.

Presents a survey of microeconomic theory at the beginning graduate level. Topics include theories of the consumer, firm, and market (including input and output markets), welfare economics, and market failures. Includes applications of theory to public policy questions in such fields as industrial organization and public finance. Requires knowledge of undergraduate microeconomic theory.

ECON 5120. Macroeconomic Theory. 4 Hours.

Examines theories of the short-run determination of output, employment, and prices, and long-run economic growth. Presents alternative macroeconomic models. Also consists of applied case study analysis of the theoretical models presented in class. Requires knowledge of undergraduate microeconomic theory.

ECON 5140. Applied Econometrics. 4 Hours.

Offers an intensive study of econometric techniques applied to cross-section, time-series, and panel data. Applies the fundamentals of econometrics to analyzing structural economic models, forecasting, and policy analysis. Computer applications and an empirical research project are an integral part of the course.

ECON 5291. Applied Development. 4 Hours.

Focuses on major macroeconomics policy questions for developing countries in an open economy context. Combines theoretical foundations with institutional analysis and empirical evidence. Begins by developing a macroeconomic framework to analyze short-term macroeconomic adjustment and concludes with long-term growth, emphasizing the effects of financial integration and capital account regulations on macroeconomic performance in developing countries. Approaches macroeconomic policy issues from a political economy perspective on macroeconomics. Empirical data and country experiences help assess the validity of theoretical propositions and explain the complexity of development trajectories. Requires previous course work in macroeconomic theory.

ECON 5292. Gender and Development Economics. 4 Hours.

Examines topics at the intersection of women's empowerment and economic development from an economic perspective. Introduces potential explanations for the gender inequalities in the context of developing countries as well as the role of public policy in addressing such disparities. Studies microeconomics topics such as education gaps, fertility, family planning, HIV/AIDS, marriage dynamics and intrahousehold allocation of resources, female labor outcomes and migration, as well as conflict and domestic violence. Offers students an opportunity to apply basic economic theory associated with each topic as well as the research methodologies used in recent empirical papers. Students with an econometrics background have a better understanding of the empirical papers. Requires previous course work in microeconomic theory and in statistics. .

ECON 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ECON 6964. Co-op Work Experience. 0 Hours.

Provides eligible students with an opportunity for work experience. May be repeated without limit.

ECON 7200. Topics in Applied Economics. 4 Hours.

Presents an application of microeconomic and macroeconomic theory, as well as quantitative methods, to a variety of social issues, both domestic and international. May be repeated without limit.

ECON 7210. Applied Microeconomic Policy Analysis. 4 Hours.

Examines the alternative microeconomic activities of the public sector and the role of a diverse array of microeconomic tools and techniques in public sector policymaking, planning, program administration, and evaluation. Topics include the economics of market failure; the economics of information, corruption, public goods, and services provision; production externalities; economics of deregulation and privatization; and policy and program evaluation techniques including outcome and impact evaluation, social and economic experiments, objective functions, cost-effectiveness analysis, and benefit-cost analysis. ECON 5140 is recommended as a previous course.

ECON 7240. Workshop in Applied Econometrics. 4 Hours.

Offers an intensive, hands-on application of econometrics to research problems in economics, using current econometric software packages. Both cross-section and time-series techniques are used and applied to different areas of economics, such as global economics, labor economics, urban economics, public finance, policy evaluation, and so on. Students are expected to complete a written applied econometrics project and present the results to the class.

ECON 7250. International Economic Development. 4 Hours.

Covers leading research topics in development economics, with a particular focus on patterns of global inequality and globalization, effects of trade policy on labor market adjustment, gender and development, education and health, long-term effects of institutions, commodity price dynamics, and Dutch disease. Course objectives include exploring the cutting-edge literature emerging on these topics and improving understanding of the most recent empirical methods used in the literature. Offers students an opportunity to learn how to apply econometric techniques to particular research questions while evaluating advantages and disadvantages of using different approaches and to demonstrate understanding of difference-in-differences analysis, instrumental variables, randomized evaluation, regression discontinuity, and structural vector autoregressive models. Students critically assess the limitations of these methods.

ECON 7251. International Finance. 4 Hours.

Introduces students to international finance and equips them with tools and methods to study and analyze international economic issues and problems. Topics include the foreign exchange market, balance of payments, international investment and banking, monetary and fiscal policy in an open economy, economic integration and monetary unification, the international monetary system, and optimum currency areas. Each student is required to write a short paper on a current problem in international finance.

ECON 7253. International Integration. 4 Hours.

Examines the evolution of global markets for goods, services, capital, and labor over the past two centuries, the stylized facts regarding trends in integration, the factors affecting the trends in integration, the linkages between integration of different markets, and the impact of integration on the dynamics of global development and disparities. The analysis follows an eclectic approach to the questions addressed, drawing upon different intellectual traditions in economics. Requires knowledge of intermediate microeconomic theory.

ECON 7260. Urban Economic Systems. 4 Hours.

Examines urban economic systems including systematic relationships among cities, as well as those within cities. The portion of the course devoted to intermetropolitan analysis covers central place theory, the location of economic activity, and intermetropolitan trade. Intrametropolitan analysis includes urban form and land use, land use controls, and local government systems.

ECON 7261. Urban Economic Development. 4 Hours.

Examines urban economic development processes. Topics include models and techniques for describing and evaluating urban economies; development strategies and tools; commercial, industrial, and housing development; and problems of poverty and housing.

ECON 7262. Regional Economic Theory. 4 Hours.

Analyzes the following topics: comparative costs and location analysis for industry, various indices of location measures, land use theories, interregional labor migration, interregional trade, regional development, regional equilibrium analysis, regional and interregional input-output analysis, and econometric models for regional analysis.

ECON 7266. Economics of Government. 4 Hours.

Presents an overview of the economics of government and the role of public policy. Develops guidelines to determine which economic activities are best performed by government and which are not. Topics include public choice, public goods, externalities, public enterprise, and efficiency and equity effects of alternative tax systems.

ECON 7270. Economics of Law and Regulation. 4 Hours.

Relies on models of welfare economics to analyze the impact of laws, regulation, and deregulation, in terms of both positive and normative aspects. Topics include economic analysis of market failures and government remedies; property, tort, and contract law; and economic and social regulation. Students are encouraged to develop critical skills in analyzing various types of economic policy. Requires knowledge of microeconomics.

ECON 7271. Industrial Organization. 4 Hours.

Analyzes the market structure of industries and strategic behavior by businesses, and the effect that these have on economic performance. Draws on economic theory, empirical evidence, and case studies. Also includes a brief discussion of governmental policies such as antitrust, regulation, and public ownership/privatization.

ECON 7710. Microeconomic Theory 2. 4 Hours.

Continues ECON 5110, building on its theories. Topics include game theory, economics of information, incentive theory, welfare economics, general equilibrium, and social choice theory.

ECON 7720. Macroeconomic Theory 2. 4 Hours.

Continues ECON 5120. Offers an advanced course in macroeconomic analysis where economic theory and econometric evidence are brought together to explain economic events and changes at the macro level including economic growth, changes in unemployment and inflation rates, and business cycles. Topics include the Solow growth model, overlapping-generations models, research and development models of growth, real-business-cycle theory, Keynesian theories of economic fluctuations, microfoundations, consumption, investment, unemployment, inflation and monetary theory, and budget deficits and fiscal policy.

ECON 7740. Applied Econometrics 2. 4 Hours.

Continues ECON 5140. Extends students' understanding of econometrics beyond the topics covered in the earlier course. Students develop and complete an econometric research project using methods covered. Topics include models with multiple equations, nonlinear regression models, asymptotic theory, maximum likelihood, discrete choice models, limited dependent variables and duration models, panel data, regression models for time-series data, and unit roots and cointegration.

ECON 7763. Labor Market Analysis. 4 Hours.

Offers a theoretical and methodological survey of the field of neoclassical labor market analysis at the PhD level. Topics include the supply of labor from the perspective of the individual and the family, human capital, the demand for labor, market equilibrium, and the determination and distribution of wages and earnings. Other topics that may be included are unions, unemployment, labor mobility, alternative models of labor markets, labor productivity and growth, and income distribution and poverty.

ECON 7764. Topics in Labor Economics. 4 Hours.

Covers the theoretical and empirical issues surrounding current topics in the area of labor economics. Topics may vary each time the course is offered and may include discrimination, efficiency wage theory, labor legislation, life cycle analysis, and the use of microdata (panel studies, search behavior, intergenerational earnings mobility, and employment and training policies).

ECON 7771. Framework of Industrial Organization. 4 Hours.

Sets out the analytical framework of industrial organization economics—the basis and method for evaluating the performance of markets and firms and for prescribing policies for improvement. Topics include size and structure of firms, market concentration, pricing in oligopoly and other markets, entry and entry deterrence strategies, and advertising and product strategies. Each of these topics is examined using a range of tools including microeconomic theory, game theory, and statistical analysis.

ECON 7772. Public Policy Toward Business. 4 Hours.

Covers the three major facets of public policy toward business: antitrust, regulation, and privatization. Demonstrates how economic theory and evidence are brought to bear on practical questions of market failure and policies to remedy such failure. Topics include mergers, collusion and facilitating practices, predatory conduct, cost of service regulation, price caps and incentive regulation, deregulation, and public enterprise vs. privatization. Policies are analyzed for their rationale, techniques for implementation, and effects as measure in the context of actual experience in the United States and other countries.

ECON 7962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ECON 7976. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May not be substituted for requirements leading to a BA or BS in economics. May be repeated without limit.

ECON 7990. Thesis. 1-4 Hours.

Provides thesis supervision by members of the department. May be repeated without limit.

ECON 8550. Internship In Economics. 1-4 Hours.

Comprises academic credit for internship work in economics. May be repeated without limit.

ECON 8960. Exam Preparation—Doctoral. 0 Hours.

Provides students with the opportunity to prepare for the qualifying exam during the semester in which they are registered for this course. Registration in this course constitutes full-time status.

ECON 8986. Research. 0 Hours.

Offers an opportunity to conduct full-time research under faculty supervision. May be repeated without limit.

ECON 9000. PhD Candidacy Achieved. 0 Hours.

Indicates successful completion of the doctoral comprehensive exam.

ECON 9986. Research. 0 Hours.

Offers an opportunity to conduct full-time research under faculty supervision. May be repeated without limit.

ECON 9990. Dissertation. 0 Hours.

Taken for two consecutive semesters, normally at the beginning of the dissertation period, to meet the residency requirement of the doctoral program. May be repeated once.

ECON 9996. Dissertation Continuation. 0 Hours.

Requires registration for those students who have completed the doctoral program's residency requirement, but who have not yet completed the dissertation. May be repeated without limit.

Economics - CPS (ECN)

Search ECN Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=ECN>)

ECN 1100. Principles of Microeconomics. 3 Hours.

Focuses on the development of the basic theory of supply and demand and market prices, as well as competition and monopoly and income distribution. Applies economic principles to selected problems such as poverty, pollution, and international trade.

ECN 1200. Principles of Macroeconomics. 3 Hours.

Introduces macroeconomics, the study of the economy as a whole. Macroeconomics applies the basic principles of economics to whole economic systems and the relationships among sectors of the economy. Topics include unemployment, inflation, national income and employment theory, government expenditures and taxation, the role of the banking system, and monetary and fiscal policies. Emphasizes the development of conceptual tools to analyze the economic problems facing modern society.

ECN 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ECN 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ECN 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ECN 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

Economics - CPS Specialty (ECNM)

Search ECNM Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=ECNM>)

ECNM 1115. Principles of Macroeconomics. 4 Hours.

Introduces macroeconomic analysis. Topics include the flow of national income, economics growth and fluctuation, the role of money and banking, and monetary and fiscal policies. Emphasizes the development of conceptual tools to analyze the economic problems facing modern society.

ECNM 1116. Principles of Microeconomics. 4 Hours.

Focuses on development of basic theory of demand, supply, and market price. Explores applications to selected microeconomic problems, such as basic monopoly and competition, and other issues that relate to the role of the pricing system in resource allocation and income distribution.

Education (EDUC)

Search EDUC Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=EDUC>)

EDUC 1111. Education in the Community. 4 Hours.

Considers the unique contributions of community, family, and public schools to education in the United States today. Uses classroom and field-based activities to provide historical and social contexts of public education. Encourages students to reflect on their own prior education, to learn from persons active in the education community, and to consider their future roles as educators.

EDUC 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

EDUC 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

EDUC 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

EDUC 4530. Race and Urban Education. 4 Hours.

Provides an intensive examination of racism in the United States and the implications of race on homophobia, sexism, and so on, with a focus on the context of urban education. Through the lenses of color, ethnicity, and class, explores questions and concepts that lie at the heart of our personal and professional interactions in the school, classroom, and the community. Students are expected to participate in class discussion and begin the personal exploration of their own feelings and experience with racism. Combines formal lectures with group and small-group discussions, fieldwork, and video presentation.

EDUC 4850. Teaching Practicum. 8 Hours.

Supervised 300-hour-minimum practicum situated within Boston Public School system that meets the requirements for Massachusetts State initial licensure. The teacher candidate is mentored by cooperating teachers and NU faculty to meet performance assessment of professional standards. Director of field placement approval required. Requires appropriate fieldwork, completion of education licensure courses, and passing scores on the Massachusetts Tests for Educator Licensure (MTEL).

EDUC 4851. Teaching Seminar. 4 Hours.

Integrates theoretical knowledge and practical understanding through a cycle of action and reflection. In conjunction with a teaching practicum, enables the teacher candidate to meet the professional standards for Massachusetts State initial licensure. Requires appropriate fieldwork and completion of education licensure courses.

EDUC 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

EDUC 5503. Culture, Equity, Power, and Influence. 4 Hours.

Examines the broad construct of culture and explores how these characteristics impact personal identity, access to education, social mobility, power, and influence. Explores educational institutions as cultural systems and questions concepts at the heart of personal and professional interactions in teaching, learning, curriculum, and administration. Expects students to participate in reflective discussion and begin to explore their own feelings and experience with culture; to develop competencies spanning cultural and international boundaries; to prepare to be more effective in diverse settings; and to influence and advocate for systemic change.

EDUC 5504. Child and Adolescent Development, Learning, and Teaching. 4 Hours.

Surveys contemporary educational theory of human learning and accomplished teaching. Offers students an opportunity to develop a working understanding of teaching and learning as they occur in different types of schools and community settings. Investigates how children and adolescents learn, acquire knowledge, and make sense of their experience, as well as theories of teaching or pedagogy—how best to teach for understanding and learning achievement.

EDUC 5570. Inclusion, Equity, and Diversity. 4 Hours.

Addresses the range of learning needs of special education legislation, as well as the politics of who is identified and why. Examines students' own attitudes about teaching children with learning disabilities. Offers students an opportunity to develop skills and strategies for identifying and teaching learning-disabled children. Requires graduate students to demonstrate advanced levels of study and research.

Education - CPS (EDU)

Search EDU Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=EDU>)

EDU 1007. Child and Adolescent Development and Variation. 1 Hour.

Reviews the biological, neuropsychological, psychosocial, cognitive, behavioral, and ecological theories of development. Examines variations and progress in the developmental domains and the intersection among these domains in development in K–12 educational settings. Infuses the impact of culture on development throughout the course. Introduces assessments and interventions in development and learning in educational K–12 settings. Offers students an opportunity to apply developmental concepts to experiential learning opportunities.

EDU 1008. Overview of Applied Behavior Analysis. 1 Hour.

Provides an overview of applied behavior analysis (ABA), which is concerned with the improvement and understanding of human behavior. Focuses on basic concepts and methodologies involved in behaviorism and their application to behavior change within educational settings. Offers students an opportunity to apply behavioral concepts related to education in the K–12 setting through experiential learning opportunities.

EDU 1009. Evidence-Based Practices. 1 Hour.

Explores specific strategies to help students retain new academic information, stay motivated, and generalize academic skills. Builds upon brain development, behavioral interventions, and educational best practices in K–12 settings to study differentiation within heterogeneous groups through experiential learning opportunities.

EDU 2004. Learning and Accomplished Practice. 4 Hours.

Examines the learning process and how an understanding of the nature of learning can lead to the implementation of effective instruction. Offers students an opportunity to study theoretical perspectives and pedagogical research in order to understand student development and diversity and to focus on how students learn. Challenges students to demonstrate a working understanding of teaching and learning as these occur in different types of school and community settings. All these facets are essential for a comprehension of three core principles: (1) characteristics that students bring to the classroom, encompassing how students are likely to be different from one another; (2) research referring to how students learn; and (3) the conversion of knowledge about development, diversity, and learning into effective teaching practice.

EDU 4818. Supervised Teaching Practicum. 6 Hours.

Offers supervised semester-long student teaching in a classroom in a school system. Guides students in their teacher candidate experience. Seeks to assist students in becoming reflective practitioners. The seminar is structured to provide students with a peer community of practice and designed to acquaint students more intimately with the Pre-Service Performance Assessment Professional Standards for teachers.

EDU 5978. Independent Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic.

EDU 6001. Experiential Learning Theory and Practice. 4 Hours.

Offers experiential educators an opportunity to obtain the knowledge, skills, and competencies needed to design and facilitate engaging and meaningful learning experiences. Compares different theoretical foundations for how people learn through experience and how these theories are put into practice using different approaches for teaching through experiences including active learning, inquiry-based learning, service-learning, place-based learning, and project-based learning. Discusses the principles of deeper learning and how to support the development of deeper learning competencies through experiential learning.

EDU 6002. Culturally Responsive Experiential Teaching and Learning. 4 Hours.

Offers experiential educators an opportunity to obtain the knowledge, skills, and competencies needed to design and facilitate engaging and meaningful student-centered learning experiences that meet the needs of a diverse range of learners. Explores the constructs of culture, equity, power, and positionality and how educators facilitate the learning of others, it is important to understand who we are and how our own learning experiences shape our practices and perspectives. Also explores how to facilitate social emotional growth, agency, and self-authorship in students through culturally responsive experiential learning.

EDU 6003. Applied Research in Experiential Teaching and Learning. 4 Hours.

Offers experiential educators an opportunity to obtain the knowledge, skills, and competencies needed to collect, analyze, and use data as evidence to inform best practices in experiential teaching and learning. After studying the ethics of engaging in practitioner-oriented, applied, educational research, students explore how to monitor and measure student engagement and outcomes through the collection and analysis of both qualitative and quantitative data. Offers students an opportunity to learn more about how action research can be employed by educators to plan, implement, monitor, and evaluate experiential teaching and learning practices.

EDU 6004. Leading Experiential Teaching and Learning. 4 Hours.

Offers experiential educators an opportunity to obtain the knowledge, skills, and competencies needed to engage in leadership practices to negotiate challenges and opportunities associated with experiential teaching and learning by applying the different leadership frameworks. Explores how to lead successful professional development experiences and how to establish and support effective professional learning communities. Offers students an opportunity to learn how to lead efforts to engage with, leverage, and contribute to different networks dedicated to supporting experiential teaching and learning. .

EDU 6023. Institute in Creating a Community of Learners/Behaviors. 4 Hours.

Designed to support student understanding of the theory, research, and practice pertaining to creating a sense of community in the classroom. Offers students an opportunity to critically examine a number of behavior management approaches and to develop practical interventions and skills for preventing and remediating behavior problems. Addresses the principles of "functional assessment" through an exploration of "responsive classroom" techniques.

EDU 6050. Education as an Advanced Field of Study. 5 Hours.

Focuses on the critical evaluation, interpretation, and uses of published research in education as a field of study. Offers students an opportunity to explore the relationship between theory and practice and the changing nature of knowledge, to examine peer-reviewed research articles, to learn the "rules" and methods through which these scholarly works are developed, and to begin to apply research findings to real problems and issues in education. As part of this course, students use an ePortfolio as they begin to document their development as scholars, practitioners, and leaders in the field of education.

EDU 6051. Culture, Equity, Power, and Influence. 4 Hours.

Examines the broad construct of culture and explores how these characteristics impact personal identity, access to education, social mobility, power, and influence. Explores educational institutions as cultural systems and questions concepts at the heart of personal and professional interactions in teaching, learning, curriculum, and administration. Expects students to participate in reflective discussion and begin the personal exploration of their own feelings and experience with culture; to develop competencies spanning cultural and international boundaries; to prepare to be more effective in diverse settings; and to influence and advocate for systemic change.

EDU 6064. Curriculum and Assessment. 4 Hours.

Presents how curriculum, student performance, and assessment are currently practiced in a variety of school settings with a view toward changing current practice to meet future needs. Offers students an opportunity to learn how to become active players in creating or improving curriculum at the classroom level, the school, or within a whole school district and to be able to link curriculum and assessment directly to student achievement.

EDU 6086. Foundations of Literacy Development and Instruction. 4 Hours.

Introduces fundamental theoretical and practical instructional principles of developing reading, writing, and language arts, grounded in research on cognitive development and language acquisition, and informed by political and sociocultural perspectives. An integrated language model suggests that reading, writing, and thinking be viewed as interrelated, critical processes for exploring and responding to the world. Offers students an opportunity to acquire foundational knowledge of materials, instructional strategies, and assessment tools that support developing literacy and engaging learners.

EDU 6101. Critical Issues in Education: Past and Present. 2 Hours.

Examines the historical, political, economic, and societal roles of schools while interrogating educational policies, inequities, and controversies that impact K–12 education, as well as the classroom and community opportunities for teachers to effect change. Educational experiences and outcomes in the United States are shaped by existing systems and institutional structures.

EDU 6102. Reflection, Community Engagement, and Agency in Education. 2 Hours.

Introduces the facets of reflective practice beginning with a dispositional self-assessment to ground an exploration of culturally responsive teaching, culturally and linguistically sustaining practices, and to cultivate an activist mindset. Includes a community-based field component to explore funds of knowledge within specific community contexts to in order to support the development of an asset view of students and families and empower an understanding of dynamic experiential teaching and learning. .

EDU 6104. Child and Adolescent Development, Learning, and Teaching. 4 Hours.

Surveys contemporary educational theory of human learning and accomplished teaching. Offers students an opportunity to develop a working understanding of teaching and learning as they occur in different types of schools and community settings. Investigates how children and adolescents learn, acquire knowledge, and make sense of their experience, as well as theories of teaching or pedagogy—how best to teach for understanding and learning achievement.

EDU 6107. Inclusion, Equity, and Diversity. 4 Hours.

Addresses the range of learning needs of special education legislation, as well as the politics of who is identified and why. Examines students' own attitudes about teaching children with learning disabilities. Offers students an opportunity to develop skills and strategies for identifying and teaching learning-disabled children. Requires graduate students to demonstrate advanced levels of study and research.

EDU 6122. Teaching the Language Arts. 4 Hours.

Offers secondary teachers an opportunity to develop competence and confidence working with diverse students, many of whom appear to read and write only when required to do so. Considers the design and practices of traditional English curricula at the middle and high school level and explores alternative syllabi and unit design as strategies for actively engaging students in the pursuit of meaning in reading and writing as they enhance their skills. Explores the role of research as well as interdisciplinary and collaborative approaches as they relate to curricula in English and the humanities. Requires graduate students to demonstrate advanced levels of study and research.

EDU 6124. Teaching History and the Social Sciences. 4 Hours.

Explores the intersecting disciplines of history and social studies, including geography, sociology, economics, political science, and history. Emphasizes the interrelatedness of disciplines and the emerging role of middle and high school students as citizens in their school, community, nation, and the world. Examines the challenge of covering all the material deemed essential by state and district curriculum frameworks, while helping one's students become problem solvers and critical thinkers in their analysis of social problems. Requires graduate students to demonstrate advanced levels of study and research.

EDU 6127. Teaching Science. 4 Hours.

Examines how the evolving nature of science—ideas, theories, concepts, and controversies—relates to diverse middle and high school students and how teachers can use experience-based, problem-centered approaches that engage the range of student learners and help them meet local and state learning goals. Identifies research possibilities within school contexts, both inside and outside the laboratory. Explores curricular frameworks and culturally relevant content to enable teachers to create a learning environment that supports inquiry and problem solving. Analyzes examples of excellent curriculum products, programs, assessments, and technology tools. Offers students an opportunity to develop a curriculum unit including assessment philosophy and practices. Requires graduate students to demonstrate advanced levels of study and research.

EDU 6129. Teaching Mathematics. 4 Hours.

Explores mathematics teaching methods that are research based, experienced based, and grounded in the contemporary theoretical frameworks influencing mathematics education. Emphasizes issues related to teaching math in an urban school, problem solving, communication, connections, and integrating technology, as well as issues of access and equity, assessment, and cross-content teaching strategies. Requires graduate students to demonstrate advanced levels of study and research.

EDU 6154. Inquiry in the Sciences and Humanities. 4 Hours.

Explores methods for enabling children in grades 1–6 to experience the dynamics of scientific investigation as they develop their abilities to make thoughtful observation and make meaning of the results of those observations. Examines methods and materials, pedagogies, and assessment strategies that foster integrated learning across the sciences, social sciences, and humanities.

EDU 6155. Inquiry in Mathematics. 4 Hours.

Explores methods for teaching mathematics in grades 1–6 that are research and experience based and grounded in the contemporary theoretical frameworks influencing mathematics education. Designed to increase students' knowledge of mathematics as it simultaneously explores the intrinsic nature of math and methods for relating it to children. Emphasizes approaches to teaching mathematics that engage diverse populations of children.

EDU 6162. Language, Culture, and Literacy in Middle and High Schools. 4 Hours.

Examines the interrelationships among language, culture, and identity and explores the implications of those relationships for effective teaching in middle schools and high schools. Considers issues of linguistic diversity within their broad sociopolitical and philosophical contexts, emphasizing how language discrimination functions within the context of other forms of systematic oppression in our society. Explores the processes of identity development in the context of schooling and literacy performance. Also examines methods of helping linguistically diverse students to develop their oral and written language abilities within a learning environment that draws upon and celebrates their native language abilities and traditions. Requires graduate students to demonstrate advanced levels of study and research.

EDU 6182. Educational Statistics. 4 Hours.

Focuses on concepts and methods used in applications of introductory statistics in education. Emphasizes applications to problems in education that are not covered in statistics courses elsewhere and do not involve derivations of statistical techniques. Covers frequency measures, measures of central and general location, measures of variation and probability and their use in making inferences, setting confidence levels, type one and type two errors, tests of significance inclusive of one- and two-sample t-tests, one- and two-way analyses of variance and chi square, correlational techniques inclusive of linear and multiple regression, and analysis of covariance and nonparametric statistics.

EDU 6183. Collaborative Strategies for Effective Classroom Management. 3 Hours.

Explores best practices in classroom organization and behavior management. Topics range from developing student-centered classrooms, routines, and space to strategies for managing transitions, classroom dynamics, individual behaviors, and positive behavioral support systems. Offers participants an opportunity to think critically and plan for a collaborative and productive classroom learning community.

EDU 6184. Interdisciplinary Foundations. 2 Hours.

Provides the iCert Program orientation through three areas of focus: reflection and self-assessment to inform the course selection process; exposure to a broad vision of the contemporary workplace and the competencies required for career success as individuals, members of organizations, and as global citizens; and development of an individual Professional Learning Plan (PLP). Includes a variety of academic and career-related support systems as students embark on a journey that builds on past experiences while providing opportunities for reflection as they develop goals for the future.

EDU 6185. English-Language Learners in the General Education Classroom. 4 Hours.

Designed to introduce K–12 general educators to skills that enable them to work more effectively with English language learners in their classrooms. Explores the history of bilingual education in the United States and other programs used to teach English language learners. Offers participants the opportunity to develop sheltered English instructional strategies to scaffold lessons that can be used in any classroom setting where English language learners are present. Offers participants an opportunity to plan Sheltered English Immersion (SEI) lessons in a Sheltered Instructional Observation Protocol (SIOP) template using the World-Class Instructional Development and Design English Language Development (WIDA ELD) Standards. This course meets DESE requirements for the Sheltered English Immersion (SEI) endorsement. .

EDU 6201. The Landscape of Higher Education. 4 Hours.

Seeks to provide the foundation to understand the structure, governance, and operations of institutions of higher education, as well as the roles, functions, and interactions of various administrative positions and offices. Through scholarly publications, research articles, and theories, offers students an opportunity to prepare to work and advance effectively within higher education by appreciating its complex organizational structure and its historical context. Assesses how these constructs are subject to today's environmental, financial, technological, and competitive pressures; considers how higher education might implement innovation and change; and offers students an opportunity to design strategies for change.

EDU 6202. Faculty, Curriculum, and Academic Community. 4 Hours.

Examines collaborative approaches to developing and improving both curriculum and the delivery of that curriculum. Faculty and curriculum are not only the core of an institution of higher education, they are also what make institutions of higher education unique from any other type of organization. Topics include academic structure and governance within the context of the wider university community in not-for profit and for-profit institutions. Examines faculty unions, academic freedom, tenure, and the increasing role of adjuncts. Assesses how administration, faculty, and staff interact in an integrated, collegial environment.

EDU 6203. Education Law, Policy, and Finance. 4 Hours.

Offers an overview of the major aspects of the legal, political, and financial environment that impact institutions of higher education, which are affected by laws and policies that range from access, affordability, readiness, and completion to gainful employment. Offers students an opportunity to learn multiple approaches for addressing these requirements, for understanding and influencing policy development at all levels, and for navigating higher education's financial complexities, both internal and external.

EDU 6204. The Foundations of Higher Education. 5 Hours.

Offers students an opportunity to obtain a foundation to understand the structure, governance, and operations of institutions of higher education in the United States. Students examine peer-reviewed articles, study the rules and methods through which scholarly works are developed, and begin to apply research findings to real problems and issues in higher education. Through critical evaluation, interpretation, and uses of published research, assesses higher education's complex organizational structure. Examines how these constructs are subject to today's environmental, financial, technological, and competitive pressures; considers how higher education may implement innovation; and analyzes strategies for adaption. Offers students an opportunity to learn to use an ePortfolio to document their development as scholar-practitioners.

EDU 6205. The Demographics of the New College Student. 4 Hours.

Offers students an opportunity to understand the changing demographics of students who matriculate at higher education institutions, such as first-generation college students, veterans, international students, and adult learners. Explores strategies and theories for college student access and success.

EDU 6216. The College Student Experience. 4 Hours.

Explores how various student development theories can be leveraged to positively impact learners' social and academic success in higher education. .

EDU 6217. The History of Colleges and Universities. 4 Hours.

Explores the historical origins of higher education in the United States, from the colonial era to the present. Focuses on an array of topics including liberal arts, graduate education, community colleges, historically black colleges and universities, Hispanic-serving institutions, study abroad, international students, online education, religious-affiliated institutions, and professional higher education associations.

EDU 6218. Money Matters: Financial Management in Higher Education. 4 Hours.

Offers students an opportunity to develop the practical skills and competencies necessary to build and manage budgets, advocate for and allocate both human/financial resources, and effectively articulate how strategic initiatives translate into budget requests. Linking theory to practice, successful students develop core financial management competencies while also being exposed to how colleges/universities approach critical fiduciary responsibilities. Developing both a conceptual and practical understanding of the financial management strategies employed within today's changing landscape of higher education is critical to professional success. .

EDU 6219. Higher Education Law and Policy. 4 Hours.

Offers an overview of the major aspects of the legal and political environments that impact institutions of higher education, ranging from access, affordability, readiness, and completion to gainful employment. Offers students an opportunity to learn multiple approaches for addressing these requirements and understanding and influencing policy development at all levels, both internal and external.

EDU 6221. Enrollment, Retention, Graduation, Success. 4 Hours.

Considers the mission of an institution as inseparably linked to student success. Simply identifying, recruiting, and enrolling students is no longer a measure of institutional or academic success. With demographics changing, institutional finances straining, and student loan debt increasing, it is strategically important, and difficult, to find the right students, support them, retain them, and have them graduate prepared for gainful employment. Taught from a systems thinking perspective, examines the multifold ways to consider cost and academic effectiveness. Emphasizes the use of data for decision making, along with policies, practices, and strategies needed to improve an institution's academic reputation and, ultimately, graduation rates.

EDU 6222. Contemporary Issues Capstone. 4 Hours.

Offers students an opportunity to reflect on their development as scholars, practitioners, and leaders in the field of higher education. Students apply knowledge developed throughout the program to various contemporary issues in higher education. Requires students to demonstrate mastery of content through a significant project and present their final ePortfolios to showcase their work. .

EDU 6223. Change Agency. 4 Hours.

Examines change management theories and strategies across disciplines. Students apply course work to their own unique contexts. Offers students an opportunity to identify a change they wish to make in their own environment and explore strategies they can utilize as individuals, resulting in the articulation and implementation of a plan to create change in their workplace.

EDU 6224. Strategic Leadership in Enrollment Management. 4 Hours.

Examines the multifold strategies in student enrollment including predictive analytics models, branding and marketing, access and affordability, and communication with internal and external constituents. Taught from a systems-thinking perspective.

EDU 6225. Capstone. 4 Hours.

Offers students an opportunity to reflect on concentration-specific work, considering their development as scholars, practitioners, and leaders in the field of education. Requires students to demonstrate mastery of content through practicum or a significant project adapted to the professional requirements of each concentration. After a thorough process of feedback and revision, students are required to present their final ePortfolios in a public forum to showcase their work and demonstrate achievement of program competencies.

EDU 6226. Budget Development. 2 Hours.

Offers students an opportunity to engage in a budget development process by selecting a focus area, identifying and articulating a vision for a new initiative/department, and creating a plan for implementation. Students then design, build, and defend a budget proposal in order to fund their initiative.

EDU 6227. The New Supervisor. 2 Hours.

Explores leadership, group dynamics, change management, and staff motivation within the field of higher education. Assuming a supervisory role over an established staff creates challenges and opportunities. Students draw from their professional contexts and engage in the process of developing a plan of action for assuming leadership in a new environment.

EDU 6228. Supervising Through Change. 2 Hours.

Explores topics such as the role of the supervisor during change, change management theories, communication strategies, leadership, and management techniques in the field of higher education. Leading a team through a change in organizational structure, philosophy, or shift in duties creates unique challenges for supervisors. Offers students an opportunity to navigate the challenge of motivating their staff through an identified change by creating an action plan.

EDU 6229. Challenges in Supervision. 2 Hours.

Explores topics around motivating difficult employees, communication techniques, management techniques, action plans, and power dynamics in the field of higher education. Offers students an opportunity to navigate the challenge of working with an underperforming employee.

EDU 6230. Program Evaluation and Assessment. 4 Hours.

Offers students an opportunity to learn how to establish goals based on measurable outcomes, how to set benchmarks for performance measurement, and how to demonstrate the impact of a program on an organization's bottom line. Program evaluation and assessment is critical to quality assurance and continuous improvement. Mechanisms that demonstrate value added are also important to organizations that sponsor training and development efforts. Examines issues related to accreditation and other academic program reviews. This is a capstone course that offers students an opportunity to design and conduct an approved research project.

EDU 6231. Crisis Management. 2 Hours.

Offers students an opportunity to identify a potential crisis relevant to their workplace or engage in a simulated crisis experience. Crisis can occur in any job function in higher education administration. Students develop and implement a tabletop exercise to stress-test their crisis management plan.

EDU 6232. Midlevel Strategic Planning. 2 Hours.

Offers students an opportunity to develop departmental strategic plans. Includes goals, objectives, forms of assessments, and development of a multipronged approach toward achieving departmental goals.

EDU 6233. Survey Design. 2 Hours.

Reviews how to build a survey that assesses the intended outcome efficiently, effectively, and accurately. Topics include logic, branching, customization, and writing better survey questions. Designing a survey is a basic requirement for assessing the effectiveness of programs and initiatives. Poorly constructed surveys can yield misleading results. Offers students an opportunity to utilize survey tools. .

EDU 6234. Program Evaluation, Assessment, and Accreditation in Higher Education. 4 Hours.

Examines the purpose and goals of program evaluation. Offers students an opportunity to explore the different methodologies of program evaluation and the application of results for continuous improvement at their workplace. Reviews various assessment tools, such as NSSE surveys and campus climate surveys. Also explores the role and purpose of accreditation associations and the impact on colleges and universities.

EDU 6236. Data Decision Making in Higher Education. 4 Hours.

Introduces students to descriptive data analysis and data visualization techniques. Examines ethical considerations, communication around data, and effective uses of data through an equity lens. Addresses questions such as how data should inform decision making, what story data tells and how, and what data reflects and omits.

EDU 6300. Introduction to Language and Linguistics. 4 Hours.

Explores the foundations of language and linguistics. Discusses theories of the origins of language and compares reading and writing systems of English and other languages. Offers students an opportunity to learn phonology (how sounds are produced), how English works in patterns (linguistics and phonetics), how meaning is conveyed (semantics), and how languages are used (pragmatics). Seeks to provide a foundation for courses related to teaching English as a second language.

EDU 6302. Teaching, Learning, and Assessment: How English Is Learned and Used. 4 Hours.

Focuses on how languages are learned using technology and assessed with and without technology. Explores theories and methods for teaching grammar, listening, speaking, composition, reading, pronunciation, vocabulary, and integrated skills. Offers students an opportunity to develop an informed, explicit understanding of second-language learning and assessment through reading, theory, and practice.

EDU 6310. Literacy Development and the Academic Domains. 4 Hours.

Offers students an opportunity to learn how to adapt their instruction to the language needs of the students in their classes. Reading, writing, speaking, and listening are the keys to academic success for students for whom English is not the first language. It is critical to understand the research about early literacy development, vocabulary development, process writing, peer editing, comprehension and metacognition, content reading, and literacy assessment. Students read the research, discuss the theory behind the research findings, and have an opportunity to learn how to apply those findings to the unique content and skill challenges they will face as classroom teachers.

EDU 6312. TESOL Practicum and Seminar. 5 Hours.

Focuses on learning how to plan lessons, design activities, and assess English-language learners. Offers students an opportunity to become familiar with techniques for promoting interaction, providing feedback, utilizing textbooks and other materials, developing one's own materials, dealing with mixed-ability-level groups, and incorporating strategy training in lessons to better manage a classroom. Demonstrates formal and informal assessment methods for both receptive and productive skills, and explores strategies used for addressing student errors in the classroom. Students observe and report on an ESL class/program and develop a syllabus for an ESL class of their choosing. Provides a field-based assessment of teaching performance. .

EDU 6319. How People Learn. 4 Hours.

Introduces the research and science of learning, integrating theory with case studies about learning principles and high-impact practices. Learning takes place in all stages of life: teenagers who go directly from high school to college, adults who "stop out" and return to school after years of work or family commitments, and even retirees who pursue learning made possible by expanded leisure time. Some education takes place formally within higher education; other opportunities are informal, sponsored by organizations such as museums and libraries or available for free online. Focuses on learning in online and mobile environments.

EDU 6321. Models for Learning Design. 4 Hours.

Offers an orientation to learning design as art and science. Design has the capacity to support or detract from learning and, therefore, the design process itself needs to be intentional and evidence driven. Participants experiment with putting learning principles and high-impact practices into action within online and mobile learning scenarios. Investigates the many settings in which learning design takes place and considers the interplay between context and design methodology.

EDU 6323. Technology as a Medium for Learning. 4 Hours.

Investigates the role that technology can play in transforming the learning experience. Emphasizes interactive approaches that increase learner access, persistence, and engagement and designs that yield evidence of learning. In addition to investigating research relevant to media design, such as visual-auditory processing, cognitive load, and universal design, the course introduces protocols for aligning technology strategy with learning goals and learner needs. Offers students an opportunity to experiment with a suite of emerging technologies and then to develop an online, media-rich learning environment.

EDU 6324. Competencies, Assessment, and Learning Analytics. 4 Hours.

Analyzes the intended outcomes of education, how we will know if we've made a difference, and what we can do to improve learning along the way. These hard but important questions are at the heart of learning design. The act of assessment verifies that learning has taken place, but it also provides opportunities for refining plans and improving student learning. Some strategies are easily implemented, while others require advanced expertise. Covers recent advances in technology that make it possible to gather a wealth of data on how people interact within the environments in which they learn, recording each click of the mouse. In education, the use of this data to improve learning is referred to as "learning analytics."

EDU 6328. Policy and Leadership. 4 Hours.

Designed to engage students in systems thinking, specifically about how education policies at the federal and state levels impact teaching and learning in elementary and secondary schools. Studies the fundamentals of how policy is created and implemented and analyzes the ways in which competing visions of the purpose of public education frame policy debates and outcomes. Focuses on a variety of contemporary policy initiatives. Offers students an opportunity to evaluate the effectiveness of specific policies that relate closely to their professional roles and to seek to identify and practice the skills educators need in order to assume leadership roles in directly and indirectly influencing policy.

EDU 6329. Connecting Theory and Practice. 4 Hours.

Involves participants in ePortfolio-based reflection regarding professional goals, progress toward program- and concentration-level competencies, and opportunities for connecting theory and practice. Investigates the "integrative knowledge" approach to evidence-based learning, reflection, and professional identity development. With input and feedback from peers, faculty, and the student's professional environment, participants then have an opportunity to develop a plan for experiential learning. The plan describes a three-to-five-month workplace-based, scholar-practitioner experience that is responsive to the needs of the employer, yet also steeped in the contemporary issues, science, and theory of learning design.

EDU 6330. Digital Media Literacy. 4 Hours.

Addresses how K–12 educators learn and use digital media literacy to prepare students for the world of tomorrow. Introduces students to innovative teaching and assessment practices as well as theoretical and philosophical orientations around participatory culture and literacies. Examines the interrelationships between cultural competencies, traditional literacy, research skills, technological skills, and critical thinking skills. Explores the role of ethics, authentic assessments of student learning, and differentiation of instruction in K–12 contexts. Requires graduate students to demonstrate advanced levels of study, application, and research.

EDU 6331. E-Learning Design as a Collaborative Profession. 4 Hours.

Explores the process of working with others to identify strategic directions about an institution's vision for the future, investment of resources, and distinctiveness; to benefit from multiple perspectives and sets of expertise, such as educators, technologists, and institutional researchers; and to respond constructively to conflicting visions and interests. Online and mobile learning is a complex venture. At the program level, key players collaborate on the development of curricula that often need to be vetted at many levels of the institution. E-learning designers often play a critical role in the project management of program and course development. Offers students an opportunity to consider their individual strengths and growth areas as collaborators.

EDU 6332. Open Learning. 4 Hours.

Investigates the history, philosophy, and theoretical perspectives of open learning. While face-to-face classrooms have physical limits on how many people can attend, millions of people can access the same materials at the same time using online and mobile environments. Early innovators on the Web proclaimed that "information wants to be free." This perspective is the heart and soul of open learning, whose mission often includes global and affordable access to education. Analyzes whether an open approach is appropriate for the learning scenario, the strategy for sustainability, if the learning experience is equally viable across cultural and economic demographics. Takes a case-study approach that investigates and critically analyzes open learning exemplars. Expects students to design and develop an open learning experience.

EDU 6333. Social Media and Beyond. 4 Hours.

Explores pedagogically sound practices for using social media to improve learning. Learning is enhanced when course participants have an opportunity to forge communities of interest, leveraging collaborative relationships to expand and deepen inquiry. When deftly designed and implemented, social media can increase the engagement of learners and the impact of an experience. Offers participants an opportunity to experiment with a range of social media applications.

EDU 6340. Learning Analytics Concepts and Theories. 4 Hours.

Offers students an opportunity to learn about diverse perspectives in the field of learning analytics—including learning analytics assumptions, theories, epistemologies, and debates—in order to understand this emerging field. Explores distinctions among educational data mining, learning analytics, and big data, as well as their relationships to data analytics. Discusses key ethical, practical, and cultural challenges to the effective and appropriate use of learning analytics. Expects students to demonstrate their understanding of learning analytics concepts and theories through the development of a learning analytics philosophy statement.

EDU 6341. Introduction to Data Mining in Education. 4 Hours.

Offers an overview of educational data mining, data preparation, and the fundamentals of using data mining software. Using the Cross-Industry Standard Process for Data Mining (CRISP-DM) methodology, illustrates the principles and practice of data mining. The course structure follows the stages of a typical data mining project, from reading data, to data exploration, data transformation, modeling, and effective interpretation of results. Offers training in the basics of how to read, explore, and manipulate data with data mining software and then create and use successful models. Expects students to demonstrate their educational data mining skills through a hands-on final project.

EDU 6343. Predictive Modeling for Learning Analytics. 4 Hours.

Offers students an opportunity to learn how to develop models to predict categorical and continuous outcomes, using such techniques as neural networks, decision trees, logistic regression, support vector machines, and Bayesian network models. Reviews expert options for each modeling node in detail and advises when and how to use each model. A hands-on final project offers students experience implementing predictive models.

EDU 6344. Data Visualization for Learning Analytics. 4 Hours.

Studies how to synthesize the technical components of data analysis into reports, presentations, and visual dashboards that are meaningful for the intended audience and deliver those components in a coherent, convincing format. In addition to gathering and interpreting data, today's educational environment requires the ability to communicate the results of data analysis to a variety of audiences. Expects students to produce a sample research report as a culminating project.

EDU 6345. Text Mining for Learning Analytics. 4 Hours.

Offers students an opportunity to learn practical techniques for mining unstructured text data (such as that found in learning management system discussion boards, social media, student assignments, survey data, etc.) for the purpose of creating predictive models or reports based in part on text data. A hands-on final project offers students experience implementing text mining techniques.

EDU 6425. Special Education: Role of Special Educators in an Inclusive School. 4 Hours.

Designed to enable teachers to plan for the broad and varied range of student learning and behavior and build a foundation for inclusive schools. Offers students an opportunity to understand the policies and regulations in special education; the role of the special educator in writing and implementing individual education plans (IEPs); the responsibility of special educators to create partnerships with families; and the role of the special educator in working within the school on curriculum across disciplines, service delivery for students with IEPs, and co-teaching models. Explores high- and low-tech assistive technology options and its integration into practice and the facilitation of principles of universal design. Using a case-study approach offers students an opportunity to analyze and problem-solve scenarios derived from field experience.

EDU 6426. Developmental Language, Literacy, and Writing: Assessment and Instruction. 4 Hours.

Introduces fundamental theoretical instructional principles of developing oral and written language, reading, writing, and language arts skills. Offers students an opportunity to learn about materials, instructional strategies, and classroom-based assessment for literacy development and instruction and empowering both elementary and secondary readers. Links a focus on early literacy acquisition with clinical assessment and questions regarding English-language learners and students with mild-to-moderate learning disabilities and variations.

EDU 6429. Variations in Child and Adolescent Development. 4 Hours.

Reviews the biological, neuropsychological, psychosocial, cognitive, behavioral, and ecological theories of development. Examines variations and progress in the developmental domains and the intersection among these domains in development and learning in terms of disability and language differences within these theoretical perspectives. The impact of culture on development is infused throughout. Introduces assessments and interventions in development and learning.

EDU 6437. Assessment in Education. 4 Hours.

Examines principles and practices in assessment for learning and assessment of learning. Assessment and evaluation take different forms depending on the setting, from preschool to graduate school and beyond, each presenting unique opportunities and challenges. Regardless of context, effective assessment serves more than one purpose: as a strategy for improving learning and as a means for verifying that learning has taken place. This course offers participants an opportunity to consider the assessment strategies that are most relevant to their specific educational contexts.

EDU 6438. Teachers as Curriculum Leaders. 4 Hours.

Explores how to translate curriculum development theory and vision into advocacy and action. Offers students an opportunity to develop a perspective and skills that allow them to be effective teacher-leaders in modifying curriculum across content areas, including math, science, history, and English-language arts. Seeks to prepare students to lead initiatives and projects, including those at the classroom, school, and district level. Examines state curriculum frameworks and other standards alignment and evaluation.

EDU 6447. The Demographics of Higher Education. 4 Hours.

Provides an up-to-the-minute analysis of who accesses postsecondary education in any of its forms, from certificate to technical to community college to the various types of four-year and graduate-level institutions. Examining changing demographics, the course evaluates societal, cultural, and vocational development needs of students from the 18- to 22-year-old traditional student to adults completing college or pursuing professional degrees. Addresses issues of access, readiness, affordability, persistence, and employment upon completion of the degree, with an eye toward designing programs and interventions that contribute to student success.

EDU 6450. The Globalization of Education. 4 Hours.

Emphasizes a global view of political structures, educational systems, workforce development, and issues of interest to the student and specific to the culture and region studied. Offers students an opportunity to deepen their global knowledge and understanding through intensive research by comparing and investigating systems and ideals, examining alternative solutions, and engaging in critical dialogue and debate. Students are expected to prepare and present a research paper on their work.

EDU 6465. Critical and Creative Thinking. 4 Hours.

Explores critical and creative thinking, particularly the ways in which the two types of thinking operate together. Focuses on K–12 classrooms and how teachers can bring critical and creative thinking to the center of their curriculum and instruction. Approaches critical and creative thinking as skills that can improve through practice but remains mindful of the relationship between thinking skills and specific academic content. Offers participants an opportunity to examine theories and research involving critical thinking and creativity, engage in activities designed to help them become more familiar with their own ways of thinking, and design strategies for teaching critical thinking and creativity in their own classrooms.

EDU 6516. Sheltered English Instruction and Assessment. 4 Hours.

Designed for students that are already familiar with the SIOP (Sheltered Instruction Observation Protocol) Model, the widely implemented research-based foundation for supporting the English-language learners in many current classrooms. With the switch to the rigor of Common Core and the focus on close reading and complex texts, this course seeks to deepen the practice of teachers to effectively plan and deliver lessons that meet this demand. Exposes students to even more strategies beyond the SIOP that are necessary to enable English-language learners to be successful with the Common Core State Standards.

EDU 6517. Foundations of Teaching English as a Second Language: Research and Practice. 4 Hours.

Reviews the basics of language acquisition theory and strategies for incorporating academic vocabulary into content instruction and assessment of language proficiency. Joins theory to practice by introducing students to current instructional research and practice and includes fieldwork. Offers participants an opportunity to begin to learn how to translate theory into practical strategies for teaching content in culturally sensitive ways using the Sheltered Instruction Observation Protocol (SIOP), World-Class Instructional Design and Assessment (WIDA) standards, and the Common Core. Every educator shares the responsibility for ensuring that students who are in the process of learning English have every opportunity to increase their understanding of the content. This requires understanding the cultural context of each student's background and the level of their progress in English-language acquisition.

EDU 6520. Learning and the Brain: Translating Research into Practice. 4 Hours.

Introduces current, cutting-edge brain-related research and the implications for classroom practice. Draws upon research from neuroscience, psychology, and education to investigate the following topics as they relate to the brain and learning: anatomy, research-based strategies that are effective for students with learning disabilities, current research in the underlying causes of learning disabilities, learning to read, influencing behavior, and future areas of exploration.

EDU 6528. Adaptive Learning/Behavior Management Strategies: Consultation and Collaboration. 4 Hours.

Seeks to extend participants' competence in theory, research, and practice pertaining to creating a sense of classroom community, family engagement, and school culture. Examines behavior management approaches and offers participants an opportunity to develop practical interventions and skills for preventing, intervening, and remediating behavior problems. Participants also have an opportunity to apply inclusive principles to the classroom, examine student issues and learning needs, and analyze delivery models to consider how to impact participants' teaching, classroom, and school.

EDU 6534. Bilingualism, Second Language, and Literacy Development. 4 Hours.

Introduces second-language acquisition (SLA) and bilingualism. Studies how learners create a new language system, frequently with only limited exposure. Covers the debates in the field whose main claim is that second-language acquisition is dynamic and nonlinear. Addresses how native language facilitates or impedes SLA, the universal processes affecting SLA, the challenges advanced second-language learners encounter in higher education, and the question of identity transformation. Emphasizes the components of language structure and their relevance to language learning and literacy; issues in culture, language socialization, and cognitive processes in language acquisition; variability of language learners; and language learners in academic context. Some of the major disciplines that contribute to SLA include theoretical linguistics, psychology, anthropology, conversation analysis, and sociology.

EDU 6558. Issues in Education. 1-4 Hours.

Offers students an opportunity to explore in-depth a current educational issue, long-standing unresolved educational problem, and/or ways of considering innovation and change in education. The topic alternates each time the course is offered, and students are allowed to enroll each time the focus of the course changes. May be repeated up to 15 times for up to 16 total credits.

EDU 6569. Differentiated Instruction and Assessment in Mathematics. 4 Hours.

Focuses on the development of individualized intervention programs for children and youth in need of special education. Offers students an opportunity to translate results of norm-referenced diagnostic assessments and curriculum-based or criterion-referenced assessments into goals for intervention and effective instructional strategies. Explores the use of data to differentiate mathematics and other instruction. Offers students an opportunity to learn the limitations of assessments and to develop informal classroom-based assessments that reflect student learning and drive instruction.

EDU 6866. Teaching Practicum and Seminar. 1-8 Hours.

Includes at least 300 hours of supervised student teaching in a public school system and reflection seminar. Provides a field-based assessment of teaching performance for students in one of the MAT programs. Requires prior successful completion of all Commonwealth of Massachusetts licensure prerequisites. May be repeated for up to 8 total credits.

EDU 6874. Practicum, Portfolio, and Panel Review. 4 Hours.

Contains both a portfolio requirement and a panel review in addition to a supervised practicum. The portfolio that is submitted includes work products demonstrating the competencies specified in the Professional Standards for Teachers. The review panel is composed of School of Education faculty members, a partner-school special educator/administrator, and community members. Requires students to present a video and/or portfolio in which they demonstrate competencies. .

EDU 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

EDU 6980. Interdisciplinary Capstone. 2 Hours.

Offers students an opportunity to act as reflective change agents as they apply the knowledge and skills gained from their individualized programs of study to the creation of a final project, an action research proposal. The proposal, presented to faculty and peers, identifies a workplace problem or need and includes an implementation plan to address it. Students also have an opportunity to reflect on their learning journey and to refine their original Professional Learning Plan (PLP) with a five-year focus.

EDU 7202. Transforming Human Systems. 3 Hours.

Focuses on the many challenges presented by today's dynamic environment and examines change processes as they relate to various organizational settings. Emphasizes the usefulness of theory and research, in addition to management and leadership practice techniques, that facilitate effective change and transformation efforts. Underscores the planning process as it relates to institutional change and transformation. Offers students an opportunity to analyze both empirical research and case studies and to use theoretical research to examine real-world examples of change and transformation.

EDU 7204. Global and Historical Perspectives on Higher Education. 3 Hours.

Provides a historical foundation for understanding how current trends in higher education are informed by ideas and practices from the past. Compares seminal theories of teaching and learning, benchmarks in the evolution of higher education, and changing notions about the purposes of higher education cross-culturally over time. Offers students an opportunity to gain a more sophisticated perspective on today's changing landscape in higher education across the world.

EDU 7207. Introduction to Action Research and Social Change. 3 Hours.

Examines professional doctoral studies, the construct of scholar-practitioner, and the role of action research in creating change for social justice. Offers students an opportunity to define problems of practice and explore the basic components of action research.

EDU 7209. Introduction to Doctoral Studies. 3 Hours.

Seeks to provide a foundation for further study in the Northeastern University Doctor of Education program. Examines doctoral studies, resources, philosophical issues, and basics of research. Offers students an opportunity to integrate theoretical and scholarly knowledge in the development of a researchable problem of practice.

EDU 7210. Leadership Theory and Research. 3 Hours.

Examines seminal works, contemporary theories and models, and emerging perspectives of educational leadership. Exposes students to the ways in which educational leadership has been conceptualized, explores how it is currently defined and analyzed, and discusses how it will be shaped in the future. Adopts a cross-disciplinary and integrative view of the leadership phenomenon that highlights how different disciplines inform leadership study and illustrates various research methodologies used for understanding and assessing the concept of leadership. Covers a range of leadership processes (e.g., individual, dyadic, group, organizational) along with theoretical perspectives (e.g., trait, behavioral, contingency, change and transformation).

EDU 7213. Education Entrepreneurship. 3 Hours.

Examines how entrepreneurial activity can make a significant impact on the lives of others and considers how political, social, and community conditions can either support or hinder such activity. Uses several contemporary case studies to examine how individuals and groups have pursued entrepreneurial activity. Through scenario planning students analyze the critical elements that lead to successful entrepreneurial activity. At the end of the course, offers students an opportunity to design their own entrepreneurial endeavor grounded in the impact they would like to make for others and their communities. Educators at all levels need to be innovators, capable of creating, facilitating, and supporting entrepreneurial activity that serves others and their communities.

EDU 7214. Changing Conceptions of Learning and Human Development: Research and Practice. 3 Hours.

Examines how interdisciplinary fields in the social sciences and the humanities provide frameworks for thinking about changing conceptions of learning and human development at the levels of the individual, the individual in relationship with others, and the individual in varied social contexts. Close examination of primary source readings offers students an opportunity to investigate the ways these ideas have influenced educational research and practice. Requires students to deeply reflect about how conceptions of learning and human development matter when designing and conducting their own doctoral research.

EDU 7216. Social Justice and Educational Equity. 3 Hours.

Explores how conceptions of justice and oppression have evolved in the United States. Offers students an opportunity to examine seminal texts, analyze contemporary educational research, and explore and analyze how social justice issues inform and contribute to problems of practice in contemporary educational contexts. Instructors employ a variety of pedagogical strategies to facilitate independent and collaborative learning.

EDU 7217. Educational Systems: The Dynamics between Policy, Values, and Practice. 3 Hours.

Offers students an opportunity to analyze education systems—macro to micro—using a wide array of resources and learning experiences. Public school systems have been shaped by numerous policies and legislated expectations as well as by political and social arguments, values, and beliefs. Many of these forces greatly affect the structures, organization, practices, and cultures of districts, schools, and classrooms today.

EDU 7218. Leadership for Social Justice. 3 Hours.

Examines how knowledge is produced in the context of historical and contemporary understandings of power. Focuses on change agency through ongoing self-examination, context analysis, and development of an action plan.

EDU 7219. Collaborative Leadership. 3 Hours.

Focuses on the collaborative nature of leadership and the skills necessary to enact change. Considers the importance of teamwork in the collaboration process along with an understanding of what makes teams effective from both relational and task perspectives. Students examine their own role as a change agent and explore opportunities for social change from diverse and global perspectives. In combination with other foundation and research courses, offers students an opportunity to develop and execute action research plans.

EDU 7225. Introduction to Research Design. 3 Hours.

Studies the theory and philosophy behind qualitative, quantitative, and mixed-methods approaches to action research. Offers learners an opportunity to gain skills in collecting data, creating research questions, and exploring ethical considerations of conducting research. Learners create a plan for collecting baseline data for the dissertation in practice. This is the first of four research courses in the Doctor of Education Program.

EDU 7226. Intermediate Research Design. 3 Hours.

Offers learners an opportunity to collect and analyze baseline data around their action research topic. Learners leave the class with a draft of a plan for implementing an action step and collecting data for the dissertation in practice. This is the second of four research courses in the Doctor of Education Program.

EDU 7227. The Power of Experiential Learning. 3 Hours.

Examines the theory and employment of personal, group, and organization-based experiential learning to effect change and innovation. By employing experiential learning we seek to transform our thinking, understanding, and actions of how we can design, support, and use experiential learning in our contexts to engender individual, educational, and organizational development, improvement, and transformation.

EDU 7228. Bringing Experiential Learning, Assessment, and Reflection to Life. 3 Hours.

Offers students an opportunity to design, develop, and pursue organizational experiential learning activities, reflection, and assessment to explore understanding the impact and influence of experiential learning. Students design and implement the oversight of an experiential learning initiative and assess outcomes.

EDU 7229. The Experiential Learning Leader. 3 Hours.

Focuses on the role of the leader in the design and use of experiential learning to effect improvement and change. The experiential learning leader engages their colleagues and community in experiential learning design, actions, reflection, and assessment, empowering others and their organization in that process. Explores and develops employing experiential learning tools—the skills, mindset, and competencies to lead through experiential learning.

EDU 7230. Current and Emerging Practice in STEM Education. 3 Hours.

Examines standards-based curricula in current use and under development in science, technology, engineering, and mathematics (STEM) education in grades K–12. Focuses on the capacity of these curricula to promote scientific literacy and facilitate conceptual understanding of scientific principles through guided inquiry and other modes of instruction. Explores curricula that develop and apply mathematical skills to solving significant scientific problems. Analyzes the fidelity of implementing these standards and their impact on student learning as measured by national and international tests, including TIMSS and PISA.

EDU 7234. Thinking and Acting Entrepreneurially. 3 Hours.

Considers theory, research, and case studies to critically analyze entrepreneurial thinking, behaviors, and pursuits. Explores insights as to how entrepreneurial thinking and activity can lead to the transformation of agency and organizational capacity. Offers students an opportunity to understand how the entrepreneurial mindset can lead to the transformation of one's actions and an organization's structures, practices, and use of resources to effect desired outcomes.

EDU 7235. Leading Entrepreneurial Practices in Organizations. 3 Hours.

Examines theory and case studies of entrepreneurial organizations and the leadership behaviors supporting entrepreneurial activity in organizations, incorporating students' own thinking and actions. Explores a variety of theories of entrepreneurial activity across organizations and social contexts, as well as case studies of entrepreneurial activity and the role of leadership in organizations and communities.

EDU 7242. Situated Leadership. 3 Hours.

Focuses on student reflections on the challenges and opportunities they face as educational leaders and change agents in contemporary educational settings. Is theory driven. Offers students an opportunity to investigate various theoretical frameworks and apply them to their various problems of practice; to investigate, gather, and synthesize empirical research articles that pertain to their particular areas of interest; to write cogent literature reviews detailing their analysis; and to present and debate their ideas with classmates.

EDU 7244. Curriculum Theory and Practice Over Time: Implications for Educational Leadership. 3 Hours.

Explores the theoretical and historical dimensions of curriculum, teaching, and learning in varied educational settings. Offers students an opportunity to learn about touchstone principles that have shaped the thinking and implementation of subject-based curricula over time. Uses historical and contemporary case studies to examine how educational leadership is intimately connected to the process of curriculum development, teaching, and learning.

EDU 7245. Urban Education. 3 Hours.

Focuses on the historical and contemporary challenges and possibilities that urban public schools face. Encourages students to consider the urban school from desegregation post–*Brown vs. the Board of Education* through current resegregation, high-stakes testing, and education reform. Through analysis and critical thinking, offers students an opportunity to create their own research-based plans to address a critical issue in urban schools.

EDU 7250. Organizational Systems and Institutional Governance. 3 Hours.

Examines the issues related to shared governance. Focuses on managing and leading in an environment of shared governance. Institutions of higher education are unlike any other kind of institutions in either the public or private sector. The difference is largely due to the concept and use of shared governance. Other topics include variations of shared governance and organizational structures.

EDU 7251. Student Engagement in Higher Education. 3 Hours.

Examines influential student development theories and theorists. The higher education sector in the United States and around the world is being transformed by competitive forces that require institutions to be market-driven. Analyzes the implications of work on enrollment management and students in a market-driven environment.

EDU 7253. The Legal Environment of Higher Education. 3 Hours.

Examines the major laws that impact the decision making of higher education leaders and emphasizes strategies for navigating the legal environment and managing potential legal threats. Institutions of higher education operate in a complex legal environment that includes laws related to financial aid, admissions, licensure, and privacy.

EDU 7254. Postsecondary and Institutional Public Policy. 3 Hours.

Examines the political contexts within which institutions of higher education operate, including the influences of various interest groups—faculty, students, parents, community groups, alumni, trustees, and central administrators. Explores the additional factors affecting public institutions, including state and national education policy resource allocation priorities. Emphasizes development of the skills and understandings necessary for education leaders to navigate and manipulate a range of political environments.

EDU 7256. Financial Decision Making in Higher Education. 3 Hours.

Explores financial aspects of postsecondary educational institutions with particular emphasis on the use of financial information for decision making. Specific topics include financial analysis, budget creation, and budget oversight. Examines both cost-center and RCM models. Emphasizes using financial data for decisions related to resource allocation, forecasting, and other planning and control activities in higher education.

EDU 7257. The Urban University in the United States. 3 Hours.

Explores the development and special characteristics of the urban university in the United States. Includes an introductory session focused on the meaning of the term “urban university” and the societal importance of this type of institution, a sequence of historically oriented classes that explore the emergence and evolution of different types of urban universities from the late-nineteenth century to the present, a sequence of topically oriented classes that focus on various aspects of urban universities in terms of both their internal characteristics and their relationships with their surrounding communities, and a view of selected urban universities in the United States.

EDU 7258. Strategic Management in Higher Education. 3 Hours.

Examines strategic management from multiple conceptual and intellectual traditions. Focuses on the latest research and situates strategic management within the context of higher education.

EDU 7260. Comparative International/Global Higher Education. 3 Hours.

Examines the many educational systems that exist around the world, along with worldwide emerging trends in education. An understanding of these global models can better inform policy decisions, institutional strategies, and pedagogy at the micro- and macrolevels. Emphasizes topics of governance, credentialing, assessment, portability, funding, curriculum, and instruction. Examines current and emerging trends resulting from changing demographic and economic shifts, as well as varied reform initiatives.

EDU 7261. International Student Markets. 3 Hours.

Examines the characteristics and drivers that influence the needs and interests of various student markets, as well as current strategies being employed domestically and internationally to recruit and retain international students. International students have become a major factor in education markets that include specialized preparatory schools to major research universities. Many schools have relied on international students, who generally pay full tuition, to meet tuition revenue targets. As the world economy continues to globalize, and the importance of knowledge-driven industries expands, the importance of understanding and competing in global education markets continues to increase.

EDU 7264. Educating Global Students: Issues and Practices. 3 Hours.

Examines higher education issues of quality, assessment, outcomes, faculty development, use of adjunct faculty, etc., which are intensified in transnational delivery. Transnational higher education (i.e., international education), typically defined as the mobility of higher education students and programs across countries, is not only a growing educative approach broadening world views and increasing access but is also seen as entrance to new student markets. The growth of transnational higher education brings opportunities and presents challenges.

EDU 7266. Contemporary Issues in Community Colleges. 3 Hours.

Examines contemporary issues facing community college administration, including promoting equity, open access, diversity and affirmative action, transfer policies, workforce development, and developmental education.

EDU 7269. Leadership in Higher Education: The College Presidency. 3 Hours.

Focuses on the special characteristics of the presidency in four-year colleges and universities. Structured around the three basic roles of the president—leader, manager, policymaker—uses case studies to illustrate the challenges of each. Considers views of the presidency by scholars and practitioner-observers and includes the experience of the presidency as described in the memoirs of former presidents. The premise of the course is that the presidency is a uniquely complex position, indispensable to the effective functioning of colleges and universities and subject to many different approaches depending on institutional needs and individual characteristics. Stresses the idea of the scholar-practitioner as a central element of effectiveness in each of the three critical roles.

EDU 7272. Organizational Culture and Change. 3 Hours.

Examines organizational culture models and change processes through the lenses of seminal theory and current research. Focuses on how organizational culture develops and evolves and discusses the relationship of organizational culture to leadership and organizational effectiveness. Students engage in an experiential field project that simultaneously seeks to build understanding of culture in practice and to enhance doctoral-level research skills. The capability to build effective local organizational cultures that function within larger cultural systems and to create lasting cultural change are key for effective leadership. With a deep understanding of organizational culture, students become empowered to organize systems, symbols, and people in ways that influence planning, policies, and resource allocations in their organizations.

EDU 7273. Professional Leadership and Communication. 3 Hours.

Focuses on both the analysis of organizational communication and the application and practice of communication strategies for leaders at all levels of the organization. Examines organizational communication—the message, what needs to be communicated and why, and how it should be communicated. Considers the messenger who informs and the organizational meaning-maker who articulates values and vision. Offers students an opportunity to practice and show proficiency in several communication areas: leading and participating in meetings, speaking/giving presentations to large and small audiences, responding to questions in press conference conditions, reducing interpersonal conflict and dealing with difficult personalities, creating collaborative engagement, and facilitating negotiation sessions. Reviews principles and techniques in each area. Uses simulated exercises and coaching to improve skill sets.

EDU 7274. Doctoral Seminar in Organizational Leadership and Communication. 3 Hours.

Examines critical and timely issues challenging education leaders. Uses individual consultations with the instructor and critical feedback from their peers to offer students an opportunity to focus their thesis arguments and articulate how their projects contribute to applied research in the field of organizational leadership and communication. May be repeated up to four times.

EDU 7275. Contemporary Leadership Perspectives. 3 Hours.

Reviews contemporary leadership theory and models emphasizing recent conceptualizations, such as relational, distributed, complexity, followership, and global leadership. Using these models as a diagnostic lens, offers students an opportunity to explore and develop real-world answers to the leadership challenges facing their organizations. Emphasizes personal leadership development, which allows students to expand, apply, reflect on, and refine their personal leadership knowledge, skills, and abilities to further how they steward their organizations. Understanding the theory and research underpinning current leadership practice is invaluable knowledge for any organizational leader.

EDU 7276. Communication: Teams, Organizations, and Global Networks. 3 Hours.

Examines the ways we interact, make meaning, and work together—in our teams, within our organizations, and throughout global networks. Teams are the foundational, organizational archetype for bringing groups of people together to get things done. An essential experiential component of the course is the study of teamwork, analyzing the development and functioning of the team along with assessing individual roles and responsibilities. Considers organizations from perspectives such as messaging and meaning making, identity and relationships, and social media/technology. Finally, examines global networks of individuals and/or communities through levels of interconnectivity worldwide and through varying forms of social interaction. .

EDU 7277. Organizational Learning, Innovation, and Systems Thinking. 3 Hours.

Offers students an opportunity to explore foundational concepts of organizational learning and innovation from a systems perspective; to gain comprehension of strands of systems thinking and its grounding for action research; to critically compare organizational learning models for their requisite usefulness in enhancing innovative practices; and to develop diagnostic skills for assessing learning systems of an innovative workplace. Embraces a system perspective of collective learning, grounded in the premise that sustainable innovation is contingent upon an organization's ability to create new knowledge through dynamic social learning processes. An experiential learning design seeks to offer students multiple opportunities to apply scholarly concepts to workplace practices, to include collaborating in a microlearning network designed to enhance knowledge sharing practices, and to conduct a microfield project of an innovative workplace.

EDU 7278. Organization Theory and Design. 3 Hours.

Reviews the organizational design literature, both theory and research, in various settings and focuses on the interaction between the organization and its environment. As we move into a new century, the organizations we work in take on new shapes. The ability to anticipate and create new organizational forms is the mark of a successful leader. Emphasizes organizational theory and the many internal and external factors that cause an organization to fit a particular architecture. Explores classical and modern theories and key organizational design models. Offers students an opportunity to design a forward-thinking organization, creating all components, including vision, mission, strategy, structure, and processes.

EDU 7279. Organizational Consulting. 3 Hours.

Reviews various consulting strategies and organizational assessment models. Effective leadership requires the ability to critically diagnose and provide consultative services to an organization. This key competency helps leaders to continually identify and implement robust organizational systems and processes. Students select an organization and apply theory and models to conduct an organizational diagnosis. Offers students an opportunity to gain a comprehensive understanding of the theories, models, variables, and perspectives used to understand complex organizational processes. Diagnostic components include entry, data collection, interpretation, synthesis, and diagnostic conclusions.

EDU 7280. Fundamentals of Research. 3 Hours.

Offers students an overview of all components of a doctoral thesis. Designed to support students' efforts to hone in on their specific area of research and to write a problem of practice, research questions, and literature review. Offers students feedback on their work from faculty and peers in the course in order to complete a rough draft of the first two chapters of their potential thesis proposal.

EDU 7281. Research Design. 3 Hours.

Focuses on turning a research question into a potential thesis. Emphasizes effective alignment of problem, purpose, question, theory, and method. Offers students an opportunity to examine various qualitative and quantitative research designs and to explore the role of theory in each design. Encourages students to seek to gain a clear understanding of methodology and the different approaches and theories scholars have used to investigate their area of interest. Seeks to guide students through the process of creating a detailed outline that articulates all design components of their theses.

EDU 7282. Quantitative Research. 3 Hours.

Introduces students to a variety of quantitative research designs and the necessary procedures of each design in order for them to conceptualize their doctoral thesis research. Offers students an opportunity to acquire and practice skills in analyzing quantitative data. Students should conclude the course with a conceptual foundation for their doctoral thesis and familiarity with the proposal development process.

EDU 7283. Qualitative Research. 3 Hours.

Introduces students to a variety of methodological approaches in order for them to conceptualize their doctoral thesis research from the perspective of multiple qualitative perspectives. Students conduct a field project with the goal of gaining skills in collecting and analyzing data. Students should conclude the research series with a conceptual foundation for their doctoral thesis and familiarity with the proposal development process.

EDU 7284. Research Regional Seminar: Educational Research Ethics. 3 Hours.

Introduces ideas, legalities, and complex issues that are central to the ethics of educational research, with special emphasis on issues relevant to the Southeast region. Explores unethical research behavior that is obvious and also covers research misconduct involving principles and practices that are less easy to recognize and defend. Learning to become a responsible and successful researcher can be complicated and intellectually challenging. Being a participatory researcher within one's specific region adds another layer of complexity to the researcher's role and responsibility. This course is based on case studies in which there are complex and sophisticated research paradigms. Assesses and explores with a critical lens each case study to reach a higher level of nuanced understanding of the ethics in research.

EDU 7285. Research Regional Seminar: Educational Research in Regional Perspective. 3 Hours.

Designed with a focus on the collective audit of regional needs, enabling the faculty and graduate students to be involved in a broad range of community-oriented research issues in the Southeast region. Focuses on the complex economic, social, political, and educational characteristics of this region, using it as a laboratory that pedagogically links teaching, research, and service. The course is positioned around the theoretical and applied analysis of the Southeast metropolitan areas and their broader regional, national, and global contexts.

EDU 7286. Research Regional Seminar: Educational Research Design in a Postmodern World. 3 Hours.

Examines a problem of practice; the literature review associated with it; and the practice of collecting data, within the context of the Southeast region, as scholar-practitioners in a postmodern society. Explores the understandings in the Southeast region around assumptions and beliefs in education; notions of rationality, modernism, and postmodernism; the validation of value judgments; relations with future generations; multiculturalism and gender justice in democratic societies; and their impact on the review of, formulation of, and conduct of research design.

EDU 7288. Faith, Ethics, and Leadership in Education. 3 Hours.

Examines the nexus between educational leaders' multiple sources of fidelity in decision making. Focuses on the interplay between norms of specific faith-based communities and traditions on the one hand and ethical principles that cut across differences on the other. Focuses on philosophies of education and their relationships to faith-based educational aspirations. Through ethical inquiry and case studies of religious communities, offers students an opportunity to articulate their own approaches to ethical decision making in faith-based organizations and in pluralist, diverse societal contexts.

EDU 7290. Contemporary Models of Sports Leadership. 3 Hours.

Reviews contemporary leadership theory and models as applied to the world of sports. Approaches leadership as a function of social systems, emphasizing recent conceptualizations such as distributed leadership, complexity leadership, and global leadership. Offers students an opportunity to expand, apply, reflect on, and refine their personal leadership knowledge, skills, and abilities to further how they steward their sports organizations.

EDU 7292. Social Justice in Sports. 3 Hours.

Examines issues related to social justice in sports, including the influence of gender, economics, and geography within sports organizations. Studies the global footprint of sport and applies sports leadership principles to discover how sport can have a positive impact on society and various cultures. These include developing personal leadership skills and assumptions that can offer solutions for change. Sport organizations have become more socially responsible within the communities that they serve to help train and educate future leaders through the power of sport. Offers students an opportunity to investigate examples of sport being used as a vehicle for social justice and change worldwide. Studies the use of sport for development and peace.

EDU 7293. Legal and Ethical Issues in Sports Leadership. 3 Hours.

Examines the major laws that impact the decision making of sports leaders. Emphasizes strategies for navigating the legal and ethical environments for managing potential legal threats. Sports institutions are complex legal environments that include laws regarding race and ethnicity as well as other issues of gender equity. Investigates numerous legal cases and issues present in sports both professionally and at the amateur level, including athletic eligibility, drug testing, low student-athlete graduation rates, pay-for play, concussion protocol, and violence in sports. Offers students an opportunity to gain an understanding of the legal responsibilities of sports leaders and how to apply legal theories. Emphasizes researching ethical sports leaders' practices to protect and keep their respective sports organizations within the letter of the law.

EDU 7294. Advanced Research Design. 3 Hours.

Designed to engage students in the first cycle of their action research plan and the data collection and analysis linked to this process. Emphasizes the essential elements of independent and collaborative reflection within action research and the recursive cycle embedded in this work. Concludes with an exploration of approaches and outlets for the presentation of findings, both locally and within scholar-practitioner journals. This is the third of four research courses in the Doctor of Education program.

EDU 7295. Dissertation in Practice Seminar. 3 Hours.

Offers students an opportunity to be guided by their dissertation chair and to engage in peer discussion and critique of their Dissertation in Practice and course work products to develop a detailed plan for completing their Dissertation in Practice. This is the fourth of four research courses in the Doctor of Education program.

EDU 7296. Adult and Workplace Learning. 3 Hours.

Offers a comprehensive overview of major adult learning models and philosophies and addresses application to research and problems of practice in the workplace and beyond. Invites students to explore self-as-learner as a first step for understanding what it means to be a leader of learners. Offers students an opportunity to learn about the basic tenets and major models of adult learning (andragogy), including self-directed, transformational, and experiential learning, as well as foundational philosophies. Additional topics covered include learning transfer, diversity and motivation, technology, instructional design, workplace learning, and reflective practice. Students participate in experiential learning through the observation and review of a program in a real-life setting from the perspective of adult learning scholarship and address ways adult learning theories can frame doctoral research.

EDU 7300. Doctoral Research Seminar. 1-3 Hours.

Offers a special topics course designed to support candidates in the development of their doctoral projects. Through individual consultations with the instructor and critical feedback from their peers, this course offers students an opportunity to advance their Doctoral Project Proposal (DPP) by focusing in-depth on a specific application of practice-based research such as case studies, action research, evaluation studies, or survey studies. May be repeated for up to 6 total credits.

EDU 7962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions.

EDU 7978. Independent Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic.

EDU 7983. Topics. 1-4 Hours.

Covers special topics in education. May be repeated without limit.

EDU 8790. Doctoral Thesis Seminar. 6 Hours.

Supports the doctoral theses that must conform to the guidelines developed by members of the faculty. Final theses must be presented to a review panel prior to graduation. May be repeated once.

EDU 8791. Doctoral Thesis Continuation. 0 Hours.

Offers students an opportunity for continued doctoral thesis work conducted under the supervision of departmental faculty. May be repeated up to three times.

EDU 8792. Doctoral Thesis Continuation. 0 Hours.

Offers students an opportunity for continued doctoral thesis work conducted under the supervision of departmental faculty. May be repeated up to 24 times.

EDU 8796. Thesis Proposal and the Internal Review Board. 0 Hours.

Designed to support the thesis proposal and Internal Review Board (IRB) submission. After submitting their thesis proposals to the IRB, students are expected to continue to edit the first two chapters of their proposals in order to update or expand the literature review with recent contributions that have been made to the different bodies of research that inform their studies. Expects students to have developed a draft of the doctoral thesis proposal, including introductory chapter, literature review, and research design.

EDU 8797. Thesis Data Collection, Initial Analysis, and Management. 0 Hours.

Offers students an opportunity, following approval of the thesis proposal by the Internal Review Board, to begin their research projects, following their clear plans for data collection and early analysis. Expects students to gather data, conduct their initial analyses, and prepare their data for analysis.

EDU 8798. Thesis Data Analysis and Presentation. 0 Hours.

Offers students an opportunity to engage in the data analysis process and construct their presentation strategy for their analyses. Culminates with a completed outline of the fourth thesis chapter approved by the student's thesis advisor and second reader.

EDU 8799. Thesis Findings and Discussion. 12 Hours.

Supports the processes associated with writing the results and discussion chapters of the thesis. Highlights the scholar-practitioner aspect of the program's mission, requiring that students think carefully about the practical implications of their work and how they plan to communicate or disseminate those implications to an authentic audience and engage relevant stakeholders in a relevant application of their findings. Successful completion is determined by a student's defense of the final thesis work that is approved by their thesis committee.

Electrical and Computer Engineering (EECE)

Search EECE Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=EECE>)

EECE 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

EECE 2000. Introduction to Engineering Co-op Education. 1 Hour.

Provides students preparation for the first co-op experience. Focuses on skills that provide a basis for successful co-op engagement including expectations and requirements, an introduction to professional credentials, résumé construction, self-assessment and goal setting, interviewing, professional and co-op ethics, issues of diversity in the workplace community, academic planning and decision making, and an introduction to career portfolios.

EECE 2150. Circuits and Signals: Biomedical Applications. 5 Hours.

Offers an integrated lecture/lab course that covers circuit theory, signal processing, circuit building, and MATLAB programming. Introduces basic device and signal models and circuit laws used in the study of linear circuits. Analyzes resistive and complex impedance networks. Uses the ideal operational amplifier model, focusing on differential amplifiers and active filter circuits. Introduces basic concepts of linearity and time-invariance for both continuous and discrete-time systems and concepts associated with analog/digital conversion. Demonstrates discrete-time linear filter design on acquired signals in the MATLAB environment. Offers students an opportunity to explore circuits and signals in the lab and to use their knowledge of circuits, analog signals, digital signals, and biological signals to build a working analog/digital EKG system.

EECE 2160. Embedded Design: Enabling Robotics. 4 Hours.

Offers an integrated lecture/lab course that covers the basics of the Unix operating system, high-level programming concepts, introductory digital design, wireless networking, and Simulink design. Offers students a hands-on experience developing a remote-controlled robotic arm using an embedded systems platform.

EECE 2210. Electrical Engineering. 4 Hours.

Introduces the basic concepts related to circuits and circuit elements; current, voltage, and power; models for resistors, capacitors, and inductors; and circuit analysis using Kirchhoff's laws. Discusses selected topics that illustrate a variety of applications of electrical engineering, such as AC circuits and electric power, the basics of semiconductor devices with applications to transistor amplifier models, transients in circuits with energy storage, mechanical controls and mechatronics, digital signals, logic circuits, and some basic concepts of computer operations, specifically, number coding, arithmetic operations, and memory circuits.

EECE 2211. Lab for EECE 2210. 1 Hour.

Accompanies EECE 2210. Covers fundamental DC and AC electrical concepts as well as analog and digital electronics.

EECE 2300. Computational Methods for Data Analytics. 4 Hours.

Introduces the programming tools, algorithms, and software tools used in data analytics. Offers hands-on experience working with statistical software/packages and scripting languages and shows students the power of computational tools. Covers concepts of correlation, regression analysis, classification, and decomposition. Includes example data-oriented applications taken from multiple science/engineering disciplines and applies linear algebra and probability to analyze actual data sets. Students not meeting course prerequisites may seek permission of instructor.

EECE 2322. Fundamentals of Digital Design and Computer Organization. 4 Hours.

Covers the design and evaluation of control and data structures for digital systems. Uses hardware description languages to describe and design both behavioral and register-transfer-level architectures and control units. Topics covered include number systems, data representation, a review of combinational and sequential digital logic, finite state machines, arithmetic-logic unit (ALU) design, basic computer architecture, the concepts of memory and memory addressing, digital interfacing, timing, and synchronization. Assignments include designing and simulating digital hardware models using Verilog as well as some assembly language to expose the interface between hardware and software.

EECE 2323. Lab for EECE 2322. 1 Hour.

Offers students an opportunity to design and implement a simple computer system on field-programmable logic using a hardware description language. Covers simulation and testing of designs.

EECE 2412. Fundamentals of Electronics. 4 Hours.

Reviews basic circuit analysis techniques. Briefly introduces operation of the principal semiconductor devices: diodes, field-effect transistors, and bipolar junction transistors. Covers diode circuits in detail; the coverage of transistor circuits focuses mainly on large-signal analysis, DC biasing of amplifiers, and switching behavior. Uses PSpice software to simulate circuits and large-signal models and transient simulations to characterize the behavior of transistors in amplifiers and switching circuits. Digital electronics topics include CMOS logic gates, dynamic power dissipation, gate delay, and fan-out. Amplifier circuits are introduced with the evaluation of voltage transfer characteristics and the fundamentals of small-signal analysis.

EECE 2413. Lab for EECE 2412. 1 Hour.

Covers experiments reinforcing basic electronics topics such as diodes, bipolar junction transistors (BJT) as a switch, BJT amplifiers, and MOSFET circuits for switching and amplification. Practical measurements include use of voltmeters, ammeters, ohm meters, and impedance meters, as well as oscilloscope measurements of frequency, gain, distortion, and upper- and lower-cutoff frequencies of amplifiers.

EECE 2520. Fundamentals of Linear Systems. 4 Hours.

Develops the basic theory of continuous and discrete systems, emphasizing linear time-invariant systems. Discusses the representation of signals and systems in both the time and frequency domain. Topics include linearity, time invariance, causality, stability, convolution, system interconnection, and sinusoidal response. Develops the Fourier and Laplace transforms for the discussion of frequency-domain applications. Analyzes sampling and quantization of continuous waveforms (A/D and D/A conversion), leading to the discussion of discrete-time FIR and IIR systems, recursive analysis, and realization. The Z-transform and the discrete-time Fourier transform are developed and applied to the analysis of discrete-time signals and systems.

EECE 2530. Fundamentals of Electromagnetics. 4 Hours.

Introduces electromagnetics and high-frequency applications. Topics include transmission lines: transmission line model with distributed circuit elements, transmission line equations and solutions, one-dimensional traveling and standing waves, and applications; electromagnetic field theory: Lorentz force equations, Maxwell's equations, Poynting theorem, and application to the transmission line's TEM waves. Also studies uniform plane wave propagation along a coordinate axis and along an arbitrary direction; equivalent transmission lines for TEM, TE, and TM waves; reflection and refraction of uniform plane waves by conducting and dielectric surfaces. Discusses applications to wave guides, resonators, optical fibers, and radiation and elementary antennas. Introduces modern techniques (computational methods) and applications (optics, bioelectromagnetics, and electromagnetic effects in high-speed digital circuits).

EECE 2531. Lab for EECE 2530. 1 Hour.

Accompanies EECE 2530. Supports class material related to transmission lines, wave-guiding structures, plane wave reflection and refraction, and antenna radiation. Includes experiments with microwave transmission line measurements and the determination of the properties of dielectric materials, network analyzer analysis of microwave properties of circuit elements and transmission line electrical length, analysis of effective dielectric constant and loss from microstripline resonator transmission, optical measurement of refraction and reflection leading to determination of Brewster angle and optical constants for transparent and absorbing materials, and measurement of radiation patterns from dipole antennas.

EECE 2540. Fundamentals of Networks. 4 Hours.

Presents an overview of modern communication networks. The concept of a layered network architecture is used as a framework for understanding the principal functions and services required to achieve reliable end-to-end communications. Topics include service interfaces and peer-to-peer protocols, a comparison of the OSI (open system interconnection) reference model to the TCP/IP (Internet) and IEEE LAN (local area network) architectures, network-layer and transport-layer issues, and important emerging technologies such as Bluetooth and ZigBee.

EECE 2560. Fundamentals of Engineering Algorithms. 4 Hours.

Covers the design and implementation of algorithms to solve engineering problems using a high-level programming language. Reviews elementary data structures, such as arrays, stacks, queues, and lists, and introduces more advanced structures, such as trees and graphs and the use of recursion. Covers both the algorithms to manipulate these data structures as well as their use in problem solving. Introduces algorithm complexity analysis and its application to developing efficient algorithms. Emphasizes the importance of software engineering principles.

EECE 2750. Enabling Engineering. 4 Hours.

Offers students an opportunity to develop a proposal for a design project that uses engineering technologies to improve the lives of individuals with cognitive or physical disabilities. Offers student project groups an opportunity to work with end users and caregivers at local nursing homes and special education schools to assess a specific need, research potential solutions, and develop a detailed proposal for a project. Project groups are matched with product design mentors who guide groups through the design process. Lectures cover relevant topics, including surveys of specific physical and cognitive disabilities and applicable engineering technologies. The same project may not be used to satisfy both this course and EECE 4790. May be repeated up to two times.

EECE 2949. Introductory Directed Research in Electrical and Computer Engineering. 4 Hours.

Offers first- and second-year students an opportunity to pursue project and other independent inquiry opportunities under faculty supervision. The course is initiated with a student-developed proposal, including expected learning outcomes and research products, which is approved by a faculty member in the department. Requires permission of instructor.

EECE 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

EECE 3000. Professional Issues in Engineering. 1 Hour.

Provides students with an opportunity to reflect on both academic and co-op experiences in the context of planning for the senior year and beyond. Issues include professional and ethical issues, resolving ethical conflicts, awareness of engineers as professionals in a diverse world, strengthening decision-making skills, career portfolios, and lifelong learning needs, goals, and strategies. Students reflect upon issues of diversity from their experience in the University and in their cooperative education placements. Explores the role of different work and learning styles and diverse personal characteristics on the workplace and the classroom. Professional issues include impact of the cultural context, both in the United States and around the world, on the client, government relations, and the workplace.

EECE 3324. Computer Architecture and Organization. 4 Hours.

Presents a range of topics that include assembly language programming, number systems, data representations, ALU design, arithmetic, the instruction set architecture, and the hardware/software interface. Offers students an opportunity to program using assembly language and to simulate execution. Covers the architecture of modern processors, including datapath/control design, caching, memory management, pipelining, and superscalar. Discusses metrics and benchmarking techniques used for evaluating performance.

EECE 3392. Electronic Materials. 4 Hours.

Provides a basic treatment of electronic materials from atomic, molecular, and application viewpoints. Topics include atomic structure and bonding in materials, structure of materials, and crystal defects. These topics lay a foundation for the introduction of thermal and electronic conduction, which is the underlying physics of electronic devices. Finally, the electronic properties of semiconductors, dielectric, magnetic, superconducting, and optical materials are examined. The latter half deals with an introduction to the state of the art in electronic materials, including semiconductor nanoelectronics, magnetic semiconductors and spintronics, molecular electronics, carbon nanotubes, conducting polymers, diamondlike carbon, and other topics representing recent technological breakthroughs in the area of electronic materials.

EECE 3410. Electronics 2. 4 Hours.

Covers transistors and op-amp circuits. Emphasizes real devices and their performance, analog IC design concepts, and building blocks. Reviews the Laplace transform and introduces its applications to analysis of electronic circuits governed by linear differential equations. Presents and employs equivalent models of passive and active elements in s-domain analysis including response speed, pole/zero plots, and magnitude/phase frequency behavior of important network functions. Introduces feedback and stability, oscillators, A/D and D/A converters and mixed-signal circuits, active filters, sensors and signal-conditioning circuits, and other design topics at the discretion of the instructor. Uses SPICE simulation to support design work. Includes laboratory hardware projects.

EECE 3468. Noise and Stochastic Processes. 4 Hours.

Discusses probability, random variables, random processes, and their application to noise in electrical systems. Begins with the basic theory of discrete and continuous probabilities, then develops the concepts of random variables, random vectors, random sequences, and random processes. Continues with a discussion on the physical origins of noise and models of where it is encountered in electronic devices, signal processing, and communications. Defines the concepts of correlation, covariance, and power density spectra and uses them to analyze linear system operations in continuous time.

EECE 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

EECE 4512. Healthcare Technologies: Sensors, Systems, and Analysis. 4 Hours.

Examines healthcare technologies using both theory and hands-on approaches. Testing, imaging, and data collection are essential tools medical specialists use to treat patients and the primary contribution of engineers to healthcare. Covers the physics and physiology behind the newly defined concept of digital biomarkers; the electronics needed to collect these biomarkers; analysis techniques for processing and interpreting the data; and invasive (swallowable/implantable), on-body (wearable), and contactless systems for data collection. Examines safety issues, ethics, and regulatory hurdles from both an industry and research perspective. In the hands-on labs, offers students an opportunity to follow the steps of creating a startup or conducting new research and assembling a microcontroller-based sensor system for collecting digital biomarkers.

EECE 4520. Software Engineering 1. 4 Hours.

Offers an overview of the discipline of software engineering. Identifies the problems that one should expect when developing large software systems; methods that the software developer can use to deal with each of the problems; tools that the software developer can use; and procedures that can be followed in developing software. Covers the software life cycle (requirements analysis and specification, software design, coding, testing, and maintenance); various models of the software process—structured and agile; the Unified Modeling Language (UML) as applied to the software life cycle, prototyping, and documentation; design patterns; software metrics and estimation; software development environments and tools; and verification and validation. Includes a software development project that covers all the stages of the life cycle.

EECE 4524. VLSI Design. 4 Hours.

Covers a structured digital CMOS design focusing on designing, verifying, and fabricating CMOS VLSI-integrated circuits and modules. Emphasizes several topics essential to the practice of VLSI design as a system design discipline including systematic design methodology, good understanding of CMOS transistor, physical implementation of combinational and sequential logic network, and physical routing and placement issues. Begins design exercises and tutorials with basic inverters and proceeds to the design, verification, and performance of large, complex digital logic networks. Also covers IC design methodologies and performance, scaling of MOS circuits, design and layout of subsystems such as PLA and memory, and system timing. Requires lab session that includes computer exercises using CAD tools to design VLSI layouts and switch-level plus circuit-level simulations to design and analyze the project.

EECE 4525. Lab for EECE 4524. 1 Hour.

Accompanies EECE 4524. Covers topics from the course through various experiments.

EECE 4534. Microprocessor-Based Design. 4 Hours.

Focuses on the hardware and software design for devices that interface with embedded processors. Topics include assembly language; addressing modes; embedded processor organization; bus design; electrical characteristics and buffering; address decoding; asynchronous and synchronous bus protocols; troubleshooting embedded systems; I/O port design and interfacing; parallel and serial ports; communication protocols and synchronization to external devices; hardware and software handshake for serial communication protocols; timers; and exception processing and interrupt handlers such as interrupt generation, interfacing, and auto vectoring.

EECE 4535. Lab for EECE 4534. 1 Hour.

Accompanies EECE 4534. Consists of a comprehensive laboratory performed by a team of students. These laboratory exercises require students to design, construct, and debug hardware and software that runs on an embedded platform. Exercises are centered around a common embedded platform. The final exercise is a project that lets each group integrate hardware and software to realize a complete embedded design.

EECE 4542. Advanced Engineering Algorithms. 4 Hours.

Covers classical and modern algorithms that efficiently solve hard electrical and computer engineering optimization problems. These problems arise in a wide range of disciplines—including computer-aided design, parallel computing, computer architecture, and compiler design—and are usually NP-complete, making it unlikely that optimal solutions can be found in a reasonable amount of time. Covers the fundamentals of algorithm analysis and complexity theory and then surveys a wide range of combinatorial optimization techniques, including exhaustive algorithms, greedy algorithms, integer and linear programming, branch and bound, simulated annealing, and genetic algorithms. Considers the efficient generation of optimal solutions, the development and evaluation of heuristics, and the computation of tight upper and lower bounds.

EECE 4572. Communications Systems. 4 Hours.

Introduces basic concepts of digital communication over additive white Gaussian noise (AWGN) channels. Reviews frequency domain signal analysis through treatment of noiseless analog communication. Reviews foundations of stochastic processes including stationarity, ergodicity, autocorrelation, power spectrum, and filtering. Provides an introduction to lossless and lossy source coding and introduces Huffman and Lempel-Ziv algorithms. Introduces optimal quantization and PCM and DPCM systems. Examines geometric representation of signals and signal space concepts, principles of optimum receiver design for AWGN channels, correlation and matched filter receivers, and probability of error analysis for binary and M-ary signaling through AWGN channels, and performance of ASK, PSK, FSK, and QAM signaling schemes. If time permits, also covers digital PAM transmission through band-limited AWGN channels, zero ISI condition, system design in the presence of channel distortion, and equalization techniques.

EECE 4574. Wireless Communication Circuits. 4 Hours.

Covers the electronics of radio receivers and transmitters. Employs a commercial radio transceiver (MFJ-9340) as a learning tool. Presents basic topics (radio spectrum and its utilization, antennae, and information processing by modulation and demodulation). Studies building block realizations for modulators and demodulators for analog (AM, FM) and digital (ASK, PSK, FSK) radio. Covers common radio receiver architectures. Presents circuit-level designs of radio building blocks (resonators; L-C RF filters; crystals and IF filters; tuned transformers and impedance matching; amplifiers and power amplifiers; RF oscillators; mixers and up/down frequency conversion; signal detectors; and automatic gain control circuits). Includes receiver noise and sensitivity; transmitter range; spurious emissions and IM distortion; antennae and propagation in the atmosphere; wireless standards; multiple-access techniques; and software-defined radio. May include additional topics at instructor's discretion.

EECE 4604. Integrated Circuit Devices. 4 Hours.

Offers a comprehensive introduction to the technology, theory, and applications of the most important electronic devices in today's integrated circuits. Topics include semiconductor electronic properties, Si fabrication technologies, p-n junctions, MOS capacitors, MOSFETS, metal-semiconductor contacts, and bipolar transistors. Emphasizes MOS devices, which are currently the dominant technology in integrated circuits. Introduces recent research trends in novel device concepts. Offers students who may pursue semiconductor process engineering, IC design, biomedical electronics, or research and development of microelectromechanical systems (MEMS) or optoelectronics devices an opportunity to obtain electronic device knowledge.

EECE 4626. Image Processing and Pattern Recognition. 4 Hours.

Provides an introduction to processing and analysis of digital images with the goal of recognition of simple pictorial patterns. Topics include discrete signals and systems in 2-D, digital images and their properties, image digitization, image enhancement, image restoration, image segmentation, feature extraction, object recognition, and pattern classification principles (Bayes rules, class boundaries) and pattern recognition methods.

EECE 4630. Robotics. 4 Hours.

Introduces robotics analysis covering basic theory of kinematics, dynamics, and control of robots. Develops students' design capabilities of microprocessor-based control systems with input from sensory devices and output actuators by having teams of students design and implement a small mobile robot system to complete a specific task, culminating in a competition at the end of the course. Covers actuators, sensors, system modeling, analysis, and motion control of robots.

EECE 4638. Special Topics in Computer Engineering. 4 Hours.

Focuses on advanced topics related to computer engineering technology to be selected by instructor. May be repeated without limit.

EECE 4642. Antennas. 4 Hours.

Introduces the fundamental physical principles for the electromagnetic radiation from antennas and presents the most important mathematical techniques for the analysis of the radiation. Applies these principles and techniques to practical antenna systems. Starts with the fundamental parameters of the antennas. Introduces the vector potentials and the theorems that are needed for the derivation of the radiation integrals from Maxwell's equations. Covers the application of these theories to practical antennas and antenna systems, including linear wire antennas, loop antennas, linear and two-dimensional planar phased arrays, patch antennas, frequency-independent antennas, and aperture and reflector antennas. Presents impedance matching techniques.

EECE 4646. Optics for Engineers. 4 Hours.

Presents the basic optical concepts necessary for an understanding of current and future optical communication, remote sensing, and industrial and biomedical systems. Topics include geometrical optics, polarized light, diffraction, and interference. Studies lasers and other light sources, optical fibers, detectors, CCD cameras, modulators, and other components of optical systems. Presents applications to specific systems such as fiber-optic communication, medical imaging systems, fiber-optic sensors, and laser radar.

EECE 4649. Biomedical Imaging. 4 Hours.

Explores a wide variety of modalities for biomedical imaging in the pathology laboratory and in vivo. After an introductory discussion of tissue properties, waves used in imaging, and contrast mechanisms, the course discusses modalities such as microscopy, endoscopy, x-ray, computed tomography, ultrasound, and MRI. With each modality, instrument parameters, contrast mechanisms, resolution, and depth of penetration are considered. Offers students an opportunity to work in groups to complete a project in which they examine one modality in detail and either generate synthetic data using a computational model or process available image data.

EECE 4688. Detection of Signals in Noise. 4 Hours.

Introduces topics of signal detection, estimation, and related signal processing algorithms. Extraction of signals and useful information from noise is a fundamental problem encountered in engineering disciplines ranging from traditional communications and control to biomedical engineering, security and defense, and reaching into financial analysis. Addresses concepts such as hypothesis testing, Bayesian principles, likelihood functions, sufficient statistics, and minimum mean squared error estimation of signals with known as well as unknown parameters. Lectures are supported by illustrative examples and hands-on exercises, which rely on the use of MATLAB and are grounded in practical problems.

EECE 4694. Numerical Methods and Computer Applications. 4 Hours.

Presents numerical techniques used in solving scientific and engineering problems with the aid of digital computers. Topics include theory of interpolation; the theory of numerical integration and differentiation, numerical solutions of linear as well as nonlinear systems of equations, the theory of least squares; and numerical solution of ordinary and partial differential equations using a programming environment such as MATLAB.

EECE 4790. Electrical and Computer Engineering Capstone 1. 4 Hours.

Requires students to select a project requiring design and implementation of an electrical, electronic, and/or software system, form a team to carry out the project, and submit and present a detailed proposal for the work. Students must specify the materials needed for their project, provide cost analysis, and make arrangements with their capstone adviser to purchase and/or secure donation of equipment. Requires student to perform a feasibility study by extensive simulation or prototype design of subsystems to facilitate the second phase of the capstone design.

EECE 4792. Electrical and Computer Engineering Capstone 2. 4 Hours.

Continues EECE 4790. Requires students to design and implement the project proposed in that earlier course. Expects students to evaluate progress with interim milestone reports and to present the final design project with written and oral reports.

EECE 4949. Research Laboratory Project. 4 Hours.

Offers an opportunity to conduct research in a laboratory setting under faculty supervision. May be repeated once.

EECE 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

EECE 4991. Research. 4 Hours.

Offers an opportunity to conduct research under faculty supervision. May be repeated without limit.

EECE 4992. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

EECE 4993. Independent Study. 1-4 Hours.

Offers theoretical or experimental work under individual faculty supervision. May be repeated without limit.

EECE 5115. Dynamical Systems in Biological Engineering. 4 Hours.

Provides an introduction to the theoretical analysis and modeling of dynamical systems in biology, ranging from molecular to population applications. Topics include difference and differential equation models, with basic theory including nondimensionalization, steady states, linearization, stability, eigenvalues, global behavior, singular perturbations, multistability, hysteresis, cooperativity, periodic solutions, excitable systems, bifurcations, and an introduction to spatial (PDE) models. Develops all concepts in the context of concrete biological applications, such as gene regulation, chemical reaction networks and stoichiometry, drug models and PK/PD, receptor/ligand interactions, synthetic constructs, action potential generation, enzymatic reactions, population interactions, epidemiology, epigenetic phenomena including differentiation, and transport, chemotaxis, and diffusion. BIOE 5115 and EECE 5115 are cross-listed. .

EECE 5155. Wireless Sensor Networks and the Internet of Things. 4 Hours.

Covers design and modeling of architectures, communication protocols, and algorithms for wireless sensor networks. The first part of the course covers general aspects of wireless sensor networking, including protocol design, modeling, and simulation at all layers of the communication stack. The second part covers standardization efforts, including Bluetooth, IEEE 802.15.4 and Zigbee, RFID, 6LowPan, and Internet of Things, among others. The third part covers applications of sensor networks technology to many challenging problems of our times, including cyber-physical systems, smart cities, smart transportation systems, and underwater sensing systems.

EECE 5161. Thin Film Technologies. 4 Hours.

Covers the fundamentals of vacuum technology, thin film deposition technologies, characterization technologies, their applications in different industries, and the frontiers of research activities on thin film deposition technologies. Thin films are fundamental building blocks for integrated circuits chips, microelectromechanical systems (MEMS) devices, and nanoelectromechanical system devices (NEMS), etc., and play critical roles in determining the performance of IC circuits, MEMS, and NEMS devices. Topics include vacuum technologies; vacuum pumps; vacuum system design and analysis; different thin film deposition technologies, including sputtering, chemical vapor deposition, electrochemical deposition, atomic layer deposition, etc.; and different thin film characterization technologies, in particular the magnetic thin film characterization technologies, including VSM, PPMS, FMR, MOKE, etc. Students who do not meet course prerequisites may seek permission of instructor.

EECE 5170. Introduction to Multiferroics Materials and Systems. 4 Hours.

Offered by the NSF Nanosystems Engineering Research Center for Translational Applications of Nanoscale Multiferroic Systems (TANMS) and co-taught by professors from UCLA, UC Berkeley, Cornell, California State University Northridge, and Northeastern University. Course lectures will be available online for remote students. Covers introduction to multiferroics, atomic structure of multiferroics (chemistry), multiferroic material science, continuum-level analysis of multiferroic materials, and multiferroic devices.

EECE 5550. Mobile Robotics. 4 Hours.

Investigates the science and engineering of mobile robots. Topics may include kinematics, dynamics, numerical methods, state estimation, control, perception, localization and mapping, and motion planning for mobile robots. Emphasizes practical robot applications ranging from disaster response to healthcare to space exploration.

EECE 5552. Assistive Robotics. 4 Hours.

Investigates the what (modeling), how (design), and why (analysis) of assistive robotics through the use of model-based design process. System models are essential to four key aspects of the assistive robot design process: derivation of executable specifications, hardware and software design based on simulations, implementation by code generation, and continuous testing and verification. Topics may include modeling continuous and discrete dynamics, heterogeneous models, hybrid systems, stochastic models, models of computation, analysis and design of embedded control systems with applications in assistive robotics, system simulation, and validation and verification techniques. Course projects emphasize model-based design for control of assistive robots in smart environments.

EECE 5554. Robotics Sensing and Navigation. 4 Hours.

Examines the actual sensors and mathematical techniques for robotic sensing and navigation with a focus on sensors such as cameras, sonars, and laser scanners. These are used in association with techniques and algorithms for dead reckoning and visual inertial odometry in conjunction with GPS and inertial measurement units. Covers Kalman filters and particle filters as applied to the SLAM problem. A large component of the class involves programming in both the ROS and LCM environments with real field robotics sensor data sets. Labs incorporate real field sensors and platforms. Culminates with both an individual design project and a team-based final project of considerable complexity.

EECE 5576. Wireless Communication Systems. 4 Hours.

Examines fundamental principles of wireless system design, focusing on modern techniques used in cellular systems and wireless local area networks. Covers various levels of system design, from modulation/detection to traffic analysis. Introduces basics of radio propagation and studies their effect on communication signals. Special topics include spatial frequency reuse; call blocking and cellular system capacity; power control and hand-off strategies; channel access and sharing; orthogonal frequency division multiplexing (OFDM—a modulation technique used in WLAN and the fourth-generation [4G] cellular systems) and spread spectrum modulation (third-generation WCDMA systems); diversity techniques and multi-input multi-output (MIMO) signal processing. Requires an undergraduate course in communications systems.

EECE 5580. Classical Control Systems. 4 Hours.

Introduces the analysis and design of classical control systems. Examines control system objectives, modeling and mathematical description, transfer function and state-variable representations, feedback control system characteristics, system responses, and stability of feedback systems. Also addresses compensator design based on root-locus and frequency response, and modern control system design using state-variable feedback. Requires concurrent registration in EECE 5581 for undergraduate students. .

EECE 5581. Lab for EECE 5580. 1 Hour.

Accompanies EECE 5580. Covers the practical aspects of control systems design through lab experiments. Topics vary and include computer simulation, digital computer control, and use of CAD packages such as MATLAB for analysis and design of control systems. Examples emphasize concepts introduced in EECE 5580, such as system response to stimuli, stability, and robustness. Requires concurrent registration in EECE 5580.

EECE 5606. Micro- and Nanofabrication. 4 Hours.

Provides an overview of integrated circuit fabrication from the viewpoint of a process engineer. Offers students an opportunity to fabricate micro- and nanoscale devices in integrated lab sessions. Focuses on the physics, chemistry, and technology of integrated circuit fabrication in the lecture portion of the course, while students fabricate and test novel devices (an electrohydrodynamic micropump and three-dimensional carbon nanotube interconnects) in integrated lab sessions. Concentrates on silicon IC technology but also includes examples from other materials and device systems including microelectromechanical (MEMS) technologies that are used to build devices such as accelerometers, pressure sensors, and switches for telecommunications and other current examples provided from nanofabrication and nanotechnology. Lab hours are arranged.

EECE 5610. Digital Control Systems. 4 Hours.

Covers sampling and analysis tools for linear discrete-time dynamic systems, including the design of digital control systems using transform techniques by discrete equivalent and direct design methods; root locus, Bode and Nyquist diagrams, and Nichols charts; controller implementation issues, such as digital filter realizations, nonlinear effects due to quantization, round off, dead band, and limit cycles; and selection of the sampling rate.

EECE 5626. Image Processing and Pattern Recognition. 4 Hours.

Introduces processing and analysis of digital images with the goal of recognition of simple pictorial patterns. Topics include discrete signals and systems in 2D, digital images and their properties, image digitization, image enhancement, image restoration, image segmentation, feature extraction, object recognition, and pattern classification principles (Bayes rules, class boundaries) and pattern recognition methods.

EECE 5627. Arithmetic and Circuit Design for Inexact Computing with Nanoscaled CMOS. 4 Hours.

Studies the principles of inexact (approximate) computing through arithmetic and circuit design. By reducing circuit complexity, critical path delay, and power dissipation at the expense of introducing processing errors in computation, inexact computing is one of the leading emerging paradigms in nanoscale computing. Topics include basic computer arithmetic, approximation criteria, error analysis, nanoscale CMOS principles (PTMs), case studies, and experimental assessment.

EECE 5638. Compilers for Modern Computer Architectures. 4 Hours.

Covers the structure and implementation of a modular compiler. The first half of the course focuses on the compiler front end, based on a lexical analyzer, syntax parser, and intermediate code generator. The second part deconstructs a compiler back end, based on structural analysis, multistage optimizations, and assembly code generation. Topics include practical examples based on LLVM, a popular intermediate language specification and tool chain. Includes a series of tightly related assignments, which guide students through the implementation of a fully functional LLVM-based compiler from the ground up. The resulting project is a tool capable of interpreting a subset of the C programming language and generating an executable program represented with MIPS assembly code.

EECE 5639. Computer Vision. 4 Hours.

Introduces topics such as image formation, segmentation, feature extraction, matching, shape recovery, dynamic scene analysis, and object recognition. Computer vision brings together imaging devices, computers, and sophisticated algorithms to solve problems in industrial inspection, autonomous navigation, human-computer interfaces, medicine, image retrieval from databases, realistic computer graphics rendering, document analysis, and remote sensing. The goal of computer vision is to make useful decisions about real physical objects and scenes based on sensed images. Computer vision is an exciting but disorganized field that builds on very diverse disciplines such as image processing, statistics, pattern recognition, control theory, system identification, physics, geometry, computer graphics, and learning theory. Requires good programming experience in Matlab or C++.

EECE 5640. High-Performance Computing. 4 Hours.

Covers accelerating scientific and other applications on computer clusters, many-core processors, and graphical processing units (GPUs). Modern computers take advantage of multiple threads and multiple cores to accelerate scientific and engineering applications. Topics covered include parallel computer architecture, parallel programming models, and theories of computation, as well as models for many-core processing. Highlights implementation of computer arithmetic and how it varies on different computer architectures. Includes an individual project where each student is expected to implement an application, port that application to several different styles of parallelism, and compare the results. Programming is done in variants of the C programming language.

EECE 5641. Introduction to Software Security. 4 Hours.

Offers students an opportunity to learn how the security of systems can be violated and how such attacks can be detected and prevented. Computer security problems have a significant impact on practical aspects of our lives. Despite a considerable corpus of knowledge about tools and techniques to protect systems, information about actual vulnerabilities and how they are exploited is not generally available. Covers common programming, configuration, and design mistakes and examines possible protection and detection techniques. Uses examples to highlight general error classes. Includes a number of practical lab assignments that require students to apply their knowledge, as well as engage in a discussion of the current research in the field.

EECE 5642. Data Visualization. 4 Hours.

Introduces relevant topics and concepts in visualization, including computer graphics, visual data representation, physical and human vision models, numerical representation of knowledge and concept, animation techniques, pattern analysis, and computational methods. Topics include tools and techniques for practical visualization and elements of related fields, including computer graphics, human perception, computer vision, imaging science, multimedia, human-computer interaction, computational science, and information theory. Covers examples from a variety of scientific, medical, interactive multimedia, and artistic applications. Includes hands-on exercises and projects. Emphasizes modern engineering applications of computer vision, graphics, and pattern classification methodologies for data visualization.

EECE 5643. Simulation and Performance Evaluation. 4 Hours.

Studies simulation and performance evaluation in computer systems. Primarily covers both classic and timely techniques in the area of performance evaluation, including capacity planning to predict system performance, scheduling, and resource allocation in computer systems. Introduces basic computational and mathematical techniques for modeling, simulating, and analyzing the performance by using simulation, including models, random-number generation, statistics, and discrete event-driven simulation.

EECE 5644. Introduction to Machine Learning and Pattern Recognition. 4 Hours.

Studies machine learning (the study and design of algorithms that enable computers/machines to learn from experience/data). Covers a range of algorithms, focusing on the underlying models between each approach. Emphasizes the foundations to prepare students for research in machine learning. Topics include Bayes decision theory, maximum likelihood parameter estimation, model selection, mixture density estimation, support vector machines, neural networks, probabilistic graphics models, and ensemble methods (boosting and bagging). Offers students an opportunity to learn where and how to apply machine learning algorithms and why they work.

EECE 5645. Parallel Processing for Data Analytics. 4 Hours.

Covers the fundamentals of parallel machine-learning algorithms, tailored specifically to learning tasks involving large data sets. Reviews methods for dealing with both large and high-dimensional data sets, emphasizing distributed implementations. Beyond covering the theory behind statistical data analysis, the course also offers a hands-on approach, using Spark as a development platform for parallel learning. Topics include, Apache Spark fundamentals, multithreaded/cluster execution, resilient distributed data structures, map-reduce operations, using key-value pairs, joins, convex optimization, gradient descent, linear regression, Gauss-Markov theorem, ridge and lasso regularization, feature selection, cross validation, variance vs. bias trade-off, classification, logistic regression, ROC curves and AUC, matrix and tensor factorization, graph-parallel algorithms and sparsity, Perceptron algorithm, and deep neural networks.

EECE 5647. Nanophotonics. 4 Hours.

Introduces basic concepts and recent developments in nanophotonic materials and devices. Nanophotonics is one very important research area in nanotechnology. Discusses the fundamentals of electromagnetics (Maxwell's equations, polarization, wave propagations, etc.); quantum mechanics; and typical nanofabrication and characterization techniques. Focuses on specific topics in nanophotonics, including silicon photonics; photonic crystals; plasmonics and optical metamaterials, with their diverse applications in optical circuits; imaging; optical trapping; biomedical sensing; and energy harvesting. Offers students an opportunity to obtain a fundamental understanding of the property and manipulation of light at the nanoscale.

EECE 5649. Design of Analog Integrated Circuits with Complementary Metal-Oxide-Semiconductor Technology. 4 Hours.

Covers theoretical analysis, practical design, and simulation of analog integrated circuits implemented in complementary metal-oxide-semiconductor (CMOS) fabrication process technologies. Introduces cadence tools for circuit simulations, physical layout, and layout verification. Begins with basic concepts such as CMOS device models, DC and small-signal analysis techniques for single- and multistage amplifiers, biasing configurations, and reference generation circuits. Explores differential signal processing, operational amplifiers, operational transconductance amplifiers, and common-mode feedback circuits. Analysis methods include the evaluation of linearity, noise, stability, and device mismatches from process variations. Addresses some advanced design techniques, such as linearity improvement methods, frequency compensation, and digitally assisted performance tuning.

EECE 5652. Microwave Circuits and Networks. 4 Hours.

Addresses novel applications of analytical and engineering techniques for RF/Microwave Circuits. Covers transmission lines, impedance matching, S-parameters, high-frequency circuit analysis, power dividers, resonators, and filters. Emphasizes presenting fundamental concepts, essential mathematical formulas and theorems, and engineering applications. Provides ample examples to ensure participants are given an opportunity to fully appreciate the power of the techniques described and to gain extensive experience in the area of high-frequency circuits, from theory formulation to novel engineering designs.

EECE 5666. Digital Signal Processing. 4 Hours.

Presents the theory and practice of modern signal processing techniques. Topics include the characteristics of discrete signals and systems, sampling, and A/D conversion; the Z-transform, the Fourier transform, and the discrete Fourier transform; fast Fourier transform algorithms; design techniques for IIR and FIR digital filters; and quantization effects in digital signal processing. Graduate students may register for this course only if they did not complete an undergraduate course in digital signal processing; such graduate registration requires approval of instructor and an internal departmental petition.

EECE 5680. Electric Drives. 4 Hours.

Examines all subsystems that comprise an electric drive including electric machines, power electronic converters, mechanical system requirements, feedback controller design, and interactions with utility systems. Based on an integrative approach that requires minimal prerequisites: a junior-level course in signals and systems and some knowledge of electromagnetic field theory (possibly from physics classes), and does not require separate courses in electric machines, controls, or power electronics.

EECE 5681. Lab for EECE 5680. 0 Hours.

Accompanies EECE 5680. Covers topics from the course through various experiments.

EECE 5682. Power Systems Analysis 1. 4 Hours.

Covers fundamentals including phasors, single-phase and balanced three-phase circuits, complex power, and network equations; symmetrical components and sequence networks; power transformers, their equivalent circuits, per unit notation, and the sequence models; transmission line parameters including resistance, inductance, and capacitance for various configurations; steady-state operation of transmission lines including line loadability and reactive compensation techniques; power flow studies including Gauss-Speidel and Newton Raphson interactive schemes; symmetrical faults including formation of the bus impedance matrix; and unsymmetrical faults including line-to-ground, line-to-line, and double line-to-ground faults.

EECE 5684. Power Electronics. 4 Hours.

Provide tools and techniques needed to analyze and design power conversion circuits that contain switches. The first part of the course emphasizes understanding and modeling of such circuits, and provides a background for engineering evaluation of power converters. The second part covers dynamics and control of this class of systems, enabling students to design controllers for a variety of power converters and motion control systems. Addresses a set of analytical and practical problems, with emphasis on a rigorous theoretical treatment of relevant questions. Designed for students with primary interests in power conditioning, control applications, and electronic circuits, but it could prove useful for designers of high-performance computers, robots, and other electronic and electromechanical (mechatronic) systems in which the dynamical properties of power supplies become important.

EECE 5685. Lab for EECE 5684. 0 Hours.

Accompanies EECE 5684. Covers topics from the course through various experiments.

EECE 5686. Electrical Machines. 4 Hours.

Reviews phasor diagrams and three-phase circuits; the magnetic aspects including magnetic circuits and permanent magnets; transformers, their equivalent circuits, and performance; principles of electromechanical energy conversion; elementary concepts of rotating machines including rotating magnetic fields; and steady-state theory and performance of induction machines, synchronous machines, and direct current machines.

EECE 5688. Analysis of Unbalanced Power Grids. 4 Hours.

Examines common types of power system faults. Starts with a detailed description of three-phase modeling of basic power system elements such as transmission lines, transformers, and generators. Then presents fundamentals of three-phase circuit analysis in the steady state, both for balanced and unbalanced operating conditions. Uses symmetrical component transformation and positive, negative, and zero sequence networks to analyze unbalanced systems. Presents methods to calculate fault currents and postfault bus voltages. Reviews basic protective relaying and relay settings using typical distribution system examples.

EECE 5697. Acoustics and Sensing. 4 Hours.

Introduces the fundamental concepts of acoustics and sensing with waves. Offers a unified theoretical approach to the physics of image formation through scattering and wave propagation in sensing. Topics include the linear and nonlinear acoustic wave equation; sources of sound; reflection, refraction, transmission, and absorption; bearing and range estimation by sensor array processing, beam forming, matched filtering, and focusing; diffraction, bandwidth, ambient noise, and reverberation limitations; scattering from objects, surfaces, and volumes by Green's theorem; forward scatter, shadows, Babinet's principle, extinction, and attenuation; ray tracing and waveguides in remote sensing; and applications to acoustic, radar, seismic, thermal, and optical sensing and exploration.

EECE 5698. Special Topics in Electrical and Computer Engineering. 4 Hours.

Covers special topics in electrical and computer engineering. Topics are selected by the instructor and vary from semester to semester. May be repeated up to four times.

EECE 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

EECE 6964. Co-op Work Experience. 0 Hours.

Provides eligible students with an opportunity for work experience. May be repeated without limit.

EECE 6965. Co-op Work Experience Abroad. 0 Hours.

Provides eligible students with an opportunity for work experience abroad. May be repeated without limit.

EECE 7105. Optics for Engineers. 4 Hours.

Provides an introductory graduate course in optics, presenting the engineering concepts necessary to understand and evaluate electro-optical systems. Begins with a brief but rigorous treatment of geometric optics, including matrix methods, aberrations, and pupils and windows, with practical examples of optical instruments and electro-optical systems. Topics include polarization, interference, diffraction, and optical properties of crystals, thin films, optical resonators, guided waves, modulators, and detectors. Presents concepts with examples from modern optical systems such as LIDAR, fiber-optical sensors, range finders, infrared systems, and optical communication systems. Requires a Bachelor of science in engineering or physics.

EECE 7150. Autonomous Field Robotics. 4 Hours.

Examines the role of software and hardware in the design and use of real autonomous systems, including autonomous cars, autonomous underwater vehicles, and unmanned aerial systems. Focuses on using real large-scale robotics systems in real-world settings.

EECE 7200. Linear Systems Analysis. 4 Hours.

Covers fundamental algebraic concepts and algebraic structures. Topics include linear operators and their representations; matrices, algebraic equations, equivalence, and similarity transformations; introduction to the state-variable theory of continuous and discrete linear systems; standard canonical representations, the concept of state, and the representation of interconnected systems, linear spaces, the state equations, and their solution; stability; and introduction to the general control problem in terms of controllability and observability.

EECE 7201. Solid State Devices. 4 Hours.

Covers the fundamental elements of solid-state device physics and the application of these principles. Seeks to provide students with the opportunity to develop an understanding of pn junctions, bipolar junction transistors, and MOSFETs.

EECE 7202. Electromagnetic Theory 1. 4 Hours.

Examines the fundamental equations, their physical meaning, principal mathematical techniques, and important engineering applications. Topics include sources of the electromagnetic field, Lorentz force equation, integral form of Maxwell's equations and point relations (differential equations and boundary conditions), electromagnetic energy and power, propagation of uniform and nonuniform plane waves in homogeneous media, reflection and refraction, scalar and vector potentials, solutions in the absence of boundaries for static and dynamic problems, solutions to boundary value problems, duality, uniqueness, images, physical theory of diffraction, and general theory of metal and dielectric wave-guides and resonators for Cartesian and cylindrical systems.

EECE 7203. Complex Variable Theory and Differential Equations. 4 Hours.

Comprises the theory of functions of a complex variable. Covers Cauchy's integral and related theorems, Taylor and Laurent series, analytic continuation, and multivalued functions. Considers special functions of mathematical physics using generating functions, Taylor and Laurent expansions, and various integral representations. Reviews applications of complex variable theory drawn from optics and electromagnetic theory and from digital signal processing and digital communications. Focuses on the theory of ordinary and partial differential equations of mathematical physics. Develops series solutions of ordinary differential equations of second order using the tools of complex variable theory. Covers Sturm-Liouville theory and uses it to develop eigen function and Green function solutions of homogeneous and inhomogeneous partial differential equations. Requires knowledge of undergraduate advanced calculus.

EECE 7204. Applied Probability and Stochastic Processes. 4 Hours.

Covers fundamentals of probability and stochastic processes with applications to estimation and queuing theory. Includes basic laws of probability, conditioning, and Bayes rule. Topics include random variables and their functions; PDF, PMF, and CDF notions; statistical averages; moments and characteristic functions; multiple random variables; joint and conditional PDF and PMF; multiple functions of random variables; correlation and covariance; mean squared estimation of random variables; Markov, Chebychev, and Chernov inequalities; various notions of convergence of random variable sequences; laws of large numbers; central limit theorem; and large deviation theory. As time permits, discusses basic notions of estimation and properties of estimators, unbiased and minimum variance estimation, CRLB, sufficient statistics, consistency of estimators, basic notions of discrete and continuous-time random processes, mean and autocorrelation function, WSS and cyclo-stationary processes, ergodicity of random processes, and other topics. Requires a strong understanding of linear systems, transform techniques, and linear algebra.

EECE 7205. Fundamentals of Computer Engineering. 4 Hours.

Introduces fundamental techniques in computer engineering used throughout the graduate curriculum. Covers basic programming and analysis methods and the formulation and solution of a wide range of computer engineering problems. Also discusses the applications of algorithm analysis and complexity theory to analyzing and solving problems. Emphasizes those fundamental computational problems and related algorithms whose solution can be obtained in polynomial time. For basic computational problems such as sorting, searching, elementary graph algorithms, shortest-paths problems, as well as flow problems in networks, many different algorithms and data structures are described and analyzed, implemented, and compared both from a theoretical and from an experimental point of view.

EECE 7211. Nonlinear Control. 4 Hours.

Discusses phase plane analysis for nonlinear systems. Topics include fundamentals of Lyapunov theory; absolute stability, passivity, averaging, singular perturbation, input-output stability, and other advanced stability topics; describing functions; nonlinear control methods based on linearization, feedback linearization, sliding control, Lyapunov, and passivity and center manifold theory and bifurcations.

EECE 7213. System Identification and Adaptive Control. 4 Hours.

Discusses fundamental issues of adaptive identification and control, such as stability of adaptive systems, convergence, persistent excitation, and robustness. Identification is the process of mathematically modeling a system based on measurement data that may be limited or uncertain. Adaptive control, then, is the means by which a system that is poorly modeled is controlled adequately. Enhances the underlying basic ideas that are essential for adaptive control. Emphasizes recursive approaches, such as recursive least squares algorithm, where parameter estimates are updated in real time. Covers simple adaptive systems, adaptive observers, and adaptive control. Discusses in detail two major adaptive schemes, model reference adaptive control (MRAC) and self-tuning regulators (STR).

EECE 7214. Optimal and Robust Control. 4 Hours.

Explores state-space, time-domain techniques for analyzing and designing optimal and robust linear control systems. Introduces basic concepts of dynamic optimization and applies them to problems of short-term and long-term optimal control, path planning and stabilization, state estimation, and filtering. Emphasizes linear quadratic optimization, H₂ control, H_∞ control, and μ -synthesis. Reviews pertinent linear systems concepts and discusses connections with a geometric intuition relating quadratic optimization to projections.

EECE 7224. Power Systems State Estimation. 4 Hours.

Offers an up-to-date account of the strategies utilized in state estimation of electric power systems. Provides a broad overview of power system operation and the role of state estimation in overall energy management. Presents an abundance of examples, models, tables, and guidelines to clearly examine new aspects of state estimation, the testing of network observability, and methods to assure computational efficiency.

EECE 7226. Modeling and Simulation of Power System Transients. 4 Hours.

Presents computer modeling of linear and nonlinear power system components to be used in transient studies. Covers methods of digital simulation of power systems operating in the steady-state and transient conditions. Discusses use of transient simulation programs for design and analysis of power systems. Students are asked to carry out a term project and deliver a presentation about its outcome.

EECE 7228. Advanced Power Electronics. 4 Hours.

Designed to familiarize students with advanced power electronic circuits. Covers single-phase and three-phase rectifiers and inverters, including their principles of the operation, design, analysis, and applications. Diode rectifiers, phase-controlled rectifiers, and switch mode rectifiers and inverters are among the topics. Introduces different modulation techniques. If time permits, covers three-phase ac-ac converters and soft switching techniques, as well.

EECE 7237. Special Topics in Power Electronics. 4 Hours.

Covers aspects of power electronics not studied in other courses. Topics may vary from year to year. May be repeated without limit.

EECE 7240. Analog Integrated Circuit Design. 4 Hours.

Treats the analysis and design of analog ICs, their functional performance, and applications. Focuses on the various building blocks of analog circuits, their operation, and the underlying principles and techniques, with analysis supplemented by CAD simulation. Topics include modeling and layout of CMOS, bipolar, BiCMOS devices, and passive components; DC building blocks, including precision current and voltage references; performance analysis of signal gain, impedances, and frequency response and speed of basic/compound amplifier structures; architectures of operational amplifiers, including low-voltage, OTAs, and three-stage designs; feedback and performance merits, topologies, instability, and frequency compensation of feedback amplifiers; nonlinear and analog computation IC functions; noise in ICs, physical origins and device modeling, noise circuit analysis, SNR and NF, and techniques for the enhancement of system noise performance.

EECE 7242. Integrated Circuits for Mixed Signals and Data Communication. 4 Hours.

Covers analysis and design of ICs for high-speed communications and mixed-signal processing. Focuses on performance of CMOS and BiCMOS implementations of building blocks for these systems. Covers passive R, L, C, and active devices for ICs; broadband amplifiers, TIAs, limiters, buffers/drivers, muxes, and demuxes; circuit noise modeling and analysis and methods for optimization of SNR and BER, with applications to optical communication; baseband and HF filters; design methods of L-C, OTA-C, MOSFET-C, and switched-C filters; data conversion and D-A and A-D characteristics, popular DAC architectures, serial and parallel ADCs, and high-resolution techniques; clock generators and oscillators, L-C resonator-based designs, VCOs, PLLs and frequency synthesis, and CDR circuits. Requires a verification review of a selected publication relevant to the course. Students who do not meet course prerequisites may seek permission of instructor.

EECE 7244. Introduction to Microelectromechanical Systems (MEMS). 4 Hours.

Introduces microelectromechanical systems, including principles of sensing and actuation, microfabrication technology for MEMS, noise concepts, and packaging techniques. Covers a wide range of disciplines, from electronics to mechanics, material properties, microfabrication technology, electromagnetics, and optics. Studies several classes of devices including inertial measurement devices, pressure sensors, rf components, and optical MEMS. Devotes the last third of the semester largely to projects involving design of MEMS devices to specifications in a realistic fabrication process.

EECE 7245. Microwave Circuit Design for Wireless Communication. 4 Hours.

Covers planar microwave circuits and integrated circuits (MMICs) for wireless communication systems. Employs microwave CAD tools in design projects as well as in-class case-study examples. Reviews communication system basics, modulation and demodulation, architectures of receivers and transmitters, and system performance. Covers planar transmission lines and coupled lines and their application to important devices and microwave circuit functions and multipoint networks using S-parameters, flow graphs, and Smith charts. Studies microwave filters, narrowband and broadband amplifiers, their gain and stability, impedance matching, and noise performance, as well as mixers and frequency-conversion techniques. Finishes with design and performance of microwave oscillators. Covers wireless standards, multiple-access techniques, and recent advances if time permits.

EECE 7247. Radio Frequency Integrated Circuit Design. 4 Hours.

Introduces radio frequency (RF) integrated circuit analysis, design, and simulation methods with an emphasis on CMOS implementations. Covers basic RF design concepts including linearity, noise figure, sensitivity, impedance matching, and imperfections of integrated passive components (parasitics, quality factors). Discusses front-end circuit design considerations for low-noise amplifiers, mixers, oscillators, and power amplifiers.

EECE 7248. Lab for EECE 7240. 0 Hours.

Accompanies EECE 7240. Covers topics from the course through various experiments.

EECE 7250. Power Management Integrated Circuits. 4 Hours.

Presents power management circuits with a focus on modern system on a chip (SoC). Introduces linear regulators, switching converters, switched-capacitor converters, voltage references, energy harvesters, and battery chargers. Studies various control methods, design trade-offs, and performance metrics in the context of an SoC. Introduces emerging energy-harvesting techniques for IC design. After completing this course, the successful student should be able to design, characterize, choose, or specify power-management circuits or ICs for a system.

EECE 7258. Human Sensing and Recognition. 4 Hours.

Covers the state-of-the-art human-centered recognition technologies, including face/human detection, face/body tracking, face recognition, head/body pose estimation, expression recognition, body language recognition, gait analysis, hand/body/eye gesture, action/activity analysis, and so forth. Human-centered computing is an emerging technology that utilizes the intrinsic physiological or behavioral traits of individuals for machine-based automatic and reliable identification. It attracts much attention due the increasing demand for the security, privacy, and health-care-related human-centered applications.

EECE 7263. Humanoid Robotics. 4 Hours.

Investigates the emerging field of humanoid robotics. Topics may include humanoid designs, software and hardware architectures, sensing and perception, motion planning and control, high-level task planning and control, grasping and manipulation, benchmarking, and experimental methods. Course projects emphasize model-based control of humanoids for completing practical tasks from space exploration to disaster response.

EECE 7270. Electromagnetic Theory 2. 4 Hours.

Continues EECE 7202. Examines important electrodynamic applications by the use of advanced mathematical techniques. Topics include general theory of wave-guides and resonators with application to the cylindrical geometry; dielectric rod wave-guide; optical fibers; radiation; linear antennas; loop antenna; linear arrays; ray optics; scattering and diffraction of waves for planar, cylindrical, and spherical geometries; and effects of random media.

EECE 7271. Computational Methods in Electromagnetics. 4 Hours.

Presents solutions to problems in electromagnetics using a wide variety of numerical and computational methods. Discusses in detail the finite difference approximations of partial differential equations and the finite difference time-domain method of simulating electromagnetic wave propagation and scattering. Uses moment methods to solve the integral equations related to currents and charges on wire structures. Uses finite element and higher-order finite difference methods to solve problems in electrostatics and wave propagation. Discusses efficient matrix methods, relaxation methods, the conjugate gradient technique, and multidimensional Newton's method in the context of electromagnetic field simulation.

EECE 7275. Antennas and Radiation. 4 Hours.

Presents the fundamental theory and properties of antennas. Topics include equivalence, reciprocity, uniqueness, Huygen's principle, antenna impedance, and diffraction; linear, loop, array, and aperture antennas including horns, reflectors, lenses, and microstrip; transmitting and receiving antennas and transmission formulas; and numerical antenna analysis methods.

EECE 7284. Optical Properties of Matter. 4 Hours.

Presents the formal mathematical treatment of classical crystal optics including dispersion, polarization, birefringence, metal optics, and the optics of thin films. Emphasis is on the interaction of electromagnetic waves and the crystal lattice. Classical crystal optics are extended to nonlinear effects observed with very intense electric and magnetic fields. Presents applications of nonlinear optics, such as second- and third-harmonic generation, optical mixing, optical parametric oscillation, multiple photon interaction, and linear and nonlinear scattering. Various topics in linear and nonlinear optics are applied in such areas as birefringent filters, second-harmonic generators, optical parametric oscillators, and acousto-optical beam deflectors.

EECE 7293. Modern Imaging. 4 Hours.

Covers basic and advanced topics in imaging engineering. Starts with the formulation of typical forward problems in electromagnetic and acoustic wave field propagation and scattering, emphasizing biomedical and nondestructive testing applications, and continues with a survey of imaging methodologies including the so-called qualitative imaging methods. Topics covered are: obstacle scattering, inhomogeneous medium scattering, uniqueness and stability in inverse scattering, imaging with finite data, point-source method and its applications, singular sources and shape reconstruction, linear sampling methods, signal-subspace-based methods, noniterative approaches for the inverse medium problem, intensity-only imaging, estimation theory in imaging and the question of superresolution, and selected topics in compressive sensing and quantum imaging.

EECE 7296. Electronic Materials. 4 Hours.

Offers a basic treatment of electronic materials from atomic, molecular, and application viewpoints. Topics include atomic structure and bonding in materials, structure of materials, and crystal defects. These topics lay a foundation for thermal and electronic conduction, which is the underlying physics of electronic devices. Examines the electronic properties of semiconductors, dielectric, magnetic, superconducting, and optical materials. The latter half of the course deals with an introduction to state-of-the-art electronic materials, including semiconductor nanoelectronics, magnetic semiconductors and Spintronics, molecular electronics, carbon nanotubes, conducting polymers, graphene and graphane, and other topics representing recent technological breakthroughs in the area of electronic materials.

EECE 7297. Advanced Magnetic Materials—Magnetic Devices. 4 Hours.

Covers magnetism and magnetic materials, their applications in different industries, magnetic devices, and the frontiers of research activities on magnetism and magnetic materials. Topics include magnetism units, magnetic materials classification, origin of ferromagnetism and ferrimagnetism, magnetic anisotropies, magnetostriction, magnetic domain theory, ferromagnetic/ferrimagnetic resonance, soft magnetic materials, hard magnetic materials, applications of magnetic materials, information storage, and leading-edge research. Includes lectures on different magnetic sensors—including AMR, GMR, TMR, fluxgate, magnetoelectric sensors, etc.—and on microwave magnetic devices—including tunable filters, phase shifters, isolators, circulators, etc.

EECE 7310. Modern Signal Processing. 4 Hours.

Covers theory and practice of modern signal processing techniques with emphasis on optimal filtering and multirate signal processing. Includes the principle of orthogonality, Wiener and Kalman filters, linear prediction, spectral factorization, the Yule-Walker equations, decimation and interpolation, Noble identities and polyphase representation, and maximally decimated filter banks.

EECE 7312. Statistical and Adaptive Signal Processing. 4 Hours.

Uses linear mean square estimation concepts to explore some important areas of statistical and adaptive signal processing. Offers students an opportunity to gain a thorough understanding and working knowledge of FIR Wiener filtering, linear prediction, and autoregressive model matching; autocorrelation estimation and the deterministic least squares method; LMS and RLS adaptive filters; order recursive (triangular and lattice) architectures; and beamforming in antenna arrays. Emphasizes performance analysis of adaptive filters under nonstationary conditions; triangular covariance factorization; geometric derivation of RLS adaptive algorithms; a factual knowledge of some basic concepts concerning fundamentals of regularized least squares and the Kalman filter interpretation of the RLS algorithm; IIR (Laguerre-based) lattice configuration; and nonlinear adaptive filtering.

EECE 7323. Numerical Optimization Methods. 4 Hours.

Introduces fundamental theoretical and algorithmic concepts behind numerical optimization theory for objective functions with finite numbers of parameters. Optimization problems arise ubiquitously in all areas of engineering and science. Presents established numerical methods for iterative unconstrained and constrained optimization. Topics covered include line-search and trust-region strategies, gradient descent and Newton methods and their variations, linear and quadratic programming, penalty-augmented Lagrangian methods, sequential quadratic programming, and interior point methods. The course relies on the use of Matlab in projects. Requires a basic knowledge of calculus and linear algebra.

EECE 7336. Digital Communications. 4 Hours.

Covers fundamentals of digital communications and coding and the basic structure of a communication system. Topics include modeling of information sources; entropy; rate distortion function; lossless and lossy source coding theorems; Huffman coding; Lempel-Ziv algorithm; scalar and vector quantization; digital modulation schemes and their spectral characterization including PAM, MPSK, QAM, OQPSK, MSK, $\pi/4$ -QPSK, CPFSK, CPM, and GMSK; and orthogonal, biorthogonal, and simplex signaling. Explores optimal receiver design and probability of error derivation for various systems. Covers noncoherent detection and DPSK systems and their performance. Discusses synchronization systems, analysis of PLL in the presence of noise, methods of timing recovery, channel capacity, and Shannon's noisy channel coding theorem. Studies cutoff rate and its communication system design. Other topics include coding systems, linear block codes, soft and hard decision decoding, performance of linear block codes, cyclic codes, convolutional codes, Viterbi decoding, error probability bounds, concatenated codes, MAP decoding, Trellis code modulation, communication over band-limited channels, ISI, Nyquist conditions, raised cosine signaling, partial response signaling, equalization techniques, linear adaptive equalization, decision feedback equalizers, maximum likelihood sequence detection, and communication over fading channels.

EECE 7337. Information Theory. 4 Hours.

Discusses basic properties of entropy and mutual information, Shannon's fundamental theorems on data compression and data transmission in the single-user case, binning, and covering lemmas. Topics include rate distortion theory, feedback in one-way channels, Slepian-Wolf coding of correlated information sources, source coding with side information at the receiver, multiple access channel and its capacity region, and the capacity region of the Gaussian multiple access channel. Also covers broadcast channels, superposition coding, and the capacity region of the degraded broadcast channel; performance and comparison of TDMA, FDMA, and CDMA systems from a theoretical point of view; capacity issues for time-varying channels and channels with memory; relation between information theory and statistics; Stein's lemma; and large deviation theory.

EECE 7345. Big Data and Sparsity in Control, Machine Learning, and Optimization. 4 Hours.

Covers the issue of handling large data sets and sparsity priors, presenting very recently developed techniques that exploit a deep connection to semi-algebraic geometry, rank minimization, and matrix completion. Focuses on applications, including control and filter design subject to information flow constraints, subspace clustering and classification on Riemannian manifolds, and activity recognition and classification and anomaly detection from video sequences. The goal of this course is to introduce the subject to people in the systems, machine-learning, and computer vision communities faced with "big data" and scaling problems and serve as a quick reference guide, summarizing the state of the art as of today and providing a comprehensive set of references.

EECE 7346. Probabilistic System Modeling and Analysis. 4 Hours.

Covers fundamentals of probabilistic system modeling, building toward techniques that allow analyzing complex stochastic systems in a tractable fashion. Modeling large and complex systems requires reasoning about probabilistic behavior at a large scale. Reviews classic topics like Markov chains, convergence to a steady state, renewal processes, renewal reward processes, the strong law of large numbers, and the elementary renewal theorem. Additional topics include the asymptotic behavior of probabilistic systems, including stochastic approximation/Robbins-Monro type algorithms, and ODE/fluid limits. Illustrates how these modeling techniques can be applied in modeling real systems and adaptive algorithms, including queueing systems, distributed systems, and online learning algorithms like stochastic gradient descent.

EECE 7352. Computer Architecture. 4 Hours.

Presents many of the issues involved in the design and analysis of new and evolving computer architectures. Topics include all aspects of the system including the microprocessor, memory, I/O, and networking. Emphasizes the connection between architecture and the underlying software that drives it. Topics include pipelining, superscalar, out-of-order execution and completion, data flow, caching, prefetching, virtual memory, RAID, and ATM switching. Performance analysis is another fundamental theme of this course. A project is assigned that involves the creation of a trace-driven simulation model to study the performance of various hardware or software architectural features. Also provides a survey of the current state of the art in processor architectures and provides additional readings from recent research in the field. Requires a working knowledge of C programming language.

EECE 7353. VLSI Design. 4 Hours.

Covers all aspects of VLSI design and engineering including VLSI design methodology; MOS transistors and circuits; CAD tools to create, extract, simulate, and evaluate physical layouts; CMOS fabrication process; evaluation and optimization of circuit area, power consumption, and propagation delay; CAD tools to design CMOS systems with standard cells; system clocking design and evaluation; the characteristics and limitations of CAD tools, such as simulation, placement, and routing; VLSI testing, fault models, test vector generation, and design for testability; design projects going through a complete VLSI design cycle; and a research project targeting a specific area of VLSI engineering. Requires a knowledge of electronics and digital systems design.

EECE 7364. Mobile and Wireless Networking. 4 Hours.

Introduces the fundamental techniques and protocols in first- and second-generation, and emerging third-generation, wireless systems. Examines how mobility affects networks, systems, and applications. Mobility of devices and end-users has behavioral implications at all layers of the Internet protocol stack, from the MAC layer up through the application layer. Handling mobility efficiently requires more information sharing between network layers than is typically considered. Topics include cellular system, medium access control protocols for wireless systems, mobility management and signaling within mobile networks, common air interfaces (AMPS, IS-136, IS-95, or GSM), wireless data networking (CDPD), ad hoc networks, Bluetooth, Mobile IP, and PCS systems. Also introduces students to the problems and current research in the provision of quality of service (QoS) in wireless networks. Methodology includes lectures, textbooks, and emphasis on readings from relevant literature.

EECE 7368. High-Level Design of Hardware-Software Systems. 4 Hours.

Presents state-of-the-art methods, tools, and techniques for system-level design and modeling of complete multiprocessor systems from specification down to implementation across hardware-software boundaries. Recognizes that system complexities are growing exponentially, driven by ever-increasing application demands and technological advances that allow one to put complete multiprocessor systems on a chip (MPSoCs). System-level design that jointly covers hardware and software is one approach to address the associated complexities in the design process and the market pressures. Using system-level design languages (e.g., SpecC, SystemC), offers students an opportunity to specify, simulate, analyze, model, and design hardware-software systems based on examples of typical embedded applications. Requires working knowledge of C/C++, algorithms, and data structures.

EECE 7370. Advanced Computer Vision. 4 Hours.

Offers students an opportunity to obtain practical knowledge in computer vision and to develop skills for being a successful researcher in this field. The goal of the field of computer vision is to make useful decisions about real physical objects and scenes based on sensed images. Achieving this goal requires obtaining and using descriptions (models) of the sensors and the world. Computer vision is an exciting field that builds on very diverse disciplines such as image processing, statistics, pattern recognition, control theory and system identification, physics, geometry, computer graphics, and machine learning. Course material includes state-of-the-art in the field, current research trends, and algorithms and their applications, with an emphasis on the mathematical methods used.

EECE 7374. Fundamentals of Computer Networks. 4 Hours.

Focuses on fundamental concepts of computer networks with a particular focus on the Internet. Covers the language and practices of computer networking at all levels of various network protocol stacks. Basic concepts include general definitions and network organization. Delves into the protocol stack following a top-down approach, covering the application layer (with Internet applications); the transport layer, with its functions and services (e.g., the TCP protocol); the network layer, with a discussion on forwarding and routing and the IP protocol; and the data link layer, with an emphasis on multiaccess. Concludes with current topics including networks analysis/modeling, physical layer/cross-layer design, emerging technologies, and mobility.

EECE 7376. Operating Systems: Interface and Implementation. 4 Hours.

Covers fundamentals of operating systems (OS) design, including theoretical, OS-generic design considerations as well as the practical, implementation-specific challenges in the development of a real OS. Requires proficiency in the C programming language, the GNU tool set for C programming, and debugging in Unix operating systems.

EECE 7377. Scalable and Sustainable System Design. 4 Hours.

Focuses on data center scale system design issues. Covers advanced issues in designing high-performance computing and data storage systems. Through a mix of lectures and paper discussions, offers students an opportunity to learn how parallel computing systems work and review recent research related to scalability, energy efficiency, sustainability, resilience, and big data management. Topics include high-performance scalable parallelization strategies for emerging computational applications from different science and engineering domains. Successful students should be able to understand the design trade-offs in designing, engineering, and operating large-scale parallel computing systems. Features a research-oriented project that serves as the experiential learning component of the course for gaining hands-on experience in solving real-world problems in parallel computing. Students are expected to present their results and findings and submit a written report.

EECE 7390. Computer Hardware Security. 4 Hours.

Presents the foundations for understanding the new and evolving area of hardware security and trust, which have become major concerns for national security over the past decade. Coverage includes security and trust issues in all types of electronic devices and systems, such as ASICs, COTS, FPGAs, microprocessors/DSPs, and embedded systems. Topics encompass the state-of-the-art research fronts such as hardware support for system security, hardware implementations of security primitives, physical attacks and tamper resistance, analysis and practices of side-channel attacks and countermeasures, security for RFID tags, physically unclonable functions, design for hardware trust, hardware Trojan detection and localization, etc. Requires solid knowledge of digital system design, integrated circuits synthesis flow, and embedded systems recommended.

EECE 7393. Analysis and Design of Data Networks. 4 Hours.

Introduces fundamental concepts and approaches for the analysis and design of data networks. Covers delay models, multi-access communication, scheduling, routing, congestion control, and network coding. Presents analytical techniques such as basic queuing theory, queuing networks, optimization, stochastic control, and distributed algorithms. Requires knowledge of basic probability.

EECE 7397. Advanced Machine Learning. 4 Hours.

Covers topics in advanced machine learning. Presents materials in the current machine learning literature. Focuses on graphical models, latent variable models, Bayesian inference, and nonparametric Bayesian methods. Seeks to prepare students to do research in machine learning. Expects students to read conference and journal articles, present these articles, and write an individual research paper. CS 7140 and EECE 7397 are cross-listed.

EECE 7398. Special Topics. 4 Hours.

Covers topics of interest to the faculty member conducting this class for advanced study. May be repeated without limit.

EECE 7399. Preparing High-Stakes Written and Oral Materials. 4 Hours.

Focuses on how to think through and develop critical materials that have high-stakes impact. These could include writing a compelling technical paper or a winning proposal for external funding, making a compelling oral presentation for a job interview or thesis defense, or presenting arguments to a CEO about strategic directions for a complex project. Includes hands-on exercises and class exercises around challenges defined by the instructor or by guest lecturers.

EECE 7400. Special Problems in Electrical and Computer Engineering. 1-4 Hours.

Offers theoretical or experimental work under individual faculty supervision.

EECE 7674. Master's Project. 4 Hours.

Offers analytical and/or experimental work leading to a written report and a final short presentation by the end of the semester.

EECE 7962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

EECE 7990. Thesis. 4-8 Hours.

Offers analytical and/or experimental work conducted under the auspices of the department. May be repeated once.

EECE 7996. Thesis Continuation. 0 Hours.

Offers analytical and/or experimental work conducted under the auspices of the department.

EECE 8986. Research. 0 Hours.

Offers students an opportunity to conduct full-time research under faculty supervision. May be repeated without limit.

EECE 9986. Research. 0 Hours.

Offers students an opportunity to conduct full-time research under faculty supervision. May be repeated without limit.

EECE 9990. Dissertation. 0 Hours.

Offers theoretical and/or experimental work conducted under the auspices of the department. Required to be taken in two consecutive semesters. Includes attendance at Distinguished Lecture Series (DLS). May be repeated once.

EECE 9996. Dissertation Continuation. 0 Hours.

Offers continued dissertation work conducted under the supervision of a departmental faculty member. Includes attendance at Distinguished Lecture Series (DLS). Requires prior completion of EECE 9990 twice. May be repeated without limit.

Electrical Engineering Technology - CPS (EET)

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EET 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

EET 2000. Circuits 1. 3 Hours.

Covers the design and analysis of practical DC circuits. Topics include basic concepts; resistors; capacitors; inductors; series and parallel circuits; theorems of Norton and Thevenin; Ohm's Law; Kirchhoff's laws; loop; nodal and mesh analysis; amplifiers; transient analysis of RL, RC, and RLC circuits; power and energy; transformers; power sources; relays; switches; and SPICE simulation.

EET 2001. Lab for EET 2000. 2 Hours.

Accompanies EET 2000. Covers topics from the course through various experiments.

EET 2100. Circuits 2. 3 Hours.

Covers the design and analysis of practical AC circuits. Topics include network theorems; phasors; equivalent circuits; sinusoidal sources; steady-state analysis; steady-state power; impedance; admittance and frequency response; resonance; Bode plots; filters; power transfer; average, reactive, and complex power; and SPICE simulation.

EET 2101. Lab for EET 2100. 2 Hours.

Accompanies EET 2100. Covers topics from the course through various experiments.

EET 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

EET 3100. Electronics 1. 3 Hours.

Covers the theory and practical uses of active semiconductors. Topics include the operating characteristics of diodes, field-effect transistors, bipolar junction transistors, MOS transistors, and op amps; the analysis and design of single-stage amplifiers, diode circuits, and transistor circuits; rectifier circuits, clamping and clipping circuits, voltage multipliers, Zener regulators, temperature measuring, discrete amplifiers, feedback, basic op amp circuits, and switching circuits. SPICE is used to simulate circuits.

EET 3101. Lab for EET 3100. 2 Hours.

Accompanies EET 3100. Covers topics from the course through various experiments.

EET 3200. Electronics 2. 3 Hours.

Covers advanced analog devices and circuits and their uses. Topics include operational amplifiers, power transistors, timers, linear voltage regulators, switching regulators, sensors, advanced op amp circuits, active filters, oscillator circuitry, function generator, comparators, and timer circuitry. SPICE is used to simulate circuits, and data sheet analysis is included.

EET 3201. Lab for EET 3200. 2 Hours.

Accompanies EET 3200. Covers topics from the course through various experiments.

EET 3300. Digital Logic. 3 Hours.

Covers the design, analysis, and simulation of digital circuits. Topics include number systems, Boolean algebra, logic gates, combinational logic, circuit simplification, multiplexers, demultiplexers, encoders, decoders, latches, flip-flops, registers, counters, synchronous sequential circuits, and read-only (ROM) and random-access memory (RAM). Includes digital logic circuitry based on RTL, TTL, ECL, and CMOS logic families and the simulation of digital circuits using a hardware description language.

EET 3301. Lab for EET 3300. 2 Hours.

Accompanies EET 3300. Covers topics from the course through various experiments.

EET 3400. Digital Electronics. 3 Hours.

Covers concepts needed to implement digital circuits. Topics include digital logic circuitry based on RTL, TTL, ECL, and CMOS logic families; semiconductor, magnetic, and optical memory; read-only memory (ROM); random-access memory (RAM); programmable logic arrays (PLAs); programmable logic; the simulation of digital circuits using a hardware description language; and tools for electronic design automation.

EET 3401. Lab for EET 3400. 2 Hours.

Accompanies EET 3400. Covers topics from the course through various experiments.

EET 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

EET 4950. Seminar. 1-4 Hours.

Offers an in-depth study of selected topics.

EET 4955. Project. 1-4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student's major field. May be repeated without limit.

EET 4983. Topics. 1-4 Hours.

Covers special topics in electrical engineering technology. May be repeated without limit.

EET 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

EET 4991. Research. 1-4 Hours.

Offers students an opportunity to conduct research under faculty supervision.

EET 4992. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic.

EET 4993. Independent Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic.

EET 4994. Internship. 1-4 Hours.

Provides students with an opportunity for internship work.

EET 4995. Practicum. 1-4 Hours.

Provides eligible students with an opportunity for practical experience.

EET 4996. Experiential Education Directed Study. 1-4 Hours.

Draws upon the student's approved experiential activity and integrates it with study in the academic major.

Energy Systems (ENSY)

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ENSY 5000. Fundamentals of Energy System Integration. 4 Hours.

Presents fundamental issues of successfully integrating and implementing energy systems. Exposes students to combined heat and power strategies (cogeneration system), strategies of incorporating renewable with nonrenewable energy sources, thermoeconomics, and carbon sequestration techniques. Includes energy, exergy, and thermoeconomic cost factors in the presented case studies. Explores the effects of public policy, regulations, and financial operations on selecting energy technology. Students are given case studies to illustrate the complexity of implementing energy systems and are expected to complete a major project involving proposing an energy system. Emphasizes that successful implementation of energy systems requires both a technical and an economic solution. Requires calculus-based physics and chemistry.

ENSY 5050. Fundamentals of Thermal Science 1. 4 Hours.

Introduces and reviews thermodynamic properties such as temperature, pressure, energy, enthalpy, and entropy. Defines work and heat interactions and calculates the amount of energy transferred during thermodynamic processes. Introduces the first and second laws of thermodynamics and concepts of thermodynamic equilibrium. Discusses mass, energy, and entropy balance relations as well as conversion devices, such as turbine, compressors, pumps, valves, and energy exchangers. Studies simple power plants, refrigeration, heat (energy) pumps, and stationary gas turbine systems. Presents and reviews fundamentals of calculus, such as limit, differentiation, integration, power series, vector spaces, and multivariable functions needed for thermodynamic analysis.

ENSY 5060. Fundamentals of Thermal Science 2. 4 Hours.

Studies fundamental principles in fluid mechanics and thermal systems analysis. Topics include hydrostatics (pressure distribution, forces on submerged surfaces, and buoyancy); Newton's law of viscosity; integral forms of basic laws (conservation of mass, momentum, and energy); pipe flow analysis; concept of boundary layer; and drag coefficient. Presents Navier-Stokes equations as differential forms of conservative properties. Introduces theories of thermal energy transport, including conduction, convection, and thermal radiation; the design of thermal systems; and fundamentals of calculus, such as linear algebra, vector fields, and curvilinear coordinate systems required for introducing concepts of fluid dynamics and heat transfer. Discusses surface and volume integrals, conservative vector fields, and surface flux. Green's, divergence, and Stokes theorems are introduced for vector and scalar fields.

ENSY 5100. Hydropower. 4 Hours.

Covers fundamentals of hydropowered development projects and their relevant design parameters. Emphasizes harnessing the hydro-energy potentials of both natural and man-made reservoirs. Reviews hydro- and electromechanical equipment and civil structure. Addresses selection procedure and design parameters of the equipment and structure.

ENSY 5200. Energy Storage Systems. 4 Hours.

Explores the various energy storage technologies, their working, and their practical applications. Focuses on the state-of-the-art review of current and most recent technologies. Offers students an opportunity to explore various innovations in the field of energy storage that can be helpful for fulfilling our current energy storage needs. Covers many different energy storage systems such as mechanical, chemical, electrochemical, thermal, thermochemical, etc.

ENSY 5300. Electrochemical Energy Storage. 4 Hours.

Covers the basics of electrode kinetics and thermodynamics as applied to electrochemical energy storage systems, as well as batteries and capacitors for traction and stationary power. Discusses the chemical structure of electrodes and electrolytes and practical battery construction.

ENSY 5400. Power Plant Design and Analysis. 4 Hours.

Reviews the fundamental laws of thermodynamics and balance equations for mass, energy, exergy, and entropy. Studies thermochemistry, chemical equilibrium, fuels and combustion, steam power plant cycle, gas turbine systems, thermo-economics, nuclear power plants, and energy recovery.

ENSY 5500. Smart Grid. 4 Hours.

Covers fundamentals of smart electric power grid. Covers definition, design criteria, and technology. Smart grid can be defined as the application of information processing and communications to the power grid. Seeks to motivate development of the smart grid, evaluating options for adding sensing, communications, computation, intelligence, control, and automation to various parts of the electric system. Topics include automation, or lack thereof, in existing power systems; generation; transmission; distribution; and smart grid definition.

ENSY 5585. Wind Energy Systems. 4 Hours.

Introduces wind energy and its applications. Integrates aerodynamics of wind turbine design with the structures needed to support them. Covers types of wind turbines, their components, and related analyses; airfoil aerodynamics; concepts of lift, drag, pitching moment, circulation, angle of attack, and stall; laminar and turbulent boundary layers and separation concepts; fundamental conservation equations; Bernoulli's, Euler's, and Navier-Stokes equations and their applications; Betz limit; computational fluid dynamics and its application for flow over typical airfoils; compressibility and elements of one-dimensional gas dynamics; wind resource; wind climatology and meteorological data; turbine tower and structural engineering aspects of turbines; vibration problems; aeroelastic phenomena in turbines; small wind turbines and vertical axis wind turbines; and introduces environmental and societal impacts and economic aspects.

ENSY 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ENSY 7374. Special Topics in Energy Systems. 4 Hours.

Offers topics of interest to the staff member conducting the course for advanced study. May be repeated without limit.

ENSY 7440. Energy Systems Engineering Leadership Challenge Project 1. 4 Hours.

Offers students an opportunity to develop and present a plan for the demonstration of a marketable technology product or prototype with an energy systems focus. Constitutes the first half of a thesis-scale project in technology commercialization. Requires work/training with a sponsoring organization or employer to improve a process or develop a project that is of significant value to the organization and demonstrates a quantifiable market impact while enhancing the student's technological and engineering depth and fostering the student's leadership development.

ENSY 7442. Energy Systems Engineering Leadership Challenge Project 2. 4 Hours.

Continues ENSY 7440, a thesis-scale project in technology commercialization. Offers students an opportunity to demonstrate their development of a marketable technology product or prototype with an energy systems focus and to produce a written documentary report on the project to the satisfaction of an advising committee. Requires work/training with a sponsoring organization or employer to improve a process or develop a project that is of significant value to the organization and demonstrates a quantifiable market impact while enhancing the student's technological and engineering depth and fostering the student's leadership development.

ENSY 7945. Master's Project. 4 Hours.

Offers theoretical or experimental work under individual faculty supervision.

ENSY 7978. Independent Study. 1-4 Hours.

Offers an individual effort in an area selected by student and advisor and approved by the Department Discipline Committee, resulting in a definitive report. May be repeated without limit.

Engineering Cooperative Education (ENCP)

Search ENCP Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=ENCP>)

ENCP 6000. Career Management for Engineers. 1 Hour.

Designed to introduce graduate engineering students to the cooperative education program and to maximize their learning by helping them become more intentional about learning in co-op and in the transfer of that knowledge and experience to and from their academic program and throughout their entire careers. Offers students an opportunity to develop career goals; to be able to identify and justify what they need to learn through their co-op experience and entire careers; and to acquire the tools to be able to continually assess what they already know, what they think they know, what they need to know, and what they would like to know in relation to achieving their career goals. Includes readings, exercises, and discussions. This course does not count toward degree requirements.

ENCP 6100. Introduction to Cooperative Education. 1 Hour.

Introduces graduate students to the cooperative education program. Offers students an opportunity to develop job-search and career-management skills. Students perform discipline-specific assessments of their workplace skills, interests, and values and discuss how they impact personal career choices. Covers how to develop field/industry-specific materials, including a professional-style resumé and cover letter, and introduces students to career portfolios. Additional topics include ethics, professional behaviors, workplace culture, and proper interviewing techniques. Familiarizes students with workplace issues relative to their field of study while outlining co-op policies, procedures, and expectations of the cooperative education program and employers. This course does not count toward degree requirements.

ENCP 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ENCP 6964. Co-op Work Experience. 0 Hours.

Provides eligible students with an opportunity for work experience. May be repeated without limit.

Engineering Interdisciplinary (ENGR)

Search ENGR Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=ENGR>)

ENGR 5050. Advanced Engineering Calculus with Applications. 4 Hours.

Introduces methods of vector analysis. Expects students to master over thirty predefined types of problems. Topics include analytic geometry in three dimensions, geometric vectors and vector algebra, curves in three-space, linear approximations, the gradient, the chain rule, the Lagrange multiplier, iterated integrals, integrals in curvilinear coordinates, change of variables, vector fields, line integrals, conservative fields, surfaces and surface integrals, the flux and the circulation of a vector field, Green's theorem, the divergence theorem, and Stokes' theorem. Illustrates the material by real-world science and engineering applications using the above techniques. Requires familiarity with single-variable calculus.

ENGR 5670. Sustainable Energy: Materials, Conversion, Storage, and Usage. 4 Hours.

Examines, in this interdisciplinary course, modern energy usage, consequences, and options to support sustainable energy development from a variety of fundamental and applied perspectives. Emphasizes both (1) physical and chemical processes in materials for the conversion of energy and (2) how to design a system with renewable energy for applications such as electricity generation and transmission. Takes a systems analysis point of view. Topics may include energy conservation; fossil fuels; and energy conversion methods for solar, geothermal, wind, hydro, bioenergy, electrochemical, and similar methods.

ENGR 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ENGR 7978. Independent Study. 1-4 Hours.

Offers theoretical or experimental work under individual faculty supervision. May be repeated without limit.

ENGR 9700. Dissertation Fieldwork. 0 Hours.

Offers students an opportunity to pursue experiential research outside the classroom and outside the university. Engineering PhD students only. May be repeated up to two times.

ENGR 9701. Engineering Teaching Practicum. 0 Hours.

Offers intermediate or terminal-level doctoral candidates a teaching assignment under the guidance of a faculty member. Typical activities include preparing and teaching recitations; preparing and teaching laboratory sessions; holding office hours; preparing and grading quizzes, problem sets, and other assignments; and assisting the instructor with other activities associated with teaching a course. All nonnative English speakers should conform to the university language requirements for teaching assistants. May be repeated up to five times.

Engineering Leadership (ENLR)

Search ENLR Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=ENLR>)

ENLR 5121. Engineering Leadership 1. 2 Hours.

Covers elements of engineering practices such as product engineering (system design and engineering, integration, and documentation); engineering leadership (team building, communication, leadership styles, ethical behavior, and conflict resolution); market assessment (engineering economics, business plans, intellectual property, risk assessment, and mitigation); and engineering excellence (quality, reliability, serviceability, manufacturability, procurement, and problem solving). Requires work/training with a sponsoring organization or employer to improve a process or develop a project that is of significant value to the organization and demonstrates a quantifiable market impact while enhancing the student's technological and engineering depth and fostering the student's leadership development.

ENLR 5122. Engineering Leadership 2. 2 Hours.

Continues the examination of engineering practices begun in ENLR 5121. Requires work/training with a sponsoring organization or employer to improve a process or develop a project that is of significant value to the organization and demonstrates a quantifiable market impact while enhancing the student's technological and engineering depth and fostering the student's leadership development.

ENLR 5131. Scientific Foundations of Engineering 1. 2 Hours.

Presents the fundamental science underlying engineering disciplines. Develops a conceptual framework to understand interdisciplinary engineering practice and to make informed, back-of-the-envelope, quantitative estimates. Covers topics such as principles of mechanics and mechanics of materials, wave physics, quantum physics, statistical and thermal physics, fluid physics, Maxwell's equations and constitutive relations, and topics in chemistry and biology.

ENLR 5132. Scientific Foundations of Engineering 2. 2 Hours.

Continues the examination of fundamental science begun in ENLR 5131.

ENLR 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ENLR 7400. Special Problems in Engineering Leadership. 1-4 Hours.

Offers theoretical or experimental work under individual faculty supervision.

ENLR 7440. Engineering Leadership Challenge Project 1. 4 Hours.

Offers students an opportunity to develop and present a plan for the demonstration of a marketable technology product or prototype. This course is the first half of a thesis-scale project in technology commercialization. Requires work/training with a sponsoring organization or employer to improve a process or develop a project that is of significant value to the organization and demonstrates a quantifiable market impact while enhancing the student's technological and engineering depth and fostering the student's leadership development.

ENLR 7442. Engineering Leadership Challenge Project 2. 4 Hours.

Continues ENLR 7440, a thesis-scale project in technology commercialization. Offers students an opportunity to demonstrate their development of a marketable technology product or prototype and produce a written documentary report on the project to the satisfaction of an advising committee. Requires work/training with a sponsoring organization or employer to improve a process or develop a project that is of significant value to the organization and demonstrates a quantifiable market impact while enhancing the student's technological and engineering depth and fostering the student's leadership development.

ENLR 7444. Engineering Leadership Challenge Project Continuation. 0 Hours.

Continues ENLR 7442, a thesis-scale project in technology commercialization. Requires work/training with a sponsoring organization or employer to improve a process or develop a project that is of significant value to the organization and demonstrates a quantifiable market impact while enhancing the student's technological and engineering depth and fostering the student's leadership development.

Engineering Management (EMGT)

Search EMGT Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=EMGT>)

EMGT 5220. Engineering Project Management. 4 Hours.

Examines the theory and practice of managing projects. Explores human, mathematical, entrepreneurial, managerial, and engineering aspects of project management. The systems development life cycle is the framework for the course. Addresses needs analysis, requirements definition, design, and implementation in the context of project management. Introduces mathematical and software tools for planning, monitoring, and controlling projects.

EMGT 5300. Engineering/Organizational Psychology. 4 Hours.

Offers an analysis of the purpose and functioning of organizations as the basic networks for achieving goals through coordination of effort, communication, and responsibility. Studies the role and function of engineering organizations based on modern behavioral science concepts as well as the application of psychology to industry relative to human relations, group dynamics, tests and measurements, personnel practices, training, and motivation. Examines the evolution of the learning organization and its role in the management of R&D and technology, the influence of the rapid changes in technology, and the globalization of the marketplace through group-oriented case studies.

EMGT 5964. Experiential Project. 0 Hours.

Offers students an applied project setting in which to apply their curricular learning. Working with a sponsor, students refine an applied research topic, perform research, develop recommendations that are shared with a partner sponsor, and create a plan for implementing their recommendations. Seeks to benefit students with a curriculum that supports the development of key business communication skills, project and client management skills, and frameworks for business analysis. Offers students an opportunity to learn from sponsor feedback, review lessons learned, and incorporate suggestions from this review to improve and further develop their career development and professional plan. May be repeated twice. .

EMGT 6225. Economic Decision Making. 4 Hours.

Explores economic modeling and analysis techniques for selecting alternatives from potential solutions to an engineering problem. Considers measures of merit, such as present worth, annual worth, rate of return, and benefit/cost techniques. Examines recent techniques of economic analysis, especially the tools of decision making. Explores decisions under uncertainty. Studies the causes of risk and uncertainty, and examines ways to change and influence the degree of risk and uncertainty through sensitivity analysis, expectation-variance criterion, decision tree analysis, statistical decision techniques, and multiple attribute decision making through group case studies.

EMGT 6305. Financial Management for Engineers. 4 Hours.

Examines the issues and processes of short-term financing on industrial firms, financial analysis of cases, supplemented by readings to develop familiarity with sources and uses of working capital as well as the goals and problems involved in its management. Also covers the analysis necessary for such long-term financial decisions as issuance of stock or bonds; contracting of leases or loans, and financing of a new enterprise; mergers, capital budgeting, the cost of capital, and the valuation of a business. Examines financial statement ratio analysis along with the use of the capital asset pricing model as it relates to risk and return. Explores leverage and capital structure and international managerial finance in the examination of the overall financial policy decision-making process.

EMGT 6600. Engineering Team Performance. 4 Hours.

Offers students an opportunity to obtain foundational knowledge of team performance and learn the practical application of principles to enable them to develop practical skills in managing engineering and other technical team development initiatives. Teaming is a critical technique used to make a positive impact on personal and organizational performance and is essential for engineering and other technical disciplines. Designed to help students understand why and how team skills are critical to organizational success, learn how to use team skills to more effectively achieve engineering and technical goals as well as to organize and influence others to work more effectively, and to apply cognition to develop higher-performing teams.

EMGT 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

EMGT 7374. Special Topics in Engineering Management. 4 Hours.

Offers topics of interest to the staff member conducting this class for advanced study. May be repeated without limit.

EMGT 7945. Master's Project. 4 Hours.

Offers theoretical or experimental work under individual faculty supervision.

EMGT 7962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

EMGT 7978. Independent Study. 1-4 Hours.

Offers theoretical or experimental work under individual faculty supervision. May be repeated without limit.

EMGT 7990. Thesis. 1-8 Hours.

Offers analytical and/or experimental work conducted under the direction of the faculty in fulfillment of the requirements for the degree. Requires first-year students to attend a graduate seminar program that introduces the students to the methods of choosing a research topic, conducting research, and preparing a thesis. Requires successful completion of the seminar program. May be repeated without limit.

EMGT 7996. Thesis Continuation. 0 Hours.

Continues thesis work conducted under the supervision of a departmental faculty member.

English (ENGL)

Search ENGL Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=ENGL>)

ENGL 1000. English at Northeastern. 1 Hour.

Intended for first-year students in the College of Social Sciences and Humanities. Introduces first-year students to the liberal arts in general; familiarizes them with their major; helps them develop the academic skills necessary to succeed (analytical ability and critical thinking); provides grounding in the culture and values of the University community; and helps them develop interpersonal skills—in short, familiarizes students with all skills needed to become a successful university student. .

ENGL 1120. Trouble in Utopia. 4 Hours.

Offers a first-year seminar exploring utopian/dystopian thought from Plato to contemporary popular culture, as a site for literary, political, social, and personal experimentation. Offers students opportunities to identify, critique, and theorize utopian ideas in critical and creative writing exercises. Culminates in a collective exhibit for which students produce and analyze their own utopian "artifacts" in the medium of their choice.

ENGL 1140. Grammar: The Architecture of English. 4 Hours.

Seeks to provide students with the basic tools for analyzing sentence structure—the nuts and bolts of English. Starting from internalized systems of linguistic rules, which allow us to produce and understand language, students study the organizing principles of grammar: how words are assigned to categories (or parts of speech); how they form syntactic units, or phrases; and how these phrases function together in larger units, or clauses. Offers students an opportunity to acquire a precise vocabulary for talking about sentence structure, as well as a useful set of tools for analyzing language in all of its representations.

ENGL 1160. Introduction to Rhetoric. 4 Hours.

Introduces students to major concepts, traditions, and issues in rhetorical studies. Explores the range of ways that people persuade others to change their minds or take action; the relationship among language, truth, and knowledge; and the role of language in shaping identity and culture. Focuses on recognized thinkers from the Western tradition as well as writers that challenge the rhetorical canon. Emphasizes contemporary and interdisciplinary approaches to rhetoric interested in the entire range of rhetorical artifacts, with primary attention given to methods of critically investigating texts and their effects.

ENGL 1400. Introduction to Literary Studies. 4 Hours.

Offers a foundational course designed for English majors. Introduces the methods and topics of English literary and textual studies, including allied media (e.g., film, graphic narrative). Explores strategies for reading, interpreting, and theorizing about texts; for conducting research; for developing skills in thinking analytically and writing clearly about complex ideas; and for entering into written dialogue with scholarship in the diverse fields that comprise literary studies.

ENGL 1410. Introduction to Writing Studies. 4 Hours.

Introduces the basic theories, history, methodologies, and debates surrounding the study of how people learn to write and how writing is used in home, school, work, and civic contexts. Considers writing itself as both a practice and an object of study. Explores historical, rhetorical, linguistic, cognitive, social, and critical approaches to the teaching, study, and practice of writing, both in the U.S. tradition and in international contexts (e.g., UK, France, China). Emphasizes research on the development of critical reading and writing practices and students' understanding of their own experiences and practices of other groups.

ENGL 1450. Reading and Writing in the Digital Age. 4 Hours.

Grapples with the long and sometimes tumultuous relationship between literature—including fiction, poetry, film, and video games—and new media technologies. Offers students opportunities to historicize and engage the social and literary upheavals of our own technological moment through reading, discussion, writing projects, and practicums that seek to develop skills for analyzing the data and metadata of texts through both qualitative and quantitative methods.

ENGL 1502. American Literature to 1865. 4 Hours.

Surveys the major American writers and major literary forms from the colonial period to the Civil War. Includes works by such writers as Bradstreet, Taylor, Wheatley, Cooper, Poe, Hawthorne, Douglass, Stowe, Melville, and Emerson.

ENGL 1503. American Literature 1865 to Present. 4 Hours.

Surveys the major American writers and major literary works from the Civil War through the present. Includes works by such writers as Whitman, Dickinson, Twain, James, Hemingway, Moore, Faulkner, Ellison, and Morrison.

ENGL 1600. Introduction to Shakespeare. 4 Hours.

Introduces students to a selection of Shakespeare's major plays in each of the principle genres of comedy, tragedy, history, and romance.

ENGL 1700. Global Literature to 1500. 4 Hours.

Introduces students to the ancient and classical literatures of Greece, Rome, and the eastern Mediterranean, as well as other premodern literatures in translation.

ENGL 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ENGL 2150. Literature and Digital Diversity. 4 Hours.

Focuses on the use of digital methods to analyze and archive literary texts, emphasizing issues of diversity and inclusion. Covers three main areas: text encoding, textual analysis, and archive construction. Considers literary texts and corpora, including works by well-known authors such as Shakespeare, together with collections by marginalized writers, including slave narratives and writings by early modern women. Offers students an opportunity to explore what counts as literature and how computers, databases, and analytical tools give substance to concepts of aesthetic, cultural, and intellectual value as inflected by race and gender.

ENGL 2240. 17th-Century British Literature. 4 Hours.

Examines the literature and culture of the period from the death of Elizabeth I to the end of the century. Considers such figures as Bacon, Jonson, Donne, Herbert, Milton, Marvell, Cavendish, and Behn.

ENGL 2250. 18th-Century British Literature. 4 Hours.

Surveys the long eighteenth century with particular attention to the Augustan age. Includes such major writers as Behn, Pope, Swift, Goldsmith, and Johnson.

ENGL 2270. Victorian Literature. 4 Hours.

Surveys the major writers, genres, and issues of Victorian England, considering such authors as Tennyson, Browning, Dickens, the Brontës, Hopkins, and Wilde.

ENGL 2296. Early African-American Literature. 4 Hours.

Surveys the development and range of black American writers, emphasizing poetry and prose from early colonial times to the Civil War. ENGL 2296 and AFM 2296 are cross-listed.

ENGL 2301. The Graphic Novel. 4 Hours.

Explores the word-and-image relationship in a narrative form. Offers students an opportunity to learn how to read comics—and what they teach us about reading—in addition to the creative practices that go into making them. Examines antecedents including “engraved novels,” newspaper comic strips, “wordless novels,” underground comic books, and punk fanzines to understand the graphic novel's rise in the 1970s. Explores current directions in production. Includes visits from artists to discuss the craft of this verbal-visual form. ARTE 2301 and ENGL 2301 are cross-listed.

ENGL 2330. The American Renaissance. 4 Hours.

Studies the nineteenth-century development of an American national literary tradition in the context of democratic and romantic attitudes toward experience, nation formation, and national crisis. Includes such writers as Emerson, Thoreau, Hawthorne, Fuller, and Melville.

ENGL 2360. Modern African-American Literature. 4 Hours.

Surveys the development and range of black American writers in poetry and prose from the post-Civil War period to the present.

ENGL 2380. The Modern Novel. 4 Hours.

Studies the major British and American novelists of the twentieth century. Considers theme and form in such authors as Lawrence, Woolf, Fitzgerald, Ellison, and Hurston.

ENGL 2420. Contemporary Poetry. 4 Hours.

Studies developments in British and (especially) American poetry since 1945. Includes such writers as Bishop, Lowell, Ginsberg, Ashbery, Walcott, Heaney, Kunitz, Jorie Graham, Frank Bidart, Rita Dove, and Kevin Young.

ENGL 2430. Contemporary Fiction. 4 Hours.

Examines British and American writers from 1945 to the present, including such figures as Lessing, Burgess, Pynchon, Morrison, Kingston, and Erdrich.

ENGL 2440. The Modern Bestseller. 4 Hours.

Explores the relationship between commercially successful fiction and the popular imagination.

ENGL 2450. Postcolonial Literature. 4 Hours.

Examines the literature and cultures of postcolonial nations in the Caribbean, Africa, and Asia. Designed to familiarize students with the cultural paradigms and transnational experiences of colonialism. Focuses on the variety of artistic strategies employed by writers to communicate contemporary postcolonial themes such as neocolonialism, nationalism, Third-World feminism, and diaspora. CLTR 2450 and ENGL 2450 are cross-listed.

ENGL 2451. Postcolonial Women Writers. 4 Hours.

Examines the literature and cultures of postcolonial nations in the Caribbean, Africa, Asia, and elsewhere through the lens of gender. Designed to familiarize students with the relationships between cultural paradigms associated with gender and transnational experiences of colonialism. Focuses on the variety of artistic strategies employed by writers to communicate the impacts of gender and sexuality on contemporary postcolonial themes such as neocolonialism, nationalism, and diaspora. Writers may include Chimamanda Adichie, Nawal El Saadawi, Marjane Satrapi, Bessie Head, Arundhati Roy, Banana Yoshimoto, Sonia Singh, and Dionne Brand. ENGL 2451, WMNS 2451, and CLTR 2451 are cross-listed.

ENGL 2455. American Women Writers Race. 4 Hours.

Surveys the diversity of American women's writing to ask what it means to describe writers as disparate as Phillis Wheatley, Edith Wharton, Toni Morrison, and Alison Bechdel as part of the same "tradition." With attention to all genres of American women's writing, introduces issues of genre and gender; literary identification; canons; the politics of recuperation; silence and masquerade; gender and sexuality; intersectionality; sexual and literary politics, compulsory heterosexuality, and more. AFAM 2455, ENGL 2455, and WMNS 2455 are cross-listed.

ENGL 2460. Multiethnic Literatures of the U.S.. 4 Hours.

Explores contemporary American literature by writers from distinctive ethnic groups (for example, Native, Asian, African, Latino/a, Jewish, Italian, Irish, Arab). Features a variety of works that reflect an evolving recognition of the artistically and culturally diverse nature of American literature.

ENGL 2510. Horror Fiction. 4 Hours.

Explores English and American horror fiction. Focuses on short stories, novels, and movies. Examines the evolution of horror fiction and the various themes, techniques, and uses of the macabre.

ENGL 2520. Science Fiction. 4 Hours.

Traces the development of various science fiction themes, conventions, and approaches from early human-vs.-machine tales to tales of alien encounters. Examines how science fiction explores the relationship between humans and technology as well as humans and nature.

ENGL 2600. Irish Literary Culture (Abroad). 4 Hours.

Explores Irish writers from the nineteenth century through the present. Emphasizes their relationships to contemporary Irish society. Explores the formal traditions of Irish writing as well as the historical, political, and cultural discourses that Irish writing has both helped to shape and within which the writing circulates. As the course takes place in Dublin during the summer term, offers students an opportunity to meet living Irish writers who talk about their relationship to the literary tradition and their own craft. Covers writers such as Oscar Wilde, James Joyce, Kate O'Brien, Colm Tóibín, Anne Enright, Paul Murray, Kevin Barry, and Maeve Binchy. .

ENGL 2610. Contemporary Israeli Literature and Art (Abroad). 4 Hours.

Explores contemporary Israeli culture through literature and art. Focuses on the tensions, pains, and pleasures of existence from various Israeli points of view. Takes place in Israel during the summer term, offering students an opportunity to meet with contemporary Israeli writers, visit sites of the literary settings, and explore art galleries and museums. Readings include short stories and poetry by major Israeli and Palestinian writers from 1948 through the present. ENGL 2610 and JWSS 2610 are cross-listed.

ENGL 2620. What Is Nature? (Abroad). 4 Hours.

Focuses on a variety of texts (imaginative literature, memoir, scientific writing, creative nonfiction, and popular journalism) that take nature, ecology, and the environment as their subject. Examines paintings, photography, and other visual representations (such as computer simulations) of the natural world. Takes place in Boston and in the United Kingdom.

ENGL 2690. Boston in Literature. 4 Hours.

Explores the various ways in which the city of Boston and its environs are represented in literature and other media. Each semester, the course focuses on a different aspect of Boston in literature, such as representations of Boston's different communities, different historical eras, particular genres or concepts associated with the city, and so forth. Offers students an opportunity to build upon their readings about the city by experiencing independent site visits, class field trips, guest speakers, and other activities. In addition to a culminating group or individual research project about Boston, students may also have the opportunity to participate in a community-based reading project. ENGL 2690 and AFAM 2690 are cross-listed.

ENGL 2695. Travel and Place-Based Writing. 4 Hours.

Focuses on travel writing and place-based writing. Examines the history, global cultural contexts, conventions of, and theories about the genres through reading exemplary texts and studying photographs and films. Offers students an opportunity to produce examples of travel writing and place-based writing as well as short videos and photo-collages.

ENGL 2700. Creative Writing. 4 Hours.

Gives the developing writer an opportunity to practice writing various forms of both poetry and prose. Features in-class discussion of student work.

ENGL 2710. Style and Editing. 4 Hours.

Explores the relationship between style and substance through close attention to choices made at the level of the paragraph, sentence, and word. Introduces editorial processes and practices and gives students practice in editing for themselves and others.

ENGL 2740. Writing and Community Engagement. 4 Hours.

Offers students an opportunity to study and practice writing in community contexts through advocacy writing, service-learning, community research, and/or community publishing.

ENGL 2760. Writing in Global Contexts. 4 Hours.

Explores the various ways that linguistic diversity shapes our everyday, academic, and professional lives. Offers students an opportunity to learn about language policy, the changing place of World English in globalization, and what contemporary theories of linguistic diversity, such as translanguaging, mean for writing. Invites students to explore their own multilingual communities or histories through empirical or archival research.

ENGL 2770. Writing to Heal. 4 Hours.

Explores how creative writing can be used as a healing tool. Offers students opportunities to analyze, theorize, and create healing narratives through readings, in-class writing activities, writing workshops, and process journals. Culminates in the creation and revision of written personal narratives as well as a digital storytelling project.

ENGL 2780. Visual Writing: Writing Visuals. 4 Hours.

Explores how visual elements, such as fonts, graphics, charts, and video, work within different types of documents to reach various audiences across cultures. Readings cover several aspects of visual writing (e.g., thinking, learning, and expressing) and draw on theories of visual rhetoric to explore the interaction among content, visual elements, audiences, and contexts. Culminates in an electronic portfolio and collective exhibit.

ENGL 2850. Writing for Social Media: Theory and Practice. 4 Hours.

Explores the development and roles of social media writing. Asks students to describe, define, and contextualize current social media genre(s) using readings from social media sites, scholarship, popular/journalistic works, and fiction. Invites students to adopt a new social media platform and to produce social media writing in short, longer individually produced, and longer collaborative forms. Offers each student an opportunity to create a curated, reflective portfolio that works toward an integrated personal/professional digital identity.

ENGL 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ENGL 2995. Practicum. 1-4 Hours.

Offers eligible students an opportunity for practical experience. May be repeated without limit.

ENGL 3325. Rhetoric of Law. 4 Hours.

Introduces students to the persuasive work of legal texts, procedures, and institutions. Investigates the range of critical approaches to the study of law and rhetoric, as well as the implications of understanding law as rhetorical. Draws on texts produced by lawyers and judges, classical rhetoricians, contemporary rhetorical critics, and legal scholars.

ENGL 3340. Technologies of Text. 4 Hours.

Examines innovations that have reshaped how humans share information, e.g., the alphabet, the book, the printing press, the postal system, the computer. Focuses on debates over privacy, memory, intellectual property, and textual authority that have historically accompanied the rise of new media forms and genres. Offers students an opportunity to gain skills for working with texts using the rapidly changing tools of the present, e.g., geographic information systems, data mining, textual analysis.

ENGL 3370. Writing Cultures. 4 Hours.

Offers students an opportunity to conduct qualitative empirical research (using methods such as interviewing and observation) into rhetorical practices, such as reading, writing, listening, speaking, and body language. Explores the role of rhetoric and writing in the representation of people, cultures, and research in online and physical spaces.

ENGL 3375. Writing Boston. 4 Hours.

Explores how writing shapes the life of, and life in, the city. Considers how Boston is constructed in a range of discourses and disciplines. Offers students an opportunity to research and write about the city and participate in a community-based writing project.

ENGL 3376. Creative Nonfiction. 4 Hours.

Explores how writers apply narrative strategies and techniques to factual material. Offers students an opportunity to read and write a variety of nonfiction forms (e.g., narrative essays and narrative journalism, travel and science writing, memoir, editorials, protest and political essays), as well as cross-genre and hybrid forms (e.g., nonfiction prose mixed with poetry, audio and graphic nonfiction). The topics for narrative nonfiction writing apply to a wide array of disciplines, including the humanities, the sciences, and journalism.

ENGL 3377. Poetry Workshop. 4 Hours.

Offers an advanced workshop in writing and reading original poetry. Students experiment in established poetic forms. Features in-class discussion of student work.

ENGL 3378. Fiction Workshop. 4 Hours.

Offers an advanced workshop in writing and reading original fiction. Features in-class discussion of student work.

ENGL 3380. Topics in Writing. 4 Hours.

Allows writers to hone their skills as readers and writers and to develop their interests in a particular form, such as travel writing, autobiography, and science writing. May be repeated without limit.

ENGL 3381. The Practice and Theory of Teaching Writing. 4 Hours.

Focuses on the teaching of writing by studying the professional literature of writing theory as well as a teaching practicum. Students work as a writing tutor or shadow experienced teachers. Offers students an opportunity to prepare for future teaching of writing and to obtain deeper insight into their own writing processes.

ENGL 3382. Publishing in the 21st Century. 4 Hours.

Explores modes and processes of publication in an era of technological and economic change. Investigates the roles of writers, editors, and publishers in this shifting landscape. Offers students an opportunity to attend readings, lectures, and other community literacy events and work with community partners on publication projects.

ENGL 3384. The Writer's Marketplace. 4 Hours.

Explores how writers negotiate the world of literary publishing. Focuses on producing publishable work in genres of the student's choice (fiction, poetry, creative nonfiction), submitting work to appropriate venues, and working with editors and agents.

ENGL 3426. Literature and Politics. 4 Hours.

Explores how authors represent the religious, moral, ethical, and social conflicts arising from the acquisition, use, and misuse of political power.

ENGL 3487. Film and Text (Abroad). 4 Hours.

Studies the similarities and differences between literary texts and film versions of those texts or the interrelations between film and literature as a means of cultural expression in a specific country outside the United States. May be repeated without limit.

ENGL 3572. Fantasy Literature. 4 Hours.

Introduces students to the history, cultural contexts, and social functions of fantasy broadly defined (characterized by imaginary or parallel worlds, magic, magical creatures and objects, and magicians, as well as the supernatural) across a variety of forms and media: poetry, short fiction, novels, film, art, music, and games. .

ENGL 3582. Children's Literature. 4 Hours.

Studies children's literature with attention to such matters as genre, theme, and social dynamics.

ENGL 3618. Milton. 4 Hours.

Concentrates on Milton's *Paradise Lost*, with supplementary readings in his minor poetry and prose.

ENGL 3619. Emerson and Thoreau. 4 Hours.

Focuses on Ralph Waldo Emerson and Henry David Thoreau, two major American Romantic writers whose ideas about the individual, spirituality, nature, and politics have had a wide-ranging impact on American culture. Readings include essays, poetry, and journals by these two Massachusetts-based authors.

ENGL 3663. The African-American Novel. 4 Hours.

Studies the African-American novelist's place in the history of American fiction. Focuses on Chesnut, Toomer, Wright, Ellison, and contemporary novelists and on their different perceptions of the African-American experience in America. ENGL 3663 and AFAM 3663 are cross-listed. .

ENGL 3676. Representing Gender and Sexuality in Literature. 4 Hours.

Investigates the construction of gender and its representation in relation to sexuality, power, and subjectivity in a variety of texts. May be repeated without limit. ENGL 3676 and WMNS 3676 are cross-listed.

ENGL 3678. Bedrooms and Battlefields: Hebrew Bible and the Origins of Sex, Gender, and Ethnicity. 4 Hours.

Considers stories from Hebrew Scripture in English translation, beginning with the Garden of Eden through the Book of Ruth, asking how these foundational narratives establish the categories that have come to define our humanity. Analyzes how the Bible's patterns of representation construct sexual and ethnic identities and naturalize ideas about such social institutions as "the family." ENGL 3678, JWSS 3678, and WMNS 3678 are cross-listed. .

ENGL 3685. Modern and Contemporary Jewish Literature. 4 Hours.

Surveys Jewish literature from the late modern (1880–1948) and contemporary (1948–present) periods. Considers themes of immigration and cross-cultural influences and issues of religious, ethnic, and gender identity. Emphasizes American and European literatures to begin to define an international Jewish literary canon, including Yiddish poets and playwrights, Russian Jewish writers, and modern writers. ENGL 3685 and JWSS 3685 are cross-listed.

ENGL 3700. Narrative Medicine. 4 Hours.

Introduces students to the field of narrative medicine, which explores literary analysis as a set of tools for medical practice. Offers students an opportunity to develop close reading and analytical skills that are useful for improving doctor-patient relationships and patient care. Requires students to complete essays that cultivate these skills.

ENGL 3720. 19th-Century Major Figure. 4 Hours.

Examines in detail the work and critical reception of a major writer of the nineteenth century. May be repeated up to four times.

ENGL 3730. 20th- and 21st-Century Major Figure. 4 Hours.

Examines in detail the work and critical reception of a major writer of the twentieth or twenty-first century. May be repeated up to four times.

ENGL 3900. Gender and Black World Literatures. 4 Hours.

Explores different aspects of the literary and cultural productions of black women throughout history. Examines writing by women in the United States—like Octavia Butler, Zora Neale Hurston, and Toni Morrison—in addition to writing by women across the global African diaspora—like Chimamanda Adichie and Jamaica Kincaid. Students may also engage with theories such as Black feminism, womanism, or intersectionality; consider issues of genre such as the novel, poetry, or science fiction; and explore key themes such as class, sexuality, and disability. AFRS 3900, WMNS 3900, and ENGL 3900 are cross-listed.

ENGL 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ENGL 4000. Topics in Early Literatures. 4 Hours.

Focuses on a particular aspect of medieval or Renaissance British literature, such as medieval romance or Renaissance representations of gender and sexuality. May be repeated up to five times.

ENGL 4020. Topics in 17th- and 18th-Century Literatures. 4 Hours.

Focuses on a particular topic in 17th- or 18th-century British or American literature, such as women and the novel or the captivity narrative. May be repeated once.

ENGL 4040. Topics in 19th-Century Literatures. 4 Hours.

Focuses on a particular topic in 19th-century British or American literature, such as lyric poetry or popular print culture. May be repeated once.

ENGL 4060. Topics in 20th- and 21st-Century Literatures. 4 Hours.

Focuses on a particular topic in 20th- or 21st-century British or American literature, such as capitalism or the Harlem Renaissance. May be repeated once.

ENGL 4400. Opening the Archive. 4 Hours.

Offers a seminar designed to introduce students to the rich archival holdings in the greater Boston area and to offer training in the materials and methods of primary source research. Primary materials include a wide range of resources, including books, manuscripts, letters, pamphlets, broadsides, journals, maps, illustrations, photographs, etc., from the seventeenth through the twentieth centuries.

ENGL 4410. Research in Rhetoric and Writing. 4 Hours.

Introduces students to, and offers them practice in, a range of research methodologies (e.g., ethnography, archival research, historical inquiry) and methods (e.g., interviewing, observation, rhetorical analysis) for studying rhetoric, writing, and writers. Requires permission of instructor for freshmen and sophomores.

ENGL 4710. Capstone Seminar. 4 Hours.

Offers an advanced senior seminar organized around an important critical question in the discipline. This writing-intensive course is designed to be a summative experience for English majors, offering in-depth study of the theories, methods, and practices of critical work on a particular topic while providing students opportunities for reflecting on the connections between their capstone and other work they have done as majors. Offers students an opportunity to produce significant research projects on the critical issues raised by the seminar. May be repeated without limit.

ENGL 4720. Capstone Project. 4 Hours.

Offers students an opportunity to design, develop, and complete a major intellectual project in a workshop setting. Students must enter this course with an approved project and the support of a faculty member in the relevant area of study. In addition to producing original research, offers students an opportunity to contextualize their work in relation to their focus within English studies, their experience of the major, and their intellectual and professional goals.

ENGL 4970. Junior/Senior Honors Project 1. 4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student's major field. Combined with Junior/Senior Project 2 or college-defined equivalent for 8 credit honors project. May be repeated without limit.

ENGL 4971. Junior/Senior Honors Project 2. 4 Hours.

Focuses on second semester of in-depth project in which a student conducts research or produces a product related to the student's major field. May be repeated without limit.

ENGL 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ENGL 4992. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

ENGL 4993. Independent Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

ENGL 5103. Proseminar. 4 Hours.

Introduces the history and current scholarly practices of English studies. Surveys theoretical, methodological, and institutional issues in the development of the discipline; introduces students to the research of the English department's graduate faculty; and offers opportunities for the practice of key components of scholarly production, including formulating research questions, using databases, conducting literature reviews, and writing and presenting scholarship in common formats other than the long research paper, such as conference proposals, oral presentations, and book reviews.

ENGL 5976. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

ENGL 6960. Exam Preparation—Master's. 0 Hours.

Offers the student the opportunity to prepare for the master's qualifying exam under faculty supervision.

ENGL 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ENGL 6964. Co-op Work Experience. 0 Hours.

Provides eligible students with an opportunity for work experience. May be repeated without limit.

ENGL 7000. Qualifying Exam. 0 Hours.

Provides eligible students with an opportunity to take the master's qualifying exam.

ENGL 7215. Topics in 20th-Century American Literature. 4 Hours.

Examines an issue or issues in twentieth-century American literature, such as women in twentieth-century American writing; surrealism in modern and contemporary American poetry; naturalism and the city in the modern American novel; autobiography by American women writers of color; and race, ethnicity, and the oral tradition in ethnic American literature. May be repeated without limit.

ENGL 7244. African-American Novel. 4 Hours.

Surveys major nineteenth- or twentieth-century African-American novelists, such as Francis Harper, Charles Chestnutt, Zora Neale Hurston, Nella Larsen, Toni Morrison, Ralph Ellison, James Baldwin, and Ishmael Reed.

ENGL 7281. Topics in Medieval Literature. 4 Hours.

May consider the following: Anglo Saxon literature (including poems such as Beowulf, Judith, The Wanderer, The Seafarer, and a selection of prose); the poems of the Pearl Poet (Sir Gawain and the Green Knight, Pearl, Cleanness); women and/in the Middle Ages; medieval literature and medievalism; the medieval romance, Malory's *Morte Darthur*; religious, mystical, and didactic works; medieval travel literature; or William Langland's *Piers Plowman*. May be repeated without limit.

ENGL 7282. Topics in Renaissance Literature. 4 Hours.

Considers specific topics in the literature of the sixteenth and seventeenth centuries, such as the sonnet sequence, Renaissance women, and utopian and travel literature. May be repeated without limit.

ENGL 7284. Topics in 18th-Century Literature. 4 Hours.

Explores in depth a topic, theme, or genre in eighteenth-century British literature, such as satire; London's city culture; literary theory; the emerging women writers; the essay; or a major writer, for example, Jonathan Swift, Jane Austen, or Henry Fielding. May be repeated without limit.

ENGL 7342. Topics in Criticism. 4 Hours.

Examines such topics in critical theory as narrative, cultural criticism, representation, reader response, feminist theory, postcolonial studies, and comparative literature. May be repeated without limit.

ENGL 7351. Topics in Literary Study. 4 Hours.

Focuses on literature on a thematic, formal, or generic basis. May include black women writers, poetry of nature. May be repeated without limit.

ENGL 7358. Topics in Literature and other Disciplines. 4 Hours.

Examines such subjects as literature and the visual arts, literature and psychology, and literary impressionism. May be repeated without limit.

ENGL 7360. Topics in Rhetoric. 4 Hours.

Focuses on specialized topics in rhetoric, such as visual rhetoric, rhetorical criticism, rhetoric of science, issues in contemporary rhetorical theory, and rhetoric and cultural studies. Varies by semester. May be repeated without limit.

ENGL 7370. Introduction to Digital Humanities. 4 Hours.

Offers a critical orientation to the tools, methods, and intellectual history of the digital humanities (DH). Explores key questions such as what debates are (re)shaping DH in this moment; what central theories lead humanities scholars to experiment with computational, geospatial, and network methodologies; how visualization can illuminate literature, history, writing, and other humanities subjects; and how new modes of research and publication might influence our teaching. Balances theory and praxis: Successful students come away with a well-grounded understanding of the DH field and a set of foundational skills to support their future research. No prior technical expertise is required to take the course, but students should be willing to experiment with new skills.

ENGL 7380. Topics in Digital Humanities. 4 Hours.

Explores specific analytical techniques such as mapping, computational text analysis, or network analysis; a particular methodological tradition such as digital scholarly editing; the history of a particular debate, research problem, or theoretical orientation such as intersectional feminism; or the intersection of digital humanities and another domain such as writing studies. Offers students an opportunity to develop more specialized skills and methods that support advanced research and teaching in digital humanities.

ENGL 7392. Writing and the Teaching of Writing. 4 Hours.

Examines the theory and practice of writing and teaching writing. Required for stipended graduate assistants (SGAs) in their first year.

ENGL 7395. Topics in Writing. 4 Hours.

May include the following topics: literacy and literacies; basic writing; issues of gender, race, and class in the classroom; writing assessment; or collaborative learning. May be repeated without limit.

ENGL 7962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ENGL 7976. Directed Study. 1-4 Hours.

Offered by arrangement. May be repeated without limit.

ENGL 7990. Thesis. 4 Hours.

Offers thesis supervision by members of the department. May be repeated without limit.

ENGL 7996. Thesis Continuation. 0 Hours.

Offers thesis supervision by members of the department.

ENGL 8407. Teaching Practicum. 1 Hour.

Gives students the opportunity to observe a senior faculty member teaching an undergraduate course in American or British literature, literary studies, rhetoric, composition studies, or linguistics. Students meet regularly with the faculty member to discuss teaching practices and other pedagogical issues and submit a term project discussing the experience in the context of the scholarship of teaching. May be repeated without limit.

ENGL 8960. Exam Preparation—Doctoral. 0 Hours.

Offers the student the opportunity to prepare for the PhD qualifying exam under faculty supervision.

ENGL 8986. Research. 0 Hours.

Offers the student the opportunity to conduct full-time research. May be repeated without limit.

ENGL 9000. PhD Candidacy Achieved. 0 Hours.

Indicates successful completion of the doctoral comprehensive exam.

ENGL 9986. Research. 0 Hours.

Offers the student the opportunity to conduct full-time research. May be repeated up to three times.

ENGL 9990. Dissertation. 0 Hours.

Offers dissertation supervision by members of the department. May be repeated once.

ENGL 9996. Dissertation Continuation. 0 Hours.

Offers dissertation supervision by members of the department. May be repeated without limit.

English - CPS (ENG)

Search ENG Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=ENG>)

ENG 1103. College Writing 1 for Nonnative Speakers. 3 Hours.

Offers students an opportunity to develop written communication skills and basic research techniques in preparation for English-language college writing in their majors. Incorporates reading, research, and critical thinking in the development of expository writing—the kind of objective, audience-directed prose used in college and the workplace to explain and defend ideas. Emphasizes planning, drafting, revising, and correct citation in essays, along with development of focus, organization, and paragraph/sentence structure. In addition to in-class assignments and peer-review activities, includes extended essays developed outside of class. Requires a grade of C or higher in order to receive credit and continue on to ENG 1107.

ENG 1104. Lab for ENG 1103. 1 Hour.

Requires students to analyze and draft writing assignments from topics covered in ENG 1103.

ENG 1105. College Writing 1. 3 Hours.

Offers students an opportunity to develop written communication skills and basic research techniques in preparation for college writing in their majors. Incorporates reading, research, and critical thinking in the development of expository writing, the kind of objective, audience-directed prose used in college and the workplace to explain and defend ideas. Emphasizes planning, drafting, revising, and correct citation in essays, along with development of focus, organization, and paragraph/sentence structure. Offers opportunities for in-class assignments and peer-review activities in addition to extended essays developed outside of class. Students must pass with a C or higher in order to receive credit and continue to ENG 1107.

ENG 1106. Lab for ENG 1105. 1 Hour.

Requires students to analyze and draft writing assignments from topics covered in ENG 1105.

ENG 1107. College Writing 2. 3 Hours.

Builds on students' skills of written communication and basic research in preparation for college writing in their majors. Offers opportunities to emulate and incorporate various rhetorical strategies in the development of written analysis and researched argumentation. Focuses on techniques for logical analysis (inductive and deductive reasoning) and effective reasoning, establishing credibility, and emotional appeals to develop persuasive arguments. Emphasizes planning, drafting, revising, and correct citation in essays. Offers opportunities for in-class assignments and peer-review activities in addition to extended essays developed outside of class. Students must pass with a C or higher in order to receive credit and continue to ENG 3105 or ENG 3107.

ENG 1108. Lab for ENG 1107. 1 Hour.

Requires students to analyze and draft writing assignments from topics covered in ENG 1107.

ENG 1200. Introduction to Literature. 3 Hours.

Surveys basic concepts in literature as these are integrated into various genres, such as poetry, short fiction, the novel, and drama. Examines fundamentals of literary analysis (plot, character, symbolism, theme, irony), as well as critical principles for making literary judgments. Discusses the definition and characteristics of the term “story,” and offers students an opportunity to analyze the role stories play in culture, politics, and other areas of daily life.

ENG 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ENG 2105. Writing Workshop. 3 Hours.

Offers students an opportunity to continue developing writing skills presented in ENG 1107. Requires students to have a strong grasp of English-language grammar and mechanics. Offers students an opportunity to learn the tools and techniques involved in analyzing, synthesizing, and evaluating argumentative texts. In addition to shorter writing assignments, students create a polished documented research paper of at least 10 pages, which must include proper MLA citation and effective research strategies. Emphasizes argumentative writing, peer review, and research skills aimed at preparing students for college writing in their majors. This is a required course for all Global Classroom students, and all students must pass with a C or higher in order to receive credit and continue to ENG 3105 and ENG 3107.

ENG 2106. Lab for ENG 2105. 1 Hour.

Requires students to analyze and draft writing assignments from topics covered in ENG 2105.

ENG 2230. English Literature 1. 3 Hours.

Explores English literature from the Middle Ages to the Romantic period and might include studying works by authors such as Chaucer, Donne, Milton, Pope, Swift, Johnson, Blake, Wordsworth, Byron, and Keats.

ENG 2231. English Literature 2. 3 Hours.

Explores English literature from the Victorian era through the present and might include studying works by authors such as Browning, Tennyson, Dickens, Wilde, Hardy, Woolf, Joyce, Lessing, and Pinter.

ENG 2450. American Literature 1. 3 Hours.

Offers students an opportunity to examine the roots of American thought and culture to reach a broad understanding of many of the major currents of contemporary American thought. Explores American literature from its Puritan beginnings through the turn of the 20th century. Includes works by such writers as Winthrop, Franklin, Emerson, Thoreau, Poe, Stowe, Whitney, Dickinson, Twain, and DuBois.

ENG 2451. American Literature 2. 3 Hours.

Examines the continuing themes of the nature of the American dream, the desire to create a distinctly American literature, and continues through the artistic and literary movement known as modernism. Surveys the major American writers and major literary works through these eras. Includes works by such writers as Whitman, Dickinson, Twain, James, Hemingway, Moore, Faulkner, Ellison, Cahan, and Morrison.

ENG 3105. Writing for the Professions: Science and Engineering. 3 Hours.

Offers writing instruction for students considering careers or advanced study in fields of science, technology, engineering, and mathematics.

Students practice and reflect on writing in professional, public, and academic genres as they plan, research, write, and analyze various forms of technical communications such as technical reports, progress reports, proposals, instructions, presentations, and technical reviews relevant to technical professions and individual student goals. Offers students opportunities to evaluate a wide variety of sources and to develop communication skills in audience analysis, critical research, peer review, and revision. Students must pass with a C or higher in order to receive credit.

ENG 3106. Lab for ENG 3105. 1 Hour.

Requires students to analyze and draft writing assignments from topics covered in ENG 3105. *Coreq ENG 3105.*

ENG 3107. Writing for the Professions: Business and the Social Sciences. 3 Hours.

Offers writing instruction for students considering careers or advanced study in business administration and the social sciences. Students practice and reflect on writing in professional, public, and academic genres as they plan, research, write, and analyze various forms of business communications such as proposals, recommendation reports, letters, presentations, and emails relevant to industry. Offers students opportunities to evaluate a wide variety of sources and to develop communication skills in audience analysis, critical research, peer review, and revision. Students must pass with a C or higher in order to receive credit.

ENG 3108. Lab for ENG 3107. 1 Hour.

Requires students to analyze and draft writing assignments from topics covered in ENG 3107. *Coreq ENG 3107.*

ENG 3210. Writing for Young Readers. 3 Hours.

Introduces the changing world of children's literature by examining published picture books, chapter books, and young adult novels ranging from fairy tales to modern-day works. Examines the influence children's literature has on young lives and its impact on culture and communication. Encourages students to examine their own childhoods for ideas as they complete writing exercises aimed at craft development and in the production of work designed for young readers. Provides time for students to critique their own work and the work of others in writing workshops and peer-review sessions.

ENG 3220. Writing Poetry. 3 Hours.

Introduces techniques, forms, structures, and styles of both traditional and contemporary poetry. Focuses on fundamentals of poetry, including line, diction, syntax, image, trope, rhetoric, and rhythm, along with examining roles of audience, speaker, and message. Class discussion emphasizes essential terms of poetic analysis as students develop an appreciation for the challenges that poets set for both themselves and their readers. Offers students an opportunity to use developing insights to craft original polished and completed poems. Provides time for students to critique their work and the work of others in writing workshops and peer-review sessions.

ENG 3230. Writing Fiction. 3 Hours.

Introduces techniques and strategies of fiction writing. Examines key communication elements of fiction, including plot, characterization, setting, point-of-view, and various story development techniques. Students have an opportunity to read and react to a variety of texts while completing writing exercises and while generating, developing, and revising original pieces of fiction. Provides time for students to critique their own work and the work of others in writing workshops and peer review sessions. Prereq ENG 1107. .

ENG 3240. Writing Nonfiction. 3 Hours.

Explores how writers translate personal experience and research into effective pieces of creative nonfiction. Studies literary journalism, personal essays, memoir, nature writing, and other subgenres to enhance understanding of this communication strategy. Class discussions analyze published works through points of view of scholar and writer, while delving into ethical considerations of writing from "real" life. Considers accurate description, scenic representation, and narrative framing, along with meaningful integration of images, videos, and Web tools. Offers students an opportunity to develop and revise original works of creative nonfiction. Provides time for students to critique their work and the work of others in writing workshops and peer-review sessions.

ENG 3260. Writing to Inform and Persuade. 3 Hours.

Focuses on techniques used in nonfiction writing to communicate ideas and influence audience point of view about "true" events or affairs. Examines a variety of nonfiction pieces and styles, such as journalism features and profiles, editorials and opinion pieces, literary essays, and visual arguments. Offers students an opportunity to advance their understanding and appreciation of informative, persuasive writing techniques as they discuss, develop, revise, and review each other's original nonfiction pieces.

ENG 3300. Literature and Business Leadership. 3 Hours.

Examines organizational leadership by studying fictional characters whose workplace challenges parallel those encountered by today's business executives. Analyzes a variety of management styles and strategies as depicted in story form to guide students' understanding of leadership as it applies to workplace responsibility, choice, risk taking, moral obligation, and self-mastery. Offers students an opportunity to use insights gained from literary examples to inform personal reflections on the meaning of leadership and the qualities that combine to make someone an effective manager of people and organizations.

ENG 3310. Literature, Technology and Culture. 3 Hours.

Investigates relationships between literature and technology and how these connections influence human culture. Explores how writers interpret roles of technology in society and examines ways literature encourages/discourages technological research and development. Seeks to guide students' understanding of how literature, technology, and society link to envision new worlds, expand imagination, and impact concepts of individuality and community. Offers students opportunities to use insights gained from literature to inform personal reflections about technology's role in culture and its impact on human life.

ENG 3440. Western World Literature. 3 Hours.

Explores literature from the ancient world through the Renaissance; the second half explores literature from the Enlightenment to the present. Covers a variety of writers and literary traditions and might include studying works by authors such as Homer, Sophocles, Virgil, Dante, Machiavelli, Cervantes, Voltaire, Goethe, Ibsen, Kafka, and Brecht.

ENG 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ENG 4210. Writing for Publication. 3 Hours.

Focuses on nonfiction writing for students interested in learning how to generate story ideas and how to write and revise journalistic work for intended magazine audience/publication. Focuses primarily on development and pitch of travel or hobby-related articles for selected print or online magazines. Readings highlight a collection of publications to show what is revealed about magazines' content and storytelling goals through use of audience, articles, structure, photos, and other elements. Offers students an opportunity to craft a manuscript and pitch letter designed for publication consideration. Provides time for students to critique their own work and the work of others in writing workshops and peer-review sessions.

ENG 4455. Topics in Shakespeare. 3 Hours.

Explores a subject or theme common to several plays by Shakespeare, such as Shakespeare's women, the tragic vision, fathers and sons, the comic and the grotesque, and Shakespeare on film. Topics change from quarter to quarter and campus to campus. Students may take this course more than once, provided it is a different topic each time.

ENG 4950. Seminar. 1-4 Hours.

Offers students the opportunity to integrate knowledge and abilities gained throughout the program. This capstone course for English majors concludes with a detailed research project.

ENG 4955. Project. 1-4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student's major field. May be repeated without limit.

ENG 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ENG 4991. Research. 1-4 Hours.

Offers students an opportunity to conduct research under faculty supervision.

ENG 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

English - CPS Specialty (ENGH)

Search ENGH Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=ENGH>)

ENGH 1010. Introductory Writing. 4 Hours.

Introduces students to the components of the writing process, from generating ideas to drafting and revising. Offers students, in a workshop setting, an opportunity to learn to read texts of some complexity (which in turn serve as the occasion for their own writing) and to write expository prose that makes use of a variety of rhetorical strategies and research methods, while demonstrating a control of the conventions of standard edited written English. Emphasizes the writing process as well as the quality of the finished product. Requires students to write multiple drafts and to keep a portfolio of their work.

ENGH 1020. College Writing. 3,4 Hours.

Offers students an opportunity to move across texts and genres (such as expository essays, fiction, or film), thus focusing on the basics of compositions and the use of metaphor, organization, selection, gaps and silences, tone, and point of view. Through a series of sequenced assignments, students have an opportunity to read fiction and nonfiction texts of some complexity, make the critical interpretation of these texts the occasion for their own writing, write expository prose that makes use of a variety of rhetorical strategies, conduct library research when appropriate, reflect on and assess their writing, and refine their documentation skills. Emphasizes the writing process as well as the quality of the finished product. Requires students to write multiple drafts.

ENGH 3250. Writing for the Professions. 4 Hours.

Introduces the vocabulary and philosophy of business communications. Offers students an opportunity to practice planning, writing, and analyzing effective industry-related letters and memoranda. Applies the writing process (brainstorm, draft, focus, revise, edit) successfully to compose letters, e-mail/memos, proposals, and other types of writing and correspondence associated with various industries.

English as a Second Language - CPS Specialty (ESLG)

Search ESLG Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=ESLG>)

ESLG 0021. Supplemental English Instruction 1. 3 Hours.

Offers an integrated-skills course designed to improve students' language and academic skills and to help eliminate areas of weakness. Emphasizes expanding vocabulary and developing reading, writing, listening, and speaking skills. Discusses a variety of strategies to help students understand unfamiliar vocabulary and to develop their overall reading comprehension. Offers students an opportunity to develop their writing skills by learning how to effectively combine sentences and develop coherent and unified paragraphs and essays. Students listen to recorded materials from a variety of sources and participate in speaking activities designed to help them express their ideas more fluently and accurately. May be repeated once.

ESLG 0022. Supplemental English Instruction 2. 3 Hours.

Offers an advanced integrated-skills course that builds on skills covered in ESLG 0021. Offers students an opportunity to further improve language and academic skills and to help eliminate areas of weakness. Focuses on building communicative competence, vocabulary, reading, writing, and speaking skills. May be repeated once.

ESLG 0040. Reading for Business and Social Science. 3 Hours.

Offers students an opportunity to analyze the intersection between the social sciences and business sectors while seeking to improve their academic reading skills. Using journal articles and other media, students investigate current theories, trends, practices, and perspectives in the fields of business and the social sciences. This is an interdisciplinary course.

ESLG 0041. State of the Field: Engineering and Computer Science. 3 Hours.

Explores current research directions, emerging fields, and real-world problems in engineering and computer sciences. Emphasizes critique and analysis of readings from current and recent scientific literature to gain an understanding of the impact of engineering and computer sciences in global contexts.

ESLG 0043. Reading for Engineering, Math, and Science. 3 Hours.

Offers students an opportunity to analyze important issues in engineering and science while improving their academic reading skills in an interdisciplinary course. Using journal articles and other media, students investigate current theories, trends, practices, and perspectives in the fields of engineering, math, and the sciences.

ESLG 0070. Listening and Speaking. 0 Hours.

Description unavailable.

ESLG 0075. English for Academic Communication. 0 Hours.

Offers advanced students an opportunity to obtain the confidence and skills to participate effectively in the American classroom, improve academic listening skills, and give formal oral presentations. Covers note-taking skills and pragmatic rules regarding email etiquette. Students interact with instructors and advisors and sharpen their speaking and listening skills by engaging critically with others in class. In addition to self-analysis exercises, students analyze classmates' presentations and language production. Focuses on improving communication skills for use in classroom communication, co-op internships, and on-campus student organizations.

ESLG 0080. Career Exploration 1. 1 Hour.

Offers a content-based ESL course. Designed to help students develop language and academic skills through the content of career exploration. Offers students an opportunity to define and develop realistic goals, identify special needs, plan progress toward educational and career goals, and discuss linkages between academic preparation and the world of work. Uses lectures, readings, discussion, and class activities to explore three main themes: learning about yourself, exploring careers, and planning for the future. Requires permission of the English Language Center.

ESLG 0090. Advanced English-Language Skills. 8 Hours.

Offers an intensive integrated skills course designed for very advanced English-language learners to prepare them for success in the American classroom. Offers students an opportunity to enhance their academic English skills through fundamentals of university writing, presentation skills, and research methods. The writing component encourages students to engage closely with a number of challenging texts designed to help sharpen their critical reading, writing, and thinking skills. Students are asked to do close reading and critical interpretation of academic texts and give individual presentations. Working on teams, students conduct research on a project related to their major and participate in a team presentation. Covers how to organize a research project and the standards to meet in producing university-level papers and theses. May be repeated once.

ESLG 0095. Advanced Reading and Writing. 4 Hours.

Introduces the fundamentals of critical reading and writing in an academic context. Emphasizes analyzing and interpreting various forms of argument, evaluating the rhetorical dimension of a text, and using critical texts as the basis for developing an independent position with a cogent line of argument. Working closely with a selection of texts drawn from different genres, offers students an opportunity to practice summary, paraphrase, quotation, and the synthesis of multiple viewpoints. Focuses on reading strategies and grammar fundamentals. Seeks to prepare students to succeed on standardized tests of English.

ESLG 0214. High-Intermediate Core: Structure and Communication. 4 Hours.

Description unavailable. May be repeated up to two times.

ESLG 0224. Core Structure and Vocabulary. 4 Hours.

Offers an integrated-skills course that uses a content-based curriculum and student-centered activities. Seeks to expand students' vocabulary and improve their grammar through listening, speaking, reading, and writing.

ESLG 0230. Writing for Graduate School. 4,5 Hours.

Explores methods for researching, organizing, and writing term papers and for making presentations. Offers students an opportunity to become familiar with and to learn to integrate techniques such as use of metaphor and analogy, juxtaposition of ideas, and variation of tone to more effectively articulate their ideas in academic writing, as well as to learn how to conduct library and online research, to paraphrase and summarize effectively, to organize an extended piece of writing, and to cite sources appropriately. Focuses on individual writing needs. Covers the importance of the process as well as the product of writing, and students are expected to keep a portfolio of their writing as well as to develop a final extended research paper exploring an academic topic in-depth. May be repeated up to two times.

ESLG 0232. Culture and Communication Skills for University. 4 Hours.

Offers international students an opportunity to develop listening, note-taking, and discussion skills while expanding their knowledge of American culture and society. As international students prepare for undergraduate-level study, they need to understand the cultural underpinnings of American society and how these form the background to their communications in the American academic environment. Applies a critical-thinking approach to authentic lectures and readings on topics including civil rights, American values, historical events, and business practices. Students have an opportunity to develop the ability to generate and articulate opinions clearly and accurately and to engage with others in discussion using appropriate levels of politeness and formality. May be repeated up to two times.

ESLG 0234. Culture and Communication Skills for Graduate School. 4 Hours.

Offers international students an opportunity to develop listening, note-taking, and discussion skills while expanding their knowledge of American social issues. As international students prepare for graduate-level study, they need to understand the sociological foundations of American society and how these form the background to their communications in the American academic environment. Applies a critical-thinking approach to authentic lectures and readings on topics including peer pressure, gender roles, and the influence of the media. Students have an opportunity to develop the ability to generate and articulate opinions clearly and accurately, engage with others in discussion using appropriate levels of politeness and formality, investigate their own and others' interaction styles, practice techniques for effective communication, and integrate cultural knowledge into their interactions with others. May be repeated up to two times.

ESLG 0238. Managing in a Diverse and Changing World. 3 Hours.

Offers students an opportunity to examine historical changes in workforce composition and the many effects of globalization, domestic diversity, technological change, and new workforce arrangements. Businesses and individuals in the twenty-first century will undergo rapid and unpredictable change. A significant part of this change involves managing in increasingly diverse global and domestic environments. Focuses on increasing personal awareness, understanding, and skills to function effectively with members of different ethnic, racial, and cultural backgrounds.

ESLG 0244. Principles of Reading and Writing. 4 Hours.

Presents students with a variety of readings that draw from everyday life in the United States. Offers students an opportunity to learn how to develop well-organized paragraphs and short essays.

ESLG 0264. Principles of Listening and Speaking. 3 Hours.

Offers students an opportunity to practice their speaking skills through activities and assignments that require interacting with and observing Americans outside of the classroom, audio and video recordings, class discussions, presentations, and practice interviews.

ESLG 0270. American Culture and Society. 3 Hours.

Explores varying aspects of culture in contemporary American society (e.g., media, ideologies, and sociolinguistics) through discourse analysis and critical thinking.

ESLG 0310. Focus on Business and Social Science. 3 Hours.

Designed to provide intermediate-level English-language learners with a foundation for more in-depth and advanced business and leadership materials. Offers students an opportunity to improve their knowledge of business vocabulary and idioms through weekly business reading assignments, listening exercises, and discussion. The weekly materials are selected from various areas of the business curriculum, including management, marketing, advertising, and financial management and investment. Online discussions provide an opportunity for students to share their thoughts and practice the use of newly learned business expressions. Focuses on writing business letters, e-mails, faxes, and memos in English to help students communicate effectively in today's global economy. May be repeated up to two times.

ESLG 0316. College Reading and Writing. 4 Hours.

Offers students an opportunity to develop reading and writing skills at the college level (e.g., rhetorical analysis, research-based argument paper, and multimedia writing).

ESLG 0320. Focus on Science and Technology. 3 Hours.

Designed to provide intermediate-level English-language learners with a foundation for more in-depth and advanced material relating to science and technology. Offers students an opportunity to improve their knowledge of science and technology vocabulary and idioms through weekly reading assignments, listening exercises, and discussion. The weekly materials are selected from various areas of science and technology, including the health sciences, engineering, and information technology. Online discussions provide an opportunity for students to share their thoughts and practice new expressions. Focuses on the development of practical English-writing skills to help students communicate effectively in today's global economy. May be repeated up to two times.

ESLG 0324. High-Intermediate Reading. 4 Hours.

Offers students an opportunity to expand vocabulary, learn to read carefully, to infer, and to read faster and with better comprehension. Practice materials include articles exercises, sample tests, timed readings, short stories, and poems. May be repeated up to two times.

ESLG 0326. College Listening and Speaking. 3 Hours.

Designed to offer students an opportunity to obtain the confidence and skills to participate effectively in the American classroom in a variety of academic disciplines. Requires permission of the English Language Center. May be repeated up to two times.

ESLG 0330. Introduction to College. 0 Hours.

Developed to help new students make their transition into the University community. Topics include University technology assets, time management, study strategies, career/major exploration, academic planning, electronic learning portfolio development, and other topics selected to help freshmen succeed academically, personally, and socially. Promotes discussion and active learning about topics important to new students. Offers students an opportunity to form connections with their instructor and fellow students.

ESLG 0420. Introduction to Business and Leadership. 3 Hours.

Combines business cases with language-focused exercises to practice business English and bring the realities of the business world to the student. Designed to develop students' communication and vocabulary skills. Focuses on problem-solving and decision-making activities. Offers students an opportunity to study cases, do exercises, and participate in other business-related activities, as well as using a glossary of business terms to perfect their grasp of idiomatic business English. Students write case analyses and summaries, make recommendations, and suggest plans of action. Requires student participation in online discussions of each case.

ESLG 0425. Introduction to Science and Technology. 3 Hours.

Designed to improve English skills while students are exposed to their respective academic fields. Through readings, discussion, site visits, and lectures by University mentors, offers students an opportunity to develop their understanding of current events in their field from an American cultural perspective. Class activities include workshops, lectures, and a final team project.

ESLG 0434. High-Intermediate Composition. 3 Hours.

Description unavailable. May be repeated up to two times.

ESLG 0471. Advanced TOEFL Test Taking. 3 Hours.

Seeks to help international students with high English proficiency to develop excellent test-taking skills for success on the TOEFL exam. Focuses on all relevant areas of English proficiency and addresses study techniques, test-taking strategies, and reducing test anxiety.

ESLG 0510. Advanced Reading for Graduate School. 3 Hours.

Offers students an opportunity to become active and critical readers of complex academic texts. Active reading, the principal learning approach, entails close engagement with the information in an assigned reading by deconstructing a text, synthesizing main ideas, and making connections with other scholarship in a field. Focuses on identifying discipline-specific vocabulary, untangling grammatical structures, and outlining textual features of a variety of genres in a range of academic disciplines. Restricted to Global Pathways students only.

ESLG 0520. Advanced Listening and Speaking for Graduate School. 3 Hours.

Offers students an opportunity to learn how to make speech more understandable in a variety of settings (telephone, one-on-one conversation, presentations) and to improve their active listening skills. Seeks to enable students to identify the key aspects of pronunciation, choose appropriate speaking strategies to modify their own spoken English, identify characteristics that influence spoken English, and demonstrate control of pitch and intonation. Restricted to Global Pathways students only.

ESLG 0550. Research and Writing for Graduate School. 5,6 Hours.

Addresses formal investigation as one of the primary means of creating knowledge. Examines philosophical issues underpinning the nature of knowledge claims, the relationship of knowledge to evidence, and techniques of gathering and interpreting evidence. Analyzes the purposes of research; the methods of quantitative, qualitative, and mixed research; and the processes involved in research studies. Offers students an opportunity to conduct a research project in small groups by selecting a topic from a relevant area of study, designing a research proposal, reviewing relevant literature, and presenting methodology and conclusions in written form. Restricted to Global Pathways students only.

ESLG 0600. TOEFL Preparation for the iBT. 1 Hour.

Designed to prepare students to take the TOEFL test. Offers students an opportunity to obtain the skills, strategies, and confidence they need to maximize their scores on the TOEFL test through exercises, explanations, and practice exams. Covers all sections of the exam, including listening, structure, reading, and writing.

ESLG 0610. Advanced Communication Strategies. 4 Hours.

Seeks to make upper-level ESL students aware of advanced concepts in communication and to practice applying these concepts through modeling, pair practice, presentations, and role-play, followed by reflection on theirs' and others' communication styles. Effective communication in English is essential to the success of international students in integrating with their peers, establishing social networks, and interacting with University personnel and others in American society. Offers students an opportunity to learn to integrate appropriate proxemics, back channeling, timing, conversational hedges, and other features into their interactions and to become more aware of how their choice of words, tone, assertiveness, and level of formality can affect the success of their communications. Students are expected to analyze their own interaction style and devise a plan for improving their communication. May be repeated up to two times.

ESLG 0630. College Writing. 4 Hours.

Offers international students preparing for undergraduate study an opportunity to develop their academic writing skills. Explores a variety of texts and genres. Focuses on composition basics and the use of metaphor, organization, selection, tone, and viewpoint. Students read texts of some complexity, make critical interpretations in writing, write expository prose that makes use of a variety of rhetorical strategies, and conduct library research when appropriate. Offers students an opportunity to reflect on and assess their writing and learn to integrate and cite sources appropriately. Requires students to write multiple drafts and emphasizes the writing process as well as the quality of the finished product. Students are expected to keep a portfolio of their work and develop a final extended paper exploring a topic of interest in-depth. May be repeated up to two times.

ESLG 0700. Advanced Listening and Speaking. 3 Hours.

Offers advanced ESL students an opportunity to obtain the confidence and skills to participate effectively in the American classroom as well as to perform successfully on a standardized English-language exam. Students participate in and lead class discussions and give formal oral presentations with the aim of improving academic listening skills. In addition to developing testing skills, students work on note-taking skills, study rhetorical expectations, interact with instructors and advisors, and sharpen their oral skills by engaging critically with others in class. Takes a balanced approach to fluency and accuracy and strives to help students become autonomous learners through use of technology. In addition to self-analysis exercises, students analyze classmates' presentations and language production.

ESLG 0710. Advanced English-Language Skills for Graduate Studies. 4 Hours.

Takes a problem-solving approach to preparing students for graduate studies in an American university setting. Through speakers, field surveys, and the analysis of current research and trends, the course offers students an opportunity to determine what factors are necessary for success in an American university at the graduate level. Focuses on building reading, writing, listening, and speaking skills in English to enable students to participate effectively in graduate courses. Requires students to participate in ESLG 0700 as part of their studies.

ESLG 0720. Critical Writing. 4 Hours.

Offers students an opportunity to learn how to engage with and evaluate texts and issues drawn from their discipline. Focuses on critical thinking, reading, and writing. Encourages students to find their own academic voice by developing their ability to weigh evidence and arguments of others and contribute their own perspective. Includes activities and research components. Restricted to Global Pathways students only.

ESLG 0901. USPP English for Academic Purposes 1. 0 Hours.

Offers the first of a two-part foundation focusing on building up students' academic English skills to a level at which students can participate successfully in all facets of academic and college life in the United States. Comprises eight components, taught concurrently by the same teacher and tightly interconnected in skills, materials, and assignments: (1) academic writing, (2) academic writing workshop, (3) academic reading, (4) presentation and discussion, (5) English grammar and usage, (6) study skills, (7) U.S. culture and media, and (8) college life skills. These eight components complement each other and overlap in topic and materials. They are designed to strengthen the acquisition of skills and to streamline the students' work so that students are prepared to make the most of their education in the United States.

ESLG 0902. USPP English for Academic Purposes 2. 0 Hours.

Offers the second of a two-part foundation focusing on building up students' academic English skills to a level at which students are able to participate successfully in all facets of academic and college life in the United States. Covers (1) academic writing, (2) academic writing workshop, (3) academic reading, (4) presentation and discussion, (5) English grammar and usage, (6) study skills, (7) U.S. culture and media, and (8) college life skills. These eight components complement each other and overlap in topic and materials. Offers students an opportunity to strengthen their acquisition of skills and to streamline their work so that they are prepared to make the most of their education in the United States.

ESLG 0903. USPP Career and Program Counseling. 0 Hours.

Offers students an opportunity to learn about career possibilities and education options and understand their skills before committing to a particular degree path. Topics include U.S. culture and work life; the U.S. educational system; courses of study and career paths; and popular, promising, and special industries and sectors in the world economy. Uses classes, group discussions, and one-to-one conversations with counselors to assist students to acquire the knowledge, resources, and self-awareness necessary to make short-range plans and to assess long-term academic and career options.

ESLG 0904. USPP Information Technology. 0 Hours.

Seeks to provide students with the computer and Internet skills expected of an incoming sophomore at a U.S. university. Covers how to edit and format with Microsoft Word; how to build and deliver PowerPoint presentations; and how to enter, organize, and graph data in Microsoft Excel. Also covers how to use the Internet effectively, including control of search engines and Boolean search operators; the proper discovery and use of Internet-based reference material; evaluation of the authority and reliability of Web-based materials; and the use of online library catalogs, journal databases, and their search functions.

ESLG 0905. United States Pathway Program University Preparation. 0 Hours.

Designed for students undertaking the U.S. Pathway Program. Offers students an opportunity to develop critical thinking and analysis skills and to obtain knowledge for study at an American university. These skills are developed through cross-disciplinary, academic-related themes that are tailored to students' specific fields of interest/study through the choice of text types/materials, extension activities, and assessment tasks. May be repeated once.

ESLG 0906. United States Pathway Program University Preparation 2. 0 Hours.

Continues ESLG 0905. Offers students an opportunity to enhance their critical thinking, reading, and analysis skills; computer skills; active note-taking skills; and knowledge for study at an American university. Students practice synthesizing information and data and lead formal discussions to present research. As a final project, students are required to complete a report on a chosen topic. Offers students an opportunity to learn the concept of academic integrity and the consequences of its violations, particularly plagiarism. Requires students to be able to demonstrate an awareness of plagiarism and the ability to apply referencing norms with control. May be repeated once.

ESLG 0950. Exploring America. 0 Hours.

Offers an introduction to living and learning in the United States and on a U.S. campus. Uses workshops, seminars, course readings, discussions, and local civic engagement to challenge students to become global citizens and ambassadors by actively participating in their own Northeastern University learning community as well as the Boston community and beyond. Offers students an opportunity to participate in a series of field trips and regional events and to attend seminars to reflect upon and make relevant connections between their studies and experiences in the United States and their native culture.

English as Second Language - CPS (ESL)

Search ESL Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=ESL>)

ESL 0070. Listening and Speaking. 0 Hours.

Provides listening and speaking practice for students to improve their pronunciation, listening comprehension, and speaking skills for university-level classroom success. Students are required to read and discuss short business cases each week, incorporating professional development themes that are practiced through role-play raised in the weekly case discussion. Additionally, students are required to give a presentation about a company where they would like to work, participating in dictation and pronunciation exercises to strengthen their language skills. May be repeated without limit.

English Writing (ENGW)

Search ENGW Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=ENGW>)

ENGW 1102. First-Year Writing for Multilingual Writers. 4 Hours.

Designed for students whose first or strongest language is not English. Parallels ENGW 1111 but focuses on the concerns of multilingual writers. Students study and practice writing in a workshop setting; read a range of texts in order to describe and evaluate the choices writers make and apply that knowledge to their own writing; explore how writing functions in a variety of academic, professional, and public contexts; and write for various purposes and audiences in multiple genres and media. Offers students an opportunity to learn how to conduct research using primary and secondary sources and to give and receive feedback, to revise their work, and to reflect on their growth as writers.

ENGW 1110. Introductory First-Year Writing. 4 Hours.

Designed for students who would benefit from an extra semester of writing instruction before taking ENGW 1111. Students study and practice writing in a workshop setting. Introduces students to college-level writing, reading, and research. Offers students an opportunity to give and receive feedback, to revise their work, and to reflect on their growth as writers.

ENGW 1111. First-Year Writing. 4 Hours.

Designed for students to study and practice writing in a workshop setting. Students read a range of texts in order to describe and evaluate the choices writers make and apply that knowledge to their own writing and explore how writing functions in a range of academic, professional, and public contexts. Offers students an opportunity to learn how to conduct research using primary and secondary sources; how to write for various purposes and audiences in multiple genres and media; and how to give and receive feedback, to revise their work, and to reflect on their growth as writers.

ENGW 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ENGW 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ENGW 3250. Writing for the Professions. 4 Hours.

Introduces the vocabulary and philosophy of business communications. Offers students an opportunity to practice planning, writing, and analyzing effective industry-related letters and memoranda and to apply the writing process (brainstorm, draft, focus, revise, edit) successfully to compose letters, emails/memos, proposals, and other types of writing and correspondence associated with various industries.

ENGW 3302. Advanced Writing in the Technical Professions. 4 Hours.

Offers writing instruction for students in the College of Engineering and the College of Computer and Information Science. Students practice and reflect on writing in professional, public, and academic genres—such as technical reports, progress reports, proposals, instructions, presentations, and technical reviews—relevant to technical professions and individual student goals. In a workshop setting, offers students an opportunity to evaluate a wide variety of sources and develop expertise in audience analysis, critical research, peer review, and revision.

ENGW 3303. Advanced Writing in the Environmental Professions. 4 Hours.

Provides writing instruction for students in fields related to environmental studies. Students develop an in-depth analytic or recommendation report about a complex environmental concern related to their majors and/or their co-op or other personal or professional experiences. In a workshop setting, students evaluate scholarly and popular sources, practice a variety of professional and academic forms of writing and communication, and develop expertise in audience analysis, critical research, peer review, and revision. Writing is guided in stages from initial topic exploration and a formal proposal through drafts and progress reports to a final polished report, presented in a bound portfolio with a cover letter, an abstract, and other writing samples.

ENGW 3304. Advanced Writing in the Business Administration Professions. 4 Hours.

Offers writing instruction for students in the D'Amore-McKim School of Business. Students practice and reflect on writing in professional, public, and academic genres—such as proposals, recommendation reports, letters, presentations, and e-mails—relevant for careers in business. In a workshop setting, offers students an opportunity to evaluate a wide variety of sources and develop expertise in audience analysis, critical research, peer review, and revision.

ENGW 3305. Advanced Writing in the Criminal Justice Professions. 4 Hours.

Offers writing instruction for students in criminal justice. Students practice and reflect on writing in professional, public, and academic genres—such as reports, protocols, press releases, and public service announcements—relevant for careers in criminal justice and related fields. In a workshop setting, offers students an opportunity to evaluate a wide variety of sources and develop expertise in audience analysis, critical research, peer review, and revision.

ENGW 3306. Advanced Writing in the Health Professions. 4 Hours.

Offers writing instruction for students in the Bouvé College of Health Sciences. Students practice and reflect on writing in professional, public, and academic genres—such as literature reviews, case studies, protocols, and care instructions—relevant for careers in nursing, pharmacy, and other health professions. In a workshop setting, offers students an opportunity to evaluate a wide variety of sources and develop expertise in audience analysis, critical research, peer review, and revision.

ENGW 3307. Advanced Writing in the Sciences. 4 Hours.

Offers instruction in writing for students considering careers or advanced study in the physical or life sciences. By exploring research literature and reflecting on their own experiences, offers students an opportunity to identify issues of interest in their field and analyze how scientific texts make claims, invoke other scientific literature, offer evidence, and deploy key terms. Through analysis and imitation, exposes students to the challenges of the scientific project, such as the use of quantitative data and visual presentation of evidence. In a workshop setting, offers students an opportunity to evaluate a wide variety of sources and develop expertise in audience analysis, critical research, peer review, and revision.

ENGW 3308. Advanced Writing in the Social Sciences. 4 Hours.

Offers instruction in writing for students considering careers or advanced study in the social sciences. By exploring research literature and reflecting on their own experiences, offers students an opportunity to identify issues of interest and analyze how texts make claims, invoke other social science literature, offer evidence, and deploy key terms. Through analysis and imitation, exposes students to the challenges of the social science project, including the collection of data on human subjects and the ethical presentation of evidence. In a workshop setting, offers students an opportunity to evaluate a wide variety of sources and develop expertise in audience analysis, critical research, peer review, and revision.

ENGW 3309. Advanced Writing in the Humanities. 4 Hours.

Offers instruction in writing for students considering careers or advanced study in the humanities. By exploring critical literature and reflecting on their own experiences, offers students an opportunity to identify issues of interest and analyze how texts make claims, invoke primary and secondary texts, offer evidence, and deploy key terms. Through analysis and imitation, exposes students to the challenges of the humanities project, including the framing of interpretive questions and the presentation of textual evidence. In a workshop setting, offers students an opportunity to evaluate a wide variety of sources and develop expertise in audience analysis, critical research, peer review, and revision.

ENGW 3310. Advanced Writing in Literature. 4 Hours.

Builds upon courses in the English major by focusing on “writing about literature” as a genre, a kind of writing that has its own history and set of styles and conventions. Analyzes a variety of strategies that readers, including published scholars, use in writing about literature. Examines how such strategies are shaped by different literary theories and approaches to texts, as well as by assumptions about what constitutes an argument and what is an appropriate persona or voice to adopt in literary studies. In a workshop setting, offers students an opportunity to evaluate a wide variety of sources and develop expertise in audience analysis, critical research, peer review, and revision.

ENGW 3311. Advanced Writing for Prelaw. 4 Hours.

Offers instruction in writing for students considering legal careers. Introduces students to legal reasoning and to the contexts, purposes, genres, audiences, and styles of legal writing. Emphasizes the role of writing and argument in U.S. legal culture. Using strategies drawn from rhetorical theory and criticism, students examine briefs, memoranda, opinions, and other legal texts to identify and describe techniques of analysis and persuasion. In a workshop setting, offers students an opportunity to evaluate a wide variety of sources and develop expertise in audience analysis, critical research, peer review, and revision.

ENGW 3314. Advanced Writing in the Arts, Media, and Design. 4 Hours.

Examines writing in the arts and in the fields of media and design. Explores writing for a range of public and professional audiences, including scholarly and critical. Emphasizes understanding different literacies: alphabetic, visual, musical, and sculptural. Genres might include critical reviews, grant writing, promotional pieces, interactive narratives, newspaper articles, and Web pages, among others. Offers students an opportunity for analysis, reflexive imitation, and creative interdisciplinary work.

ENGW 3315. Interdisciplinary Advanced Writing in the Disciplines. 4 Hours.

Offers writing instruction for students interested in interdisciplinary study or who wish to explore multiple disciplines. Students practice and reflect on writing in professional, public, and academic genres relevant to their individual experiences and goals. In a workshop setting, offers students an opportunity to evaluate a wide variety of sources and to develop expertise in audience analysis, critical research, peer review, and revision.

ENGW 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ENGW 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

Enterprise Artificial Intelligence (EAI)

Search EAI Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=EAI>)

EAI 6000. Fundamentals of Artificial Intelligence. 3 Hours.

Introduces the fundamental problems, theories, and algorithms of the artificial intelligence field. Topics include heuristic search and game trees, knowledge representation using predicate calculus, automated deduction and its applications, problem solving and planning, and an introduction to machine learning. Required course work includes the creation of working programs that solve problems, reason logically, and/or improve their own performance using techniques presented in the course.

EAI 6010. Applications of Artificial Intelligence. 3 Hours.

Explores numerous industry applications of AI with emphasis on solving specific needs or problems. Topics include neural networks, natural language processing, and implications of cybersecurity. Artificial Intelligence is actively developing in applications across numerous fields and industries, including finance, healthcare, education, and transportation.

EAI 6020. AI System Technologies. 3 Hours.

Presents a selection of systems technologies utilized in AI, including data visualization; file systems for a large data mart; applications of structured query language; and filtering and transforming to ingest data, predictions, etc. Covers mathematics/statistics and computation, machine learning, and privacy requirements.

EAI 6030. Usability and Human Interaction. 3 Hours.

Surveys the theory and practice of human-computer interaction and the development of user interfaces. Through both analysis and design projects, offers students an opportunity to learn cutting-edge approaches to usability research and evaluation, testing methods, and how to design systems that meet end-user needs. Topics covered include behavioral and cognitive foundations of interaction design, principles of good design for interaction, basic user research techniques, and the process of user-centered design.

EAI 6050. Finance Information Processing. 3 Hours.

Covers advanced data management technologies and management systems with a focus on the finance industry. Emphasizes evaluating the advantages and disadvantages of such technologies in different application contexts. Addresses specific application contexts of AI and presents the entity relationship to data management (including network hierarchical and object oriented), with an emphasis on processing, storing, and retrieval, while also including privacy requirements.

EAI 6060. Healthcare Information Processing. 3 Hours.

Covers advanced data management technologies and management systems with a focus on the healthcare industry. Emphasizes evaluating the advantages and disadvantages of such technologies in different application contexts. Addresses specific application contexts of AI and presents the entity relationship to data management (including network hierarchical and object oriented), with an emphasis on processing, storing, and retrieval, while including privacy requirements.

EAI 6070. Human Resources Information Processing. 3 Hours.

Covers advanced data management technologies and management systems with a focus on human resources. Emphasizes evaluating the advantages and disadvantages of such technologies in different application contexts. Addresses specific application contexts of AI and presents the entity relationship to data management (including network hierarchical and object oriented), with an emphasis on processing, storing, and retrieval, while including privacy requirements.

EAI 6080. Advanced Analytical Utilization. 3 Hours.

Focuses on instrumental methods of data analysis and provides a foundation to the theory and application of modern analytical techniques for artificial intelligence. Explores the importance of instrumental analysis for specific uses of AI within various fields and context applications across numerous professional fields.

EAI 6120. AI Communication and Visualization. 3 Hours.

Offers an overview of key informational design concepts, emphasizing the relationship between information and audience in the context of communicating complex quantitative information. Encompasses three main context areas: exploratory data visualization, dashboard and scorecard design, and spatial data representation. Discusses ethical questions related to the communication and visualization of data analytics: storytelling; different techniques (such as R-spatial, GeoDa, GeoWave, GeoTrellis, GeoMesa, graph databases network visualization); and principles for visual design, including privacy requirements.

EAI 6980. Integrated Experiential Capstone. 3 Hours.

Offers students an opportunity to apply the knowledge, skills, and best practices acquired throughout the Enterprise Artificial Intelligence program in the context of a practicum in the development and delivery of discipline-specific artificial intelligence projects. Students advance a project plan, conduct research, and create and deliver recommendations with the objective to apply artificial intelligence to real-world problems in organizations. Students develop and present the insights and recommendations for successful implementation of the capstone project.

Entrepreneurship and Innovation (ENTR)

Search ENTR Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=ENTR>)

ENTR 1201. The Entrepreneurial Universe. 4 Hours.

Introduces students to the world of entrepreneurship. Covers the importance of entrepreneurship, the characteristics of entrepreneurs, and the entrepreneurship process. Describes entrepreneurship in its various forms, including startup growth ventures, entrepreneurship in small and medium enterprises, and microbusinesses.

ENTR 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ENTR 2206. Global Social Enterprise. 4 Hours.

Designed to provide students with an in-depth exposure to entrepreneurship in the social sector, a rapidly growing segment of the global economy. Uses the case method to expose students to leading entrepreneurs who have developed and implemented business models to solve social problems such as extreme poverty, disease, illiteracy, and economic and social dislocation. Focuses on uniquely creative and driven people who have dedicated their lives to making a difference in the lives of others through values-based entrepreneurship.

ENTR 2215. Understanding Family Enterprise. 4 Hours.

Covers business, personal, and family issues found in family owned and managed companies, including management of the business, succession planning, entitlement, hiring, nonfamily employees, boards of advisors and directors, compensation, managing conflict, and communications. Designed for individuals who plan to enter into the management of a family business. Focuses on small and midsize firms with annual revenue of \$5 million to \$500 million.

ENTR 2301. Innovation!. 4 Hours.

Designed for students across the entire University who wish to learn about innovation—the creative process, the different types of innovation, how innovations are created, and how innovations can be transformed into commercial reality either as new products or new services and either in startups, existing corporations, and nonprofit entities. Offers students an opportunity to obtain the fundamental insight needed to understand the innovation process and to become a player in it.

ENTR 2303. Entrepreneurial Marketing and Selling. 4 Hours.

Designed to help aspiring and serious entrepreneurship students to generate and evaluate robust marketing opportunities that may serve as the foundation for a new venture. Once a new opportunity has been vetted, students then have an opportunity to work on developing an entrepreneurial marketing plan. Covers methods for recognizing, discovering, or creating opportunities and validating those opportunities. One of the biggest challenges entrepreneurs face is coming up with the right opportunity for a new venture. This is an applied and experiential course involving field research. Two key deliverables are the opportunity assessment project and the entrepreneurial marketing plan.

ENTR 2414. Social Responsibility of Business in an Age of Inequality. 4 Hours.

Studies how businesses can be agents for social good, both locally and around the world. In an era of growing social and economic inequality both in the United States and globally, many “enlightened” businesses are reconsidering their roles in creating opportunity for disadvantaged or marginalized people and communities. Focuses on businesses that have the resources to invest in innovative social responsibility programs that address the impact of rising social and economic inequality. Considers the tension between the single-minded notion of maximizing profit for investors and serving a broader stakeholder community. The role of entrepreneurship and entrepreneurial thinking plays a key role in student learning. This is an integrative course that includes areas such as business policy, governance, strategy, and decision making.

ENTR 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ENTR 3212. Innovation for Social Change. 4 Hours.

Examines three fundamental principles of social innovation—user-centered design, integrated systems thinking, and impact measurement—and applies them to corporate, nonprofit, government, and philanthropic contexts. Through case teaching, multidisciplinary project-based learning, guest speakers, and design research, exposes students to leading ideas and policy perspectives from various sectors and regions. Seeks to embolden student commitment to creative problem-solving approaches that transcend silos and sectors. A final team project is formulated and designed with local partners, including an implementation strategy with investors that addresses the toughest problems confronting human society involving water, food, energy, education, housing, and security for marginalized and vulnerable populations.

ENTR 3217. Global Family Business Leadership. 4 Hours.

Offers students an opportunity to develop an understanding of the nuanced challenges facing entrepreneurial leaders in different cultural settings. While family businesses have been found to be both numerically and economically significant in most countries, these enterprises worldwide share many common issues. However, there are differences that emanate from specific institutional and cultural contexts. Understanding these differences and how they can affect leadership of a family business is increasingly important for stewards of family businesses in a global marketplace. Understanding the nature of international differences and appreciating the opportunities they offer for growth-oriented family business leaders is especially important as family businesses face unique barriers to international expansion. Required participation in spring break international field project.

ENTR 3220. International Entrepreneurship and Innovation Consulting. 4 Hours.

Offers students an opportunity to learn the principles and methods of consulting to growing companies and social enterprises abroad. This is done through a set of frameworks that focus on customer segmentation, product or service requirements, product-line and service strategy, business model design, and then internationalization strategy. Working in teams, students apply these frameworks to local companies in different business sectors and then prepare to apply them to client companies in their follow-on designated destination country. The final part of the course is preparation for the international field studies. This includes an introduction to effective methods for management consulting, including goal setting, team organization, and client management.

ENTR 3305. Entrepreneurial Strategy and Business Model Design. 4 Hours.

Considers dynamic entrepreneurial startup strategy from three perspectives: positioning of the venture within a dynamic, evolving industrial ecosystem that includes major companies, startups, and universities at various parts of the value-chain; different sources of innovation, including open innovation and industry-wide technology platforms; and business model design and implementation. Explores startup strategy from these perspectives using case studies and web-based company research projects and then asks students to develop their own strategy for a startup using the frameworks studied in class.

ENTR 3306. Global Entrepreneurship. 4 Hours.

Offers an opportunity to learn how entrepreneurs start, finance, and manage small businesses. Includes a field experience in South Africa, which involves identifying startups and small business for assistance in developing a business plan and seeking debt and/or equity financing. Students have an opportunity to consider the unique challenges encountered by entrepreneurs in economically disadvantaged communities and the additional challenges presented by South Africa's history of racism and its current struggles with HIV/AIDS. Teaches students the basic concepts and tools associated with small business management, such as preparing financial models and a written business plan and investment presentation, with the goal that they can provide meaningful consulting assistance to township entrepreneurs.

ENTR 3308. Business Economic History of South Africa. 4 Hours.

Covers the economic history of modern South Africa through lectures from faculty at the partner university in South Africa and also from the Northeastern professor. Includes the country's transition from apartheid to its present economic and political situation. Offers an opportunity to learn how South Africa has managed to overcome the struggles of its recent past and become one of the leading emerging economies of the world with a flourishing business community. Includes readings in and study of modern South African economics, law, history, politics, and culture.

ENTR 3310. Entrepreneurship and Social Ventures. 4 Hours.

Offers students an opportunity to design the “business model” for a solution to a social problem, emphasizing how the enterprise can become self-supporting without government grants or charitable contributions. Social entrepreneurs combine the knowledge and skills used in traditional business, with a passionate commitment to having a meaningful and sustainable social impact. The most successful social enterprises solve important social problems through disruptive innovation and business models, and their greatest challenge is to not just solve social problems but to create an economic engine within the business to insure long-lasting sustainability. Through discussion, debate, and critical thinking, students identify core concepts of entrepreneurship in the social context and create a unique opportunity to apply classroom concepts to real-world problems through group projects. .

ENTR 3330. Lean Design and Development for Entrepreneurs. 4 Hours. Studies how to rapidly create new products and services. Starting with an introduction to new product and service design and the innovation life cycle, the course applies the management concept of lean, agile development to concept creation, customer research, prototype development, and market validation. Offers students an opportunity to apply these skills to their own new product or service ideas and develop prototypes during the semester. In addition, the course explores cost-effective approaches for finding and managing third-party suppliers for design, engineering, and early stage production and delivery. Students are assessed not only for the quality of their ideas and project execution but also for their ability to work in teams and communicate results.

ENTR 3336. Resource Management and Renewable Energy in Iceland. 4 Hours.

Studies the economic history of Iceland in order to explore sustainable development and its implications. Emphasizes renewable energy and commercial fishing, land use, and tourism from the twentieth century onward. Settled in the ninth century, over the course of a few hundred years of human activity the long-term equilibrium of the island was disrupted, causing severe environmental degradation. By the turn of the twentieth century, Iceland was one of the poorest countries in Europe. Over the last hundred years, Iceland transformed itself, making it a leader in the sustainable use of natural resources. Studies the process that brought about this transformation and focus on renewable energy and sustainable resource management.

ENTR 3338. Field Research in Sustainable Energy in Iceland. 4 Hours.

Explores the use of sustainable sources of energy, as well as sustainable resource management, in Iceland. Through study and field trips to power plants and businesses, offers students an opportunity to investigate the role played by hydropower and geothermal energy in providing a sustainable source of energy in a developed economy and to learn how governments and businesses work together to develop and manage renewable energy and natural resources to create a sustainable environment.

ENTR 3401. Management of Operations and Growth in Small- and Medium-Sized Enterprises. 4 Hours.

Offers teams of students an opportunity to consult with owners of small- and medium-sized enterprises (SMEs) to develop project proposals and perform field casework specific to the needs of their SME clients. A highlight of this course is the SME consulting project. Through the project and course material, covers how to manage an SME from the day-to-day operations to strategic planning for growth. Exposes students to a variety of ways that an SME can achieve profitability and growth by generating lasting customer relationships, offering exemplary service, managing cash flow, implementing marketing strategies, and developing new and retooled products/services to reach new markets.

ENTR 3403. Managing Operations in a Technology-Based Startup Firm. 4 Hours.

Offers students an opportunity to acquire a skill set that allows them to develop a project management plan for transforming an idea or concept into a viable working product. Emphasizes the need for cross-functional collaboration throughout every phase of the effort. Explores concurrent technology practices, prototyping methods, and the approaches required for achieving the integration of business and technology interests. Utilizes case studies as part of the new-product-development process.

ENTR 3520. Impact Investing and Social Finance. 4 Hours.

Explores impact investing, a transformative way to work with money to achieve a more inclusive and sustainable economy. Large investors are entering the world of impact investing, a rapidly emerging space where social and ecological effects of finance are championed over maximizing shareholder value. New investment vehicles such as social impact bonds and Web exchanges are changing the role of financing institutions to better serve the needs of low-income populations around the world. Applies interdisciplinary frameworks, tools, and cases, with hands-on teamwork and guest speakers, to critically examine the field. Offers students an opportunity to learn to develop and test concepts that integrate social responsibility, sustainability, and mutual accountability into current financial and economic systems while expanding social capital markets.

ENTR 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ENTR 4225. Growth, Acquisitions, and Alliances. 4 Hours.

Analyzes whether, why, and how multibusiness corporations expand their operations into new business areas by questioning decisions to grow organically or through mechanisms such as acquisitions or alliances. Uses rigorous case-based discussions, expert readings, and major current events to discuss issues related to the choice of make, buy, or partner. Evaluates how these different corporate entrepreneurial strategies are used to help firms be more competitive and innovative.

ENTR 4501. Business Planning for Technology Ventures. 4 Hours.

Designed as a senior course for entrepreneurship majors. Covers the issues raised when creating a technology venture that goes through multiple rounds of financing in order to become a successful large company. Topics include managing growth, writing business plans, raising money, and formulating exit strategies. Focuses on projects to obtain venture financing from venture capitalists, angels, and corporate investors.

ENTR 4503. Business Planning for Small and Medium Enterprises. 4 Hours.

Designed for seniors interested in launching a new venture or growing an existing business venture. Includes developing a business plan, strategy development for small- to medium-sized enterprises, sales forecasting, pro-forma development, debt financing, and service developments. Sponsored by the Center for Family Business, the focus of projects is to obtain a bank loan to start a business or grow an existing small- to medium-sized venture.

ENTR 4505. Entrepreneurial Growth Strategy for Technology Ventures. 4 Hours.

Focuses on helping technology ventures define and improve their strategies and tactics to achieve external funding. Studies frameworks for developing a growth-focused product and service strategy; techniques to grow and evolve a startup team, creating scalable business models; and early stage, successive-round venture finance. Working in teams, students must apply these methods to improve the business plans for early stage technology ventures and to create new financial projections and investor packages for early stage ventures, with specific assessments of customer focus and needs, intellectual property, new product-line and technology strategy, and business model design. Company projects include the fields of web services, IT, healthcare, and life sciences. The course is a practicum on how to get new venture concepts funded and scaled from the perspective of entrepreneur and investor.

ENTR 4506. Advanced Studies in Social Enterprise. 4 Hours.

Focuses on a single developing region. Offers an opportunity to analyze the role of socially-driven entrepreneurship or “social impact enterprises” (SIEs) in alleviating poverty and its symptoms (for example, disease, illiteracy and chronic unemployment) in that country. To prepare for an intensive field experience working with local SIEs on one or more hands-on projects, students have an opportunity to study the history, politics, and development of the country, with an emphasis on the role that private-sector initiatives have played and hope to play in addressing widespread poverty and with a focus on the failures and successes in economic and business development, economic growth, and poverty alleviation. Offers students an opportunity to develop a plan for a micro-investment strategy focused on these and/or similar businesses and organizations having a significant social impact in a developing country. Includes an optional nine-day field component in a developing country during spring break; students who do not participate in the field component are given an alternative research assignment. ENTR 3210 and ENTR 3219 recommended.

ENTR 4510. Management Consulting Abroad. 4 Hours.

Offers an intensive field consulting program with local ventures in different countries. Designed to have students experience firsthand the challenges that entrepreneurs confront internationalizing products and services as well as core product management issues. Offers students an opportunity to work in cross-culture consulting teams with local students from partner universities. Projects vary widely but typically involve assessment of current product line and services strategy, marketing approaches, and how these must be adapted for foreign markets, including the United States. This is a field consulting course with heavy client engagement, requiring detailed written and oral communications for the client.

ENTR 4512. Social Entrepreneurship and Sustainable Development in India. 4 Hours.

Offers a Dialogue of Civilizations course in India focusing on a social entrepreneurial journey of researching and designing sustainable economic solutions to social problems. The overriding premise of the course is that the inception and implementation of a social innovation begins by understanding a social problem within a particular context and developing a systems-based approach to imagining solutions to reduce or solve the social problem. Through a learning-by-doing approach, offers students an opportunity to delve into critical social problems in the country—gender inequality, financial exclusion, climate vulnerability, environmental degradation, water access, disease, illiteracy, human trafficking, food insecurity, etc.—and work alongside local counterparts.

ENTR 4514. Development Practice and Global Citizenship in India. 4 Hours.

Offers a Dialogue of Civilizations course in India focusing on the personal, reflective journey of the individual and the collective journey of becoming an active global citizen. Offers students an opportunity to enter the personal journey by exploring development practice—what it means to have a life and career as a development practitioner—and by engaging in reflective practice, a set of techniques for synthesizing and analyzing our lived experience, both personal and professional. Also offers students an opportunity to engage in the global citizen journey by learning to facilitate dialogues between their class and their new colleagues and friends in India to better understand their hopes and fears about the globalized context in which we all live.

ENTR 4983. Topics. 4 Hours.

Covers special topics in entrepreneurship. May be repeated without limit.

ENTR 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ENTR 4992. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

ENTR 4993. Independent Study. 1-4 Hours.

Allows students who have received approval to undertake independent study in lieu of any course required in the various concentrations. Students present proposals to an Independent Studies Committee for evaluation and approval. Every proposal requires a detailed outline of the objectives and plan of study and must be accompanied by a supporting statement from the supervising faculty member under whose direction the study takes place. A copy of the final report prepared by the student is presented to the appropriate Independent Studies Committee. Further information about the Independent Studies Program can be obtained from concentration coordinators. May be repeated without limit.

ENTR 6200. Enterprise Growth and Innovation. 3 Hours.

Explores the challenges and processes for harnessing technological innovation for new-business development. Integrates technology strategy, innovation in marketing, product development, and organization design for the purpose of enterprise growth. Through readings, cases, and exercises, studies how firms from different industries gain competitive advantage through distinctive products and services, and leverage their technologies and skills into new emerging markets. Also focuses on processes for conceiving, financing, and organizing new ventures.

ENTR 6208. Innovation and Enterprise Growth. 2,3 Hours.

Explores the challenges and processes for harnessing technological innovation for corporate growth. Integrates innovation in four key dimensions: markets and users, technology (for both products and services), organization, and business models. Uses readings, cases, and exercises to teach students how firms from different industries accelerate corporate growth by internally generating new products and services and how to do this fast and efficiently by leveraging their skills, product technologies, and production processes into growth opportunities. Features a team-based applied project in corporate entrepreneurship. Offers students an opportunity to develop fully featured business plans using business planning tools from BUSN 6202. Focuses on growth through internal development, as opposed to mergers and acquisitions.

ENTR 6210. Managing Operations in Early Stage Ventures. 3 Hours.

Stresses the operating problems of managing small businesses. Case studies develop analytical approaches for appraising the risks and rewards of potential growth opportunities as well as operating problems. Problems range from locating, evaluating, marketing, and financing a small company to the survival and growth of more established businesses. Guest speakers and entrepreneurs provide pertinent business perspectives to in-class activities.

ENTR 6211. Entrepreneurship: Services and Retail Business Creation. 3 Hours.

Covers the issues surrounding the creation of a new business in the service and retail sectors. Emphasizes issues relating to the startup, growth, and operation of business ventures in these areas. Topics include developing a business plan for startup, market positioning, services design, operations management, sales forecasting, cash flow management, and venture financing with a heavy emphasis on debt financing. Students are asked to develop business plans for services and retail ventures of their own choosing as the class project. Requires prior completion of 9 SH of MBA core courses.

ENTR 6212. Business Planning for New Ventures. 3 Hours.

Gives students the opportunity to build a complete business plan for new high-potential ventures. Covers all aspects of the planning process, from the point of view of both the prospective entrepreneur and the potential investor. Explores the demands of the entrepreneurial career through reading, self-assessment exercises, and group projects. Guest speakers from startup companies, law firms, and venture capital firms provide a window on current experiences in the small-business world. Recommended for prospective entrepreneurs as well as others who may become involved with new ventures.

ENTR 6214. Social Enterprise. 3 Hours.

Designed to provide students with an in-depth exposure to entrepreneurship in the social sector, a rapidly growing segment of the global economy. Uses the case method to expose students to leading entrepreneurs who have developed and implemented business models to solve social problems such as extreme poverty, disease, illiteracy, and economic and social dislocation. Focuses on uniquely creative and driven people who have dedicated their lives to making a difference in the lives of others through values-based entrepreneurship.

ENTR 6216. Global Social Entrepreneurship and Innovation. 3 Hours.

Explores using innovation to build and create value in the larger global context. Examines some of the latest innovation practices: (1) to build and create value within emerging economies, (2) to facilitate social entrepreneurship, (3) to promote sustainable development, and (4) to build and create value at the bottom of the pyramid. Exposes students to what successful entrepreneurs must learn to balance business demands with the larger need for innovative thinking. Stresses the application of successful practices to generate results. Topics include creating and sharing knowledge and intellectual property, exploiting systems and networks, redefining disruptive innovation, and the steps necessary to make innovation and entrepreneurship happen in a variety of global contexts. Uses real-life examples and case studies to illustrate successful practices.

ENTR 6217. Lean Innovation. 3 Hours.

Explores how corporate venturing and entrepreneurial teams can quickly and effectively bring new concepts to market. Demonstrates how small technical teams can quickly investigate opportunity spaces, develop and select concepts, and translate these into prototypes. Other topics include industrial design thinking, project teams, prototyping, and commercialization of design. Explores the challenges and solutions to managing a technology-based product within an established corporation and details frameworks on how innovative projects can be inexpensively tested and deployed within the organization.

ENTR 6218. Business Model Design and Innovation. 3 Hours.

Introduces major topics in the modern understanding of business models: their essence and role in securing competitive advantage, key components and design of business models, business model change and innovation, technology commercialization through sustaining business models, financial representation of a business model, and validation of developed business models.

ENTR 6219. Financing Ventures from Early Stage to Exit. 3 Hours.

Introduces students to the financing process for ventures from early stage to exit. Exposes students to various financing options, which may include crowdsourcing, the American JOBS Act, and foreign-sourced capital, as well as different types of debt and equity financing. Offers students an opportunity to learn about analyzing financial aspects of term sheets, including valuation methodologies and other financing documents.

ENTR 6220. Family Business Leadership and Governance. 3 Hours.

Explores the unique challenges and strengths of family firms. Uses a learning framework with particular emphasis upon the insights and lessons learned by successful family business leaders. Offers students an opportunity to heighten their awareness of themselves concerning their roles in the family firm and their future career plans, as well as to develop key leadership skills associated with strategic planning and implantation within family enterprises. Explores particular functional issues unique to family firms in the areas of marketing, finance, control and human resource management, as well as family and business governance. Restricted to business students only.

ENTR 6222. Competing in Dynamic, Innovation-Driven Markets. 3 Hours.

Reviews the key theories and tools needed to understand how technological change creates new markets and prompts new business models, how technology-based firms can outcompete rivals in fast-growing markets characterized by high uncertainty, and how the evolution of technology in an industry affects the type of firm capabilities needed to succeed over time.

ENTR 6224. Intellectual Property and Other Legal Aspects of Business and Innovation. 3 Hours.

Introduces the major areas of the legal environment for innovation and new ventures and their relationship to early stage decisions and product and business development. Analyzes the nature, practical impact, and competitive usefulness of laws in the areas of intellectual property, contracts, employment, e-commerce, regulatory compliance, and entity formation. Offers students an opportunity to integrate and apply their understanding of legal, financial, business, technology, and ethical factors; sharpen their analytic skills; and use their skills and understanding to recognize opportunities for adding value and managing risk.

ENTR 6225. Acquisitions, Alliances, and Growth. 3 Hours.

Offers students an opportunity to analyze whether, why, and how multibusiness corporations expand their operations into new business areas by questioning decisions to grow globally through mechanisms such as acquisitions or alliances. Uses rigorous case-based discussions, expert readings, and major current events to discuss issues related to the choice of make, buy, or partner. Offers students an opportunity to evaluate how these different corporate entrepreneurial strategies are used to help firms be more competitive and innovative.

ENTR 6230. Platform Innovation. 3 Hours.

Provides a business perspective on how to design and optimize platform-based business models for growth, value creation, and innovation and a practical analytical toolkit of theories, concepts, and frameworks. Uses case studies from various industries. Many of today's growth enterprises and startups are organized as platforms. Platforms facilitate other actors and support interactions among a wider "ecosystem" of users, services, suppliers, etc., and they have potential for massive growth and value creation. High returns to successful platform business models lead companies to learn to act like platforms. Technology trends toward digitization, big data, automation, etc., accelerate these trends. Aimed at people looking to work within existing companies or those interested in starting or growing new platforms.

ENTR 6318. Innovating and Creating Futures. 2 Hours.

Introduces a number of entrepreneurship and innovation topics, including innovation and entrepreneurship as a value-creating activity for economies and firms; types of innovation (technological, process, products, business models); fundamentals of product development (design thinking, rapid prototyping, ethnography); startup creation and articulating a value proposition; the role and traits of the entrepreneur; maximizing odds of success and minimizing odds of failure; growing the startup and creating a market; finding or creating the right niche; pivoting and judo strategy; lean startup approach; innovation in established firms and resistance to change; organizational inertia; business model change; and technological discontinuities.

ENTR 6320. Innovation, Entrepreneurship, and Dynamic Competition. 3 Hours.

Explores the life cycle of industries and their effects on the dynamics of competition, including the creation of industries and the role of startups and proliferation of designs; the half-truth of entry timing advantage; design competition, emergence of dominant designs, and implication for firm strategy and industry structure; the onset of maturity: the role of process innovation and incremental product changes; technological discontinuities, challenges for incumbents, and opportunities for new entrants; the hybrid trap and how incumbents often miss the mark during times of industry transformation; the rise of platform disruptions and winner-take-all dynamics; the sociocognitive dimension of industry evolution: product categories and framing; and best practices for managing innovation in startups and established firms. Taught through a combination of cases, vignettes, and interactive lectures.

ENTR 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ENTR 7976. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on chosen topics. May be repeated without limit.

Entrepreneurship Technological (TECE)

Search TECE Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=TECE>)

TECE 6222. Emerging and Disruptive Technologies. 3 Hours.

Covers the role emerging technologies play in innovation for new ventures and established corporations. Includes a mix of theory and practical knowledge. Topics covered include technology disruption, diffusion, life cycles, and research-and-development strategy. Explores, in detail, the technical and market opportunities for current and emerging technologies across a broad spectrum of industries.

TECE 6230. Entrepreneurial Marketing and Selling. 3 Hours.

Examines the specific situation of entrepreneurial marketing. Topics include how to perform a market analysis when there are limited resources and tight schedules to be met. Also addresses new market situations, opportunity assessment, customer segmentation, going to market, and writing a marketing plan.

TECE 6250. Lean Design and Development. 3 Hours.

Covers the intersection of customer research with product design, specifically lean design and how to map abstract attributes that customers seek into concrete product designs that can actually be built. Other topics include managing the technology business interface, creating product teams, and drafting product development plans. Open to first-year graduate students.

TECE 6300. Managing a Technology-Based Business. 3 Hours.

Covers topics specific to managing a business or a strategic business unit within a firm. Considers the special issues related to technology-based firms. Topics include creating a culture, operations planning, staffing for technical excellence, dealing with technology vendors, dealing with advisers, supply chain management, and writing operations plans. Open to first-year graduate students.

TECE 6340. The Technical Entrepreneur as Leader. 3 Hours.

Focuses on the personal skills an entrepreneur needs to lead and persuade others. Students read about and complete exercises on leadership and selling ideas. In addition, students meet members of the entrepreneurship community in New England. Stresses communications skills, both written and oral, along with self-discovery of leadership style.

TECE 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

TECE 7976. Directed Study. 1-4 Hours.

Offers theoretical or experimental work under the direction of faculty on a selected topic. Course content depends upon the faculty member. May be repeated without limit.

Environmental Studies (ENVS)

Search ENVS Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=ENVS>)

ENVS 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ENVS 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ENVS 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ENVS 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ENVS 4991. Research. 4 Hours.

Offers an opportunity to conduct research under faculty supervision.

ENVS 4997. Senior Thesis. 4 Hours.

Offers students an opportunity to prepare an undergraduate thesis under faculty supervision.

Finance - CPS (FIN)

Search FIN Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=FIN>)

FIN 1200. Managing Your Personal Finances. 3 Hours.

Introduces the practical finance skills that enable students to identify their personal financial goals—such as budgeting, saving and investing, borrowing, retirement, home buying, insurance needs, and estate planning—within their careers and incomes. Offers students an opportunity to plan and make financial decisions that will help them reach those goals.

FIN 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

FIN 2105. Introduction to Corporate Finance. 3 Hours.

Studies the basic theory, techniques, and application of financial analysis tools needed for business financial administration and decision making.

FIN 2290. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

FIN 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

FIN 3100. Finance for New Ventures. 3 Hours.

Focuses primarily on startup ventures and the methods most useful to early stages companies, including microfinance, crowdfunding, angel investing, and venture capital. Covers the financing mechanism of a startup, including nonprofit companies and social entrepreneurship ventures.

FIN 3310. Financial Institutions and Markets. 3 Hours.

Explores the structure and functioning of the U.S. and international financial markets and institutions. Topics covered include banking theory; instruments of various financial markets; the roles of traditional and nontraditional financial intermediaries; and the impact of securitization, international financial competition, financial system stability, and financial regulation.

FIN 3330. Risk Management and Insurance. 3 Hours.

Offers students an opportunity to develop an understanding and appreciation of fundamental insurance principles. Studies risk, risk management, rating, and contract elements. Course material includes the major lines of insurance covering both personal and commercial insurance.

FIN 3340. Investments. 3 Hours.

Studies the nature of securities, the mechanics and costs of trading, and the ways in which the securities markets operate. Applies risk-return analysis in making decisions to buy or sell stocks, bonds, options, and other investments. Requires a semester-long project in which students follow and analyze the performance of individual and a portfolio of investments with written analysis.

FIN 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

FIN 4220. Working Capital Management. 3 Hours.

Explores short-term financial management. Reviews institutional and legal aspects as a context for making decisions involving current assets and current liabilities. This working capital management—the management of cash, inventories, accounts receivable, and short-term credit arrangements by business firms—provides the basis of long-term survival of businesses.

FIN 4230. International Finance. 3 Hours.

Studies the international financial environment in which organizations operate, including trade, balance of payments, capital flows, tariff policies, international economic institutions, currency, and exchange-rate issues. Explores international aspects of investment planning and financing decisions and other factors important to managing multicountry cash flows and financing of multinational corporations.

FIN 4240. Personal Financial Planning. 3 Hours.

Focuses on the logic, concepts, tools, and applications of financial planning for retirement, estate planning, and financial risk management. Forecasts and analyzes various financial needs such as retirement income, health and insurance protection, dependent protection projections, etc., and utilizes investment vehicles to develop a financial plan to meet the forecast needs. Intended for those planning careers in personal financial advising in one of the various financial services environments.

FIN 4250. Real Estate Finance. 3 Hours.

Discusses finance concepts applied to real estate issues. Topics include mortgage instruments, mortgage markets, residential real estate closing, income property analysis, financial leverage, real estate valuation, securitization, and real estate investments.

FIN 4955. Project. 1-4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student's major field. May be repeated without limit.

FIN 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

FIN 6101. Accounting Fundamentals for Financial Institutions. 3,4 Hours.

Emphasizes managerial and financial accounting concepts as they apply to financial institutions. Analyzes financial statements of a variety of financial institutions with an emphasis on understanding the accounting structure of financial institutions, ratio analysis as it is used to evaluate financial performance, and accounting control systems.

FIN 6102. Asset and Liability Management. 3,4 Hours.

Provides a risk-management analysis of the assets and liabilities of financial institutions. Topics include analysis and management of regulatory, liquidity, capital, credit, currency, and interest-rate risks.

FIN 6120. Building Financial Relationships. 3,4 Hours.

Explores how financial institutions develop, price, and market financial products and services in a global economy. Examines the variety of financial products available, product packaging and pricing decisions, cross-selling, and relationship building in a competitive marketplace.

FIN 6161. Investment Analysis. 4 Hours.

Focuses on investment management as the study of risk and return of financial securities and real assets. Explores domestic and international financial markets and the securities traded therein. Offers students an opportunity to develop an understanding of security analysis, including fundamental, technical, and quantitative techniques used in the valuation of financial assets. Analyzes qualitative concepts such as market efficiency, intrinsic value, and risk. Stresses portfolio construction, management, and protection.

FIN 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

Finance and Insurance (FINA)

Search FINA Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=FINA>)

FINA 1209. Personal Finance. 4 Hours.

Emphasizes the development of individually focused financial information and a comprehensive financial plan designed to enable the individual to manage his or her financial affairs. Integrates personal goals—such as buying a home, retirement, investing, and insurance needs—to help assure that the financial plan incorporates the major decision stages an individual faces.

FINA 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

FINA 2201. Financial Management. 4 Hours.

Designed to develop the financial skills and logical thought processes necessary to understand and discuss financial policy decisions in a global economy. Specific objectives include developing an understanding of the time value of money; using financial statements in decision making; and understanding the nature of financial markets, the cost of capital, valuation of stocks and bonds, management of short-term assets, short-term and long-term financing, capital markets, and multinational financial management. Addresses the impact of legal, social, technological, and ethical considerations on efficient economic outcomes. Requires a financial calculator and provides an opportunity to develop computer spreadsheet skills.

FINA 2202. Financial Management in a Global Context. 4 Hours.

Covers the financial skills and thought processes necessary to understand and discuss financial policy decisions in a global economy. Emphasizes return and risk management issues faced by financial managers as they operate internationally. Topics include the effects of currency translation and valuation; understanding the time value of money; translating, consolidating, and evaluating financial statements in decision making; determination of the cost of capital; valuing stocks and bonds available in different global markets; and managing short-term assets and liabilities and short-term financing. Addresses the impact of legal, social, technological, and ethical considerations faced by financial managers in companies that operate globally. Requires a financial calculator. Offers students an opportunity to develop computer spreadsheet skills.

FINA 2209. Financial Management. 4 Hours.

Does not count as credit for business majors. Counts as FINA 2201 for business minors only.

FINA 2710. Emerging Financial Markets. 4 Hours.

Presents essential theoretical background and practical knowledge regarding investments in emerging financial markets. Covers how emerging markets are developed and how securities are valued and traded. Explores the major risk factors associated with investing in these markets as long as the basic institutional policy issues affect emerging markets. Finally, offers a practical approach to investing in emerging financial markets (including financial securities selections, analysis, and portfolio diversification).

FINA 2720. Sustainability in the Business Environment. 4 Hours.

Examines a variety of environmental problems, including global warming, use and disposal of toxic substances, and depletion of natural resources such as water and petroleum. Many of these problems arise because these are resources that are available to all and so their overuse is an externality that is not included in manufacturing costs. Businesses have been involved in both identifying sustainability issues in their individual organizations and providing a variety of innovative solutions. Uses a combination of readings and case analyses to assesses how both government regulations—such as taxes, subsidies, building codes, prohibitions of use—and business solutions—including zero emissions, green design, producer take-back, life cycle assessment, and corporate environmental reporting—address these problems.

FINA 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

FINA 3301. Corporate Finance. 4 Hours.

Designed to develop the skills needed to make and implement financial policy decisions in a global economy. Specific objectives include developing an understanding of financial analysis; company valuation; capital markets; cost of capital; capital asset pricing and risk management; short- and long-term financial policies; working capital management; multinational financial management; and special topics including lease financing, debt refunding, mergers and acquisitions, and bankruptcy and restructuring. Offers opportunities to consider many broader issues including the relevance of globalization; the world economy; technological advances; and legal, social, and ethical issues related to the practice of corporate finance. Stresses written and oral communication skills and teamwork. Uses cases and spreadsheets extensively.

FINA 3303. Investments. 4 Hours.

Focuses on investment management as the study of risk and return of financial securities and real assets. Students design and assess models that evaluate investments while recognizing the constraints of the real world. Explores domestic and international financial markets and the securities traded therein. Discusses techniques for valuation of financial assets. Analyzes qualitative concepts such as market efficiency, intrinsic value, and risk. Provides the ability to build unique valuation models to suit the particular investment alternative that students wish to scrutinize. Also stresses portfolio construction, management, and protection, as well as performance assessment. During the semester, students have an opportunity to create and manage a stock portfolio.

FINA 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

FINA 4219. Portfolio Management. 4 Hours.

Studies the characteristics and formation of optimal portfolios by investing risky assets and fixed incomes. The discussion of theories and models is associated with the application for portfolio decision making in practice. Offers students an opportunity to obtain the ability to establish appropriate client investment objectives, gather and assess information necessary for determining the investment style and the selection of the securities and, evaluate the performance of a portfolio. Portfolio management is a critical functionality that is provided by financial institutions such as investment banks, insurance companies, and funds. This full-semester course is designed to introduce industry-grade portfolio analysis, exploring all aspects of investment evaluation from the perspective of institutional and individual investors.

FINA 4220. Behavioral Finance. 4 Hours.

Designed to revisit neoclassical economic theory based on rational market participants, then introduce students to the theory and evidence regarding psychological heuristics and biases that are inconsistent with the underlying assumptions of these classical models. Behavioral biases can severely influence financial decision making in the investment and the corporate environments, and it is important for students to understand how and why these biases occur. The course material, born out of the fields of cognitive psychology and behavioral economics, is designed to help students understand their own biases in making personal financial decisions.

FINA 4310. Working Capital Management. 4 Hours.

Examines strategies and analytical approaches to managing current assets and current liabilities. Explores corporate cash management under changing money market conditions. Discusses the use of interest rate futures and working capital management in a multinational context. Provides a summary overview of entrepreneurial finance, with a focus on small businesses, corporate ventures, and intrapreneurship. Applies knowledge of corporate finance in the context of starting, acquiring, managing, and divesting a business or a business unit within a corporation. Topics include analyzing the financial needs of new ventures, exploring sources of financing, managing decline, determining valuation, and reviewing exit strategies.

FINA 4312. Issues in Corporate Governance. 4 Hours.

Examines the nature of conflicts over control of the corporation. Applies modern finance theory and practice to the issues raised and draws on seminal works in the finance and economics literature that influence the current debate in this area. Discusses legal and ethical considerations that are especially important in corporate-control issues. Uses cases involving well-known takeovers, as well as current hostile takeover battles, to illustrate the theories discussed.

FINA 4320. International Financial Management. 4 Hours.

Introduces international financial markets including balance of payments, history of the international monetary system, exchange-rate determination, foreign-exchange-exposure hedging strategies, and international capital markets. Examines how the financial strategies and policies of multinational corporations differ from domestic corporations and how financial management is utilized in an international setting to achieve corporate goals.

FINA 4370. Financial Modeling. 4 Hours.

Designed to develop students' quantitative financial modeling skills and techniques using the Excel spreadsheet. Through learning how to use numerical examples and business cases, students study corporate valuation, weighted average cost of capital (WACC), pro forma statement modeling, portfolio models, and Monte Carlo simulation methods, etc. Seeks to cultivate students' ability to make assumptions, deal with imperfect information, and real-world data issues. Offers students an opportunity to apply theoretical knowledge in advanced corporate finance, asset pricing, and option pricing in a real-world context. This course is highly quantitative in nature; while it does not derive complicated mathematical formulas, familiarity with concepts such as the capital asset pricing model (CAPM), WACC, portfolio theory, and pro forma financial statements is expected.

FINA 4380. Financial Data Analytics with Python. 4 Hours.

Designed to introduce students to Python and its use as a financial data analytics tool. Python has gradually become one of the most widely used open-source, cross-platform programming languages. Introduces the basics of programming in Python and key libraries (NumPy, Pandas, Matplotlib, etc.) used in data analytics. The second part of the course focuses on implementing various financial models in Python. Topics covered include but are not limited to single and multifactor portfolio models, portfolio theory and the efficient frontier, algorithmic trading, options and futures, value at risk, etc.

FINA 4390. Machine Learning in Finance. 4 Hours.

Seeks to train students to develop financial technology (fintech) solutions using machine learning and deep learning algorithms and to prepare them for rapid changes in the financial services world due to technological innovations. Offers students an opportunity to learn to design algorithms and develop stand-alone scalable machine learning and financial technology applications. Covers a broad range of technology platforms including Python, database (SQL), front-end, and API tools, all of which are used to create scalable fintech applications. Topics covered include a working front-end design, which provides instant predictive output or finance-related functionality to end users. Emphasizes self-learning skills after initial preparation, as most developers need these skills to keep up with the ever-increasing set of technology development tools.

FINA 4410. Valuation and Value Creation. 4 Hours.

Explores recent developments in financial management and financial analysis through the use of modern finance theory to make capital allocation decisions that lead to long-run value maximization for the corporation. Focuses on applications and financial model building. Examines risk analysis by building spreadsheet models for valuation and risk-analysis applications. Utilizes valuation analysis models to merge financial, corporate, and business strategies to measure and manage corporate value. Develops an understanding of the mechanics of the valuation process, along with an understanding of the drivers of value and development of strategies for value creation. Topics covered are relevant to value consultants, corporate managers, and securities analysts.

FINA 4412. Personal Financial Planning. 4 Hours.

Emphasizes the development of personal financial management knowledge by applying the techniques and perspectives of financial planning professionals. Builds upon and applies skills gained in FINA 2201 to personal finance decisions such as retirement planning, home mortgages, and overall risk management. Offers students an opportunity to develop their own financial plan and understand how that plan will change as they age and their life situation changes. Note that while this course is not designed to prepare students to take the Certified Financial Planner exam, many of the topics, such as retirement planning, investment and securities planning, and estate planning, are among those discussed.

FINA 4420. Mergers and Acquisitions. 4 Hours.

Offers a practical, planning-based approach to managing the mergers and acquisitions (M&A) process. Analyzes how M&As create or destroy value; commonly used takeover tactics and defenses; M&A valuation techniques; alternative deal structures; and the financial, strategic, legal, and regulatory aspects of M&As. The first section covers how and when to apply the appropriate tools and skills to successfully complete a transaction. The second section offers students an opportunity to apply what has been learned to solve real-world business problems. Discusses all major elements of the acquisition process in the context of a logical process.

FINA 4512. Financial Risk Management. 4 Hours.

Explores the concepts of financial futures, options on financial futures, and listed options markets as developed to help corporations and financial institutions manage financial risk. Covers financial derivatives and standard hedging techniques first, followed by a study of market risk and strategies in managing market risk.

FINA 4514. Investment Banking. 4 Hours.

Examines the investment banking business. Investment bankers are one of the most important conduits through which funds flow from savers to corporations needing to invest in plant and equipment. Offers an opportunity to examine the major functions of large investment banks in regard to their investment banking, market making, and asset management businesses; to determine the financing needs of domestic and international corporations, not-for-profit organizations, and government entities by using concepts learned in earlier courses; and to learn to link these financing needs with products that are available in the capital markets, usually through the investment banking houses.

FINA 4516. Real Estate Finance. 4 Hours.

Surveys the field of real estate including principles of real estate law, transactions brokerage, management, development, valuation, taxation, finance, and investment. Provides a framework of real estate finance and investment, in both theory and practice. Examines all aspects of real estate financing including the primary and secondary mortgage markets, real estate financial institutions, regulations, and mortgage-backed securities. Analyzes the return, risk, and various strategies in real estate investments with financial methods and techniques. Uses case discussions, spreadsheet analysis, and investment projects to make learning effective.

FINA 4524. Credit Analysis. 4 Hours.

Explores all aspects of credit evaluation from the perspective of banks and other institutions. Introduces industry-grade credit analysis. Credit analysis is used by all manner of banks and other institutions, such as insurance companies, hedge funds, private equity groups, and even elements of local, state, and federal governments, to evaluate clients and potential borrowers who need loans and other structured debt products.

FINA 4526. Core Topics in Alternative Investments. 4 Hours.

Covers alternative investments, including real assets such as real estate and real estate investment trusts, hedge funds, commodities, private equity, and structured products. This course is highly quantitative and focuses on methods for understanding risk, return, and benchmarking of these investments. Offers students an opportunity to obtain a deeper understanding of each of these asset types.

FINA 4602. Turnaround Management. 4 Hours.

Examines strategies for identifying companies likely to fail and selecting and implementing remedial actions. Topics include business turnarounds, troubled companies, workouts, bankruptcies, and liquidations, using case studies and readings. Students evaluate a turnaround plan.

FINA 4604. Fixed-Income Securities. 4 Hours.

Exposes students to the theory, application, and evidence concerning highly sensitive interest rate products. Explores recent developments in pension fund management, asset/liability management, duration matching, "gap" management, and other important issues confronting domestic and international financial and corporate management. Offers students the opportunity to learn how to customize a risk management program.

FINA 4608. Advanced Financial Strategy. 4 Hours.

Covers strategic financial decision making in dynamic and technology-driven organizations operating in domestic and international settings. Through case studies, discussions with senior financial executives, and student projects, students gain insight into capital investing and financing decisions in the new economy. An analytical paradigm linking business strategy, financial management, and valuation is utilized to explore financial decision making throughout the life cycle of companies, intended to optimize shareholder value creation. Topics include fundamental financial analysis, capital budgeting under conditions of high risk and uncertainty, startup financing, creative financing, mega-mergers, risk management, and valuation.

FINA 4610. Entrepreneurial Finance, Innovation Valuation, and Private Equity. 4 Hours.

Covers qualitative and quantitative aspects of entrepreneurial finance, such as venture capital and angel financing. Also covers private equity (i.e., buyout/leveraged-buyout firms), but in less detail. Introduces valuation in entrepreneurial finance, including valuation of startups, using real options to value innovation-intensive firms, valuation in staged financing, etc. Casework emphasizes the practical aspects of qualitative and quantitative issues related to venture capital financing, entrepreneurship, and innovation from the perspective of the financier and the startup firm. Discusses issues related to the venture capital industry, such as the limited partnership structure, term-sheets and contracts, exit of portfolio firms, and international investments. Requires a working knowledge of Excel or other spreadsheet programs.

FINA 4970. Junior/Senior Honors Project 1. 4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student's major field. Combined with Junior/Senior Project 2 or college-defined equivalent for 8 credit honors project. May be repeated without limit.

FINA 4983. Special Topics in Finance. 4 Hours.

Examines areas of current interest and special topics in finance. Employs a mix of lectures, cases, and projects. Topics depend on the instructor. May be repeated up to two times.

FINA 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

FINA 4993. Independent Study. 1-4 Hours.

Allows students who have received approval to undertake independent study in lieu of any course required in the various concentrations. Students present proposals to an Independent Studies Committee for evaluation and approval. Every proposal requires a detailed outline of the objectives and plan of study and must be accompanied by a supporting statement from the supervising faculty member under whose direction the study takes place. A copy of the final report prepared by the student is presented to the appropriate Independent Studies Committee. Further information about the Independent Studies Program can be obtained from concentration coordinators. May be repeated without limit.

FINA 6200. Value Creation through Financial Decision Making. 3 Hours.

Highlights the role of financial management as a source of value creation in a competitive global environment characterized by rapid technological, personal, and market changes. Offers students an opportunity to develop tools and techniques of financial analysis and valuation to support financial decision making. Presents future managers with actual business problems to learn to apply the tools of financial analysis to strategic decisions faced by the firm, such as capital budgeting and capital structure.

FINA 6201. Financial Theory and Policy. 3 Hours.

Covers the fundamentals of financial decision making. Introduces students to the basic framework of corporate finance. Topics include tools and applications of financial asset valuations, the risk-return tradeoff, modern portfolio theory, methods of calculating the risk of financial assets, tools and applications for analyzing a firm's capital investment decisions, capital structure and dividend policy issues, theory and evidence concerning corporate restructuring, such as mergers and hostile takeovers, and issues concerning international financial management and the legal, ethical, and regulatory environment of financial management.

FINA 6202. Analysis of Financial Institutions and Markets. 3 Hours.

Introduces the domestic and international financial system and the institutions within it. Develops data and quantitative analysis tools utilized for economic and financial modeling and analysis. Emphasis is on regression analysis and its application, including how to build and interpret statistical models. Topics include the major types of financial institutions that operate within the global economy and the financial instruments employed by them; how exchange rates, interest rates, and security prices are determined and how they affect the global economy; and how governments and central banks impact economic and financial conditions.

FINA 6203. Investment Analysis. 3 Hours.

Familiarizes students with domestic and international financial markets and the securities traded therein. Discusses a variety of techniques for valuation of financial assets and relies heavily on quantitative methods. Critically analyzes such qualitative concepts as market efficiency, intrinsic value, and risk. The contents of this course, descriptive, theoretical, and applied, should provide students with the ability to build unique valuation models to suit the particular investment alternative they wish to scrutinize. Also provides students with an understanding of how investment theory and investment practice relate.

FINA 6204. International Finance Management. 3 Hours.

Develops specific concepts, policies, and techniques for the financial management of the multinational firm. Topics include operation of the foreign exchange markets, foreign exchange risk management, sources and instruments of international financing, foreign direct investment and the management of political risk, multinational capital budgeting, and financing control systems for the multinational firm.

FINA 6205. Financial Strategy. 3 Hours.

Develops financial, analytical, and communication skills necessary to develop and implement a financial strategy consistent with firm value creation in a dynamic environment. Stresses the impact of ethical and legal considerations, global markets, and technological innovation on efficient economic outcomes. Emphasizes written and oral communication skills. Upon completion of this course, students should be able to identify and analyze a firm's strategic opportunities and propose a suitable financial strategy that is consistent with firm value creation.

FINA 6206. Finance Seminar. 3 Hours.

Structures discussion of current topics in the finance literature. Students read and present the works of leading researchers. Topics are broad and may cover various areas of corporate finance, investments, and institutions. Students also complete an original project emphasizing current methodologies of analysis.

FINA 6207. Financial Modeling. 3 Hours.

Introduces financial modeling applications in the fields of risk management, statistics applied to finance, investments, and portfolio management. Financial modeling is used for performing financial analysis facilitating business decision making in virtually any business. Excel is the most widely used electronic spreadsheet program in the world. Offers students an opportunity to develop strong Excel proficiency needed to effectively and efficiently understand and implement the quantitative aspects of financial topics covered in the various financial courses taught in the MBA and MSF programs and to learn how to use a variety of spreadsheet tools and techniques to enhance their overall analytical skill set.

FINA 6208. Financial Management for Value Creation. 4 Hours.

Introduces basic concepts of financial management—the management of the flow of funds available to an organization. Uses practice-oriented education to help students develop knowledge, skills, critical-thinking abilities, and behaviors consistent with the objective of creating value. Includes frameworks, principles, tools, techniques, and procedures to illustrate their application. Topics include financial analysis, forecasting and planning, working capital management, valuation, capital budgeting, cost of capital, dividend policy, mergers, sources and methods of financing, financial structure, financial markets, financial strategy, risk management, and the timing of financial policies in domestic and international settings. Discusses ethical, legal, regulatory, environmental, societal, cultural, diversity, technological, and demographic issues related to financial management as appropriate.

FINA 6209. Introduction to International Accounting and Finance. 3 Hours.

Offers students an opportunity to obtain a graduate-level understanding of accounting principles and standards and resulting financial statements. Emphasizes problems caused from differences in accounting standards and tax codes. Traces the impact of exchange-rate changes on the reporting of profits and owner's equity.

FINA 6211. Financial Risk Management. 3 Hours.

Provides an overview of all of the hedging markets and hedging instruments. Explores specific hedging use of options, forwards, futures, swaps, and options on futures. Focuses on advanced financial risk management of interest rates, currency rates, equity returns, and fixed income returns. Students use readings and case problems to study when and how to use hedging instruments to alter a portfolio's risk exposure.

FINA 6212. Fixed Income Securities and Risk. 3 Hours.

Exposes students to theory, applications, and evidence concerning highly sensitive interest rate products. Discusses recent developments in pension fund management, asset/liability management, duration matching, "gap" management, concurrent interest rate and exchange rate management, and other important issues now confronting domestic and international financial and corporate management. Studies how to customize a risk management program.

FINA 6213. Investment Banking. 3 Hours.

Discusses policy, strategy, and administration of financial services firms. Topics include issuance of securities, the service function within financial services, pricing a negotiated issue of common stock or competitive bid issue, and meeting capital requirements of a securities firm.

FINA 6214. Mergers, Acquisitions, and Private Equity. 3 Hours.

Explores the environments that have recently given rise to a large number of corporate mergers and the business factors underlying these corporate combinations. Examines the financial, managerial, accounting, and legal factors affecting mergers. Focuses on three aspects of the merger and acquisition process: the strategic decision to acquire, the valuation decision of how much to pay, and the financing decision on how to fund the acquisition.

FINA 6215. Business Turnarounds. 3 Hours.

Concentrates on the diagnosis, prescription, and implementation of actions pertinent to business turnarounds, troubled companies, workouts, bankruptcies, and liquidations. Case studies and readings guide the student through the maze of financial, ethical, legal, general business, and strategic aspects of turnarounds, culminating in the student evaluating and developing a turnaround plan.

FINA 6216. Valuation and Value Creation. 3 Hours.

Focuses on cash-flow oriented models of the valuation of the firm. Topics include enterprise value, free cash flow, economic value added, and risk/reward analysis. Explores recent developments in financial management and financial analysis through the use of modern finance theory to make capital allocation decisions that lead to long-run value maximization for the corporation. Focuses on applications and financial model building, risk analysis for valuation applications, and business strategies to measure and manage corporate value and value creation. Topics are relevant to value consultants, corporate managers, and securities analysts.

FINA 6217. Real Estate Finance and Investment. 3 Hours.

Provides students with a comprehensive understanding of real estate finance. Emphasizes factors affecting real estate investment. Topics include valuation (appraisal), market analysis, development, taxation, ownership types, short-term financing, mortgage markets, and investment strategies. Designed for students interested in a general overview of real estate finance, as well as those intending to pursue a career in the real-estate field.

FINA 6219. Portfolio Management. 3 Hours.

Develops portfolio construction, revision, and performance measurement. Highlights portfolio construction in an efficient capital market. Topics include risk-return analysis, the effects of diversification on risk reduction, and the costs of inflation, taxes, and transaction costs on fixed income and equity security portfolios. Examines financial models of capital asset pricing as the basis for the analysis of portfolios from the institutional investor's viewpoint.

FINA 6220. Healthcare Finance. 3 Hours.

Implements financial management and economic principles to analyze real-world healthcare issues. Emphasizes and encourages problem solving and creative thinking through the use of texts, cases, and models of the healthcare industry. Students are exposed to financial, managerial, and risk management strategies unique to the healthcare industry.

FINA 6225. Entrepreneurial Finance for High Tech Companies. 3 Hours.

Provides an overview of entrepreneurial finance with a focus on high-technology companies. Specific topics covered include analyzing the financial needs of high-technology ventures, including working capital management, risk analysis, capital budgeting, sources of financing, valuation; and exit strategies, including licensing, joint ventures, mergers and acquisitions, and initial public offerings (IPOs). Uses a combination of text material, books, and cases.

FINA 6231. Disrupting the Finance and Insurance Service Industries. 3 Hours.

Offers a summary overview of fintech and how it is disrupting the financial services and insurance industries. Discusses key business, regulatory, and technical elements including, but not limited to, blockchain technologies, bitcoin, crowdsourcing, payment processing, changes in investment management, changes in commercial banking, and changes in insurance. Considers evolutionary changes taking place among incumbents and entrepreneurial startups in developed as well as emerging economies. Includes research articles, business cases, and guest speakers from the local fintech community.

FINA 6260. Entrepreneurial Finance and Venture Capital. 3 Hours.

Covers qualitative and quantitative aspects of entrepreneurial finance, such as venture capital and angel financing. Introduces students to valuation aspects in entrepreneurial finance, including valuation of startups, using real options to value innovation-intensive firms, and valuation in staged financing. Emphasizes the practical aspects of qualitative and quantitative issues related to venture capital financing, entrepreneurship, and innovation from the perspective of the financier and the startup firm. Also covers many issues related to the venture capital industry, such as the limited partnership structure of the venture capital/private equity industry, venture capital term sheets and contracts, exit of portfolio firms, and international investments. May be repeated without limit.

FINA 6284. Financing Innovation and Growth. 3 Hours.

Offers an immersion in corporate finance with a specific focus on the financing of innovation and growth at firms. Topics include analyzing and applying finance from the perspective of intrapreneurship as well as entrepreneurship.

FINA 6292. Advanced Topics in Finance. 3 Hours.

Examines current, specialized, and advanced topics in the areas of corporate finance, investments, risk management, valuation, private equity, venture capital, and other areas as appropriate. Course content, pedagogy, and prerequisites vary by topic and instructor.

FINA 6309. Foundations of Accounting and Finance. 3,4 Hours.

Explores key principles of accounting, as presented in the principal financial statements. Using those principles, explores a number of accounting practices and issues. Develops tools of financial analysis and financial planning and applies the information gained to business decision making. Utilizing the principle of time value of money to compare inflows and outflows of funds occurring at different times, develops basic decision tools for managers to make sound financial choices and to understand the context in which they are made. At the end of the course, the successful student should have a sound basic understanding of accounting and financial matters and the ability to understand business decisions in context and to evaluate the choices that management faces in the normal course of business development.

FINA 6318. Financial Management. 2 Hours.

Introduces time value of money calculations and applications. Building upon a basis in accounting, offers students an opportunity to learn how to extract relevant information from the accounting statements for use in financial calculations and ratio analysis. Also examines capital planning, including determining relevant cash flows, calculating decision measures, and making the correct decisions.

FINA 6320. Advanced Financial Management. 3 Hours.

Builds upon FINA 6318. Focuses on capital allocation and both equity and fixed-income markets. Covers the fundamentals of stock and bond valuation, as well as a brief review of macroeconomic concepts including the role of the Federal Reserve, growth, and inflation. Culminates with coverage of firm capital structure and the weighted average cost of capital (WACC).

FINA 6331. Corporate Finance. 3 Hours.

Introduces the basic framework of corporate finance and financial decision making. Topics include capital budgeting; capital investment decisions; complex valuations; security issues; dividend policy; static and dynamic capital structure; real option analysis; restructuring; bankruptcy; corporate control and governance; and the legal, ethical, and regulatory environment of financial management.

FINA 6332. Fundamentals of Financial Math and Financial Markets. 3 Hours.

Introduces the essential fundamental mathematics needed for the study of modern finance: probability, stochastic processes, statistics, and regression analysis. Also focuses on theory and empirical evidence useful for investment decisions. Topics include financial risk factors, financial models, financial markets and equilibrium models of security prices, market efficiency, and the empirical behavior of security prices.

FINA 6333. Data Analytics in Finance. 3 Hours.

Introduces Python and its use as a financial data analytics tool. Python has become one of the most widely used open-source, cross-platform programming languages. Covers the basics of programming in Python and key libraries (NumPy, Pandas, Matplotlib, etc.) used in data analytics, then focuses on implementing various financial models in Python. Topics include single and multifactor portfolio models, portfolio theory and the efficient frontier, algorithmic trading, options and futures, and value at risk.

FINA 6334. Empirical Methods in Finance. 3 Hours.

Examines statistical methods used to analyze financial data and test financial theories. Offers students an opportunity to learn how to access various sources of financial data, design empirical tests, and apply basic programming skills to analyze the data and arrive at conclusions. Specific topics include regression analysis, time-series analysis, event study methodology, panel data analysis, and limited dependent variable models.

FINA 6335. Derivatives and Risk Analysis. 3 Hours.

Introduces derivative assets, financial engineering, and risk management. Explores specific hedging use of options, forwards, and futures. Focuses on the determinants of forwards, futures, options and swaps, and various exotic derivatives pricing using computer-based numerical methods in a Monte Carlo setting and in closed form using elements of stochastic calculus. Also explores risk-management strategies using positions in derivative securities, static hedging, and dynamic hedging in continuous time.

FINA 6336. Derivatives and Fixed-Income Securities. 3 Hours.

Exposes students to theory, applications, and evidence concerning highly sensitive interest-rate products. Designed for students seeking to develop understanding of fixed-income valuation and hedging methods and familiarity with major markets and instruments. Emphasizes tools for quantifying, edging, and speculations. Topics include duration; convexity; approaches to modeling the yield curve; interest-rate forward; futures, swaps, and options; credit risk and credit derivative; mortgages; and securitization.

FINA 6337. Computational Methods in Finance. 3 Hours.

Studies various computational methods in finance. Analyzes market data and build trading strategies. Uses interpolation, solver, and optimization methods to calibrate discount curve and volatility surfaces to market prices. Analyzes market data and applies dimension-reduction techniques such as principal component analysis (PCA). Applies time-series analysis and PCA to implement and back test trading strategies.

FINA 6338. Alternative Investments. 3 Hours.

Emphasizes assets and portfolios that fall into the category of alternative investments, which includes nontraditional assets—such as structured products and other types of derivatives—and managed portfolios—such as private equity, venture capital, and hedge funds. Offers students an opportunity to obtain a fundamental understanding of the securities and products that are traded in this space. Focuses on in-depth analyses of case studies, outside speakers, focused discussions, quantitative analyses, and current developments in the industry.

FINA 6360. Fund Management for Analysts. 1 Hour.

Introduces a variety of operating documents typical to an active mutual fund. Offers students an opportunity to apply lessons from investment and portfolio management classes by presenting investment recommendations to a panel and communicating with peers in a thoughtful and forceful manner. Investment decisions are made based on student analysis and recommendations that include knowledge of macroeconomic expectations, corporate financing issues, debt-repayment concerns, and employee and technological changes. May be repeated up to three times.

FINA 6361. Fund Management for Managers. 1 Hour.

Builds on FINA 6360. Designed to provide students further analytical knowledge, including exposure to and opportunity to perform managerial tasks related to the management and operation of mutual funds. Included in these tasks are reconsideration of the fund's investment policy statement and asset allocation plan as well as preparation of accounting statements, dealing with compliance issues, addressing ethical concerns, measuring and managing risk, and performing marketing and fund-raising activities. May be repeated up to three times.

FINA 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

FINA 7976. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on chosen topics. May be repeated without limit.

First-Year Seminar (FSEM)

Search FSEM Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=FSEM>)

FSEM 1000. Connections and Decisions. 1 Hour.

Intended for first-year students who have not yet declared a major. Designed to introduce students to the liberal arts disciplines and majors, help them develop the analytical and critical thinking skills necessary to choose a major, and provide undeclared first-year students with grounding in the culture and values of the college and the University community.

FSEM 1101. First-Year Inquiry Seminar. 1 Hour.

Offers students an opportunity to explore a specific area of academic research in a small-group seminar environment. Students meet regularly with a faculty member to read and discuss the faculty member's research. Research topics vary, but general themes discussed include (a) how a specific research topic emerges and evolves over time, (b) the selection and implementation of specific research methodologies, (c) the contextualization of particular research studies within broader academic and real-world conversations, and (d) how the specific research contributes to philosophical and/or practical discussions in the world in which we live. The latter may include discussing how the research findings might help answer questions and/or be used in solving problems and making decisions. May be repeated up to three times.

Foreign Language (FLNG)

Search FLNG Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=FLNG>)

FLNG 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

FLNG 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

FLNG 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

French (FRNH)

Search FRNH Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=FRNH>)

FRNH 1101. Elementary French 1. 4 Hours.

Designed for students with very little or no prior knowledge of French. Provides a lively introduction to basic oral expression, listening comprehension, and elementary reading and writing. Each lesson incorporates helpful information about daily life in France and the varied cultures within the world of French speakers. Laboratory practice complements class work, enables students to work aloud at their own speed, reinforces their acquisition of essential structures, and acquaints them with a vast library of audio-visual resources.

FRNH 1102. Elementary French 2. 4 Hours.

Continues FRNH 1101. Reviews and continues the study of grammar and basic language skills. Offers progressively more intensive practice in oral and written communication. Laboratory practice complements class work, enables students to work aloud at their own speed, reinforces their acquisition of essential structures, and acquaints them with a vast library of audio-visual resources.

FRNH 1302. Elementary French Immersion 2. 4 Hours.

Designed for students who are in a French-speaking country, this is an off-campus immersion course. Offers students an opportunity to continue to develop grammatical and conversational competence. Focuses on oral and aural skills that are enhanced by the immersion environment.

FRNH 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

FRNH 2101. Intermediate French 1. 4 Hours.

Emphasizes further vocabulary building and mastery of fine points of grammar through written composition, prepared oral reports, and reading and discussion from current French periodicals.

FRNH 2102. Intermediate French 2. 4 Hours.

Continues FRNH 2101. Stresses the fundamentals of French to promote effective self-expression through speaking and writing and to explore the idiomatic aspects of the language. Through progressive class discussions and oral and written commentaries, students analyze a contemporary French novel or a French cultural reader, screenplay, or collection of short stories. Strives to help students read and comprehend modern French writing with confidence, and to be able to talk and write about it in good French. Provides preparation for advanced courses.

FRNH 2301. Intermediate French Immersion 1. 4 Hours.

Designed for students who are in a French-speaking country, this is an off-campus immersion course. Offers students an opportunity to continue to develop grammatical and conversational competence. Focuses on oral and aural skills that are enhanced by the immersion environment.

FRNH 2302. Intermediate French Immersion 2. 4 Hours.

Designed for students who are in a French-speaking country, this is an off-campus immersion course. Offers students an opportunity to continue to develop grammatical and conversational competence. Focuses on oral and aural skills that are enhanced by the immersion environment.

FRNH 2900. Specialized Instruction in French. 1-4 Hours.

Designed for individuals whose language skills are at the intermediate level and who seek specially focused language instruction. Such instruction might be the use of the language in specific settings, or it might be focused on specific conversational nuances of the language. Students must have at least an elementary level of competence in the language. May be repeated without limit.

FRNH 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

FRNH 3101. Advanced French 1. 4 Hours.

Continues further development of vocabulary. Offers students an opportunity to continue to master grammar and conversation through advanced reading, composition, grammar review, and listening skills. Whenever possible, offers students an opportunity to engage in local community activities to enhance communication skills and cultural knowledge.

FRNH 3102. Advanced French 2. 4 Hours.

Builds on FRNH 3101 and continues further development of vocabulary. Offers students an opportunity to continue to master grammar and conversation through advanced reading, composition, grammar review, and listening skills. Whenever possible, offers students an opportunity to engage in local community activities to enhance communication skills and cultural knowledge.

FRNH 3301. Advanced French Immersion 1. 4 Hours.

Designed for students who are in a French-speaking country, this is an off-campus immersion course. Offers students an opportunity to continue to develop grammatical and conversational competence.

FRNH 3302. Advanced French Immersion 2. 4 Hours.

Designed for students who are in a French-speaking country, this is an off-campus immersion course. Offers students an opportunity to continue to develop grammatical and conversational competence.

FRNH 3900. Specialized Instruction in French. 1-4 Hours.

Designed for individuals whose language skills are at an advanced level and who seek specially focused language instruction. Such instruction might be the use of the language in specific settings, or it might be focused on specific conversational nuances of the language. Requires at least an advanced level of competence in the language. May be repeated without limit.

FRNH 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

FRNH 4201. Advanced Proficiency French 1—BSIB. 4 Hours.

Designed to meet the special needs of international business students. Builds on FRNH 3202. Offers students an opportunity to continue building vocabulary and master fine points of grammar through written composition, prepared oral reports, and reading and discussion based on assigned material. Restricted to international business majors only.

FRNH 4202. Advanced Proficiency French 2—BSIB. 4 Hours.

Designed to meet the special needs of international business students. Builds on FRNH 4201. Offers students an opportunity to continue building vocabulary and master fine points of grammar through written composition, prepared oral reports, and reading and discussion based on assigned material. Restricted to international business majors only.

FRNH 4800. Special Topics in French. 1-4 Hours.

Focuses on a unique aspect of the French language. The specific topics are chosen to reflect current developments in the language and expressed student interests. Focuses on the use of the language for specific purposes or its use in specialized settings (e.g., media, business, health). Requires at least an advanced level of skill in the language. May be repeated up to four times.

FRNH 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

FRNH 4992. Directed Study. 1-4 Hours.

Offers students a way of going beyond work given in the regular curriculum; may also enable students to complete major or minor requirements in certain situations. Priority is given to language majors and to juniors and seniors. May be repeated without limit.

FRNH 5976. Directed Study. 1 Hour.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

French - CPS (FRN)

Search FRN Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=FRN>)

FRN 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

Game Design (GAME)

Search GAME Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=GAME>)

GAME 1110. Games and Society. 4 Hours.

Provides an historical and cultural perspective on games and other forms of interactive entertainment. Examines the present state and future directions of paper, card, and board games; physical games and sports; and video games. Introduces students to current issues, experiments, and directions in the field of game design. Through weekly lectures and small-group labs, students have an opportunity to develop a critical basis for analyzing game play.

GAME 1850. Experimental Game Design. 4 Hours.

Explores traditions of games, play, participation, and proceduralism in twentieth-century art movements, including Dada, Surrealism, Fluxus, conceptual art, the Situationists, Happenings, participatory performance and Tactical Media, avant-garde music, and contemporary art games. Through readings, lectures, and studio assignments, offers students an opportunity to understand and apply key principles by creating a series of artworks using various strategies drawn from these traditions, including appropriation, scores, intervention, and expression.

GAME 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

GAME 1999. Principles of Board Game Development. 4 Hours.

Introduces game design from engineering and innovation perspectives using initial design, rapid prototyping, and iterative design. Covers theory and implementation techniques to enable technical evaluation and game review, including statistical probability of random events; relative balance of player skill to game chance; game mechanics; and incorporating game art, theme, and flavor. Offers students an opportunity to learn game mechanics, development methods, and play-testing techniques. Introduces methods to match a game to its intended audience and designing games to be fun. Surveys roles in the tabletop game industry that impact game design: designers, publishers, manufacturers, distributors, game stores, conventions, and online sales. Students use acquired knowledge in a project-based learning environment to create a game that could be considered for commercialization. GE 1999 and GAME 1999 are cross-listed.

GAME 2010. The Business of Games. 4 Hours.

Surveys a wide array of game-specific industry topics, including pitching and development of talking points, business models and revenue structures, studio organization and style, intellectual property, contracts, project management expectations, project green-lighting, production pipelines, return on investment, outsourcing, and marketing. Exploring historical shifts and evolution of the video game market offers students an opportunity to obtain perspective on the status of the industry and potential growth in the economy.

GAME 2355. Narrative for Games. 4 Hours.

Examines and explores the structure and aesthetics of narrative, specifically in games. Begins by breaking down narrative into its various component parts that include, but are not restricted to, linear/branching narrative, emergent/inherent narrative, narrative obstacles, game pacing and narrative clock, character objectives, protagonist/antagonist, player/character, momentum and emotional journey, and tragic/comic elements. Offers students an opportunity to understand each narrative component through detailed case studies and the creation of narrative artifacts.

GAME 2500. Foundations of Game Design. 4 Hours.

Seeks to define the practice of game design within the larger context of playful interaction design, while constantly maintaining a player-centric approach. Unfolds the process of designing games between phases of analysis, synthesis, and evaluation. Establishes the role of game designer as an expert with a vision for determined player experiences and a vocal advocate for players. Seeks to offer students a broad methodology consisting of brainstorming methods, prototyping techniques, process management practices, and evaluation procedures to solve a wide array of design problems in an iterative manner.

GAME 2650. Introduction to Game Research Methods. 4 Hours.

Surveys research methods and epistemologies relevant to game researchers, designers, and artists, including experimental studies; analytics, formal and historical analysis; ethnography; qualitative social research; and design research. Engages students in lectures, readings, and game faculty guest lectures presenting practical examples of methods discussed in the class. Seeks to familiarize students with core literatures on games, library research, and research design through a series of hypothetical research project drafts and the completion of a research project using a specific method covered in the class.

GAME 2750. Games Criticism and Theory. 4 Hours.

Covers fundamental theories of art, meaning-making, expression, cultural reflection, and criticism concerning media, games, and playful artifacts. Assigns several papers that offer students an opportunity to choose and apply different critical lenses to games, game criticism, and their own gameplay experience. A long-form paper allows students to train writing theoretically informed and argumentatively cogent critical presentations of games and gameplay experience.

GAME 2755. Games and Social Justice. 4 Hours.

Analyzes games from a social justice perspective, encouraging students to consider issues of social stereotyping, normalization, exclusion, and inequity as they apply to games from all sectors of the industry. Discusses and analyzes games using a variety of social theories from a diverse set of fields, including gender studies, critical race theory, and LGBTQ studies. Provides a studio setting in which students have an opportunity to engage in critical making of playable experiences that are based upon and deeply integrate social justice theories in their design.

GAME 2950. Game Studio. 4 Hours.

Offers an experiential learning course in which students collaborate with faculty on a project for credit, which may include research, game creation, or a combination of the two. Offers students an opportunity to co-produce a publishable, distributable, or exhibitable game and/or research paper, which can become part of the student's portfolio. Course may be taught by an individual faculty member or team-taught to explore a specific topic, such as documentary games, art games, physical interfaces, installations, historical games, live-action role-playing, etc. Offers students an opportunity to gain experience working on a real-world project, as well as being credited for collaboration with an established practitioner/researcher. May be repeated once.

GAME 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

GAME 2991. Research in Game Design. 1-4 Hours.

Offers an opportunity to conduct introductory-level research or creative endeavors under faculty supervision.

GAME 3055. Playful Design. 4 Hours.

Covers how to design for playful engagement across contexts. Surveys basic theories and findings on play in ethology, evolutionary psychology, developmental psychology, anthropology, sociology, and philosophy through readings and discussion. Through lectures and exercises, familiarizes students with traditional design areas of play (toys, playgrounds, amusement parks) and the history, theory, patterns, and methods of evoking playfulness in contexts beyond games, toys, and playgrounds. Encourages students to apply these insights into portfolio work by creating playful experience prototypes across media.

GAME 3300. Game Interface Design. 4 Hours.

Analyzes both successful and unsuccessful game interfaces from a historical and cultural perspective. Uses interactive design assignments to offer students an opportunity to develop an understanding of game user interface design standards. Encourages students to develop innovative interface designs that support new game content models.

GAME 3400. Level Design and Game Architecture. 4 Hours.

Analyzes game-level designs in a variety of genres and forms. Building upon basic drawing and design skills, students have an opportunity to develop paper prototypes and simple game "mods" in the context of story and game play. Students use computer-based tools to examine game-level architecture. Encourages students to take this elective in preparation for or in parallel to the Game Projects courses.

GAME 3700. Rapid Idea Prototyping for Games. 4 Hours.

Studies digital and nondigital prototyping techniques through weekly activities in which students build and critique prototypes around a variety of game design themes. Offers students an opportunity to build a portfolio of small proof-of-concept game prototypes over the course of the semester. Additionally, covers how to iterate on a single prototype through a semesterlong project in which students have an opportunity to work individually on a larger game design.

GAME 3800. Game Concept Development and Production. 4 Hours.

Offers student teams an opportunity to conceptualize, design, document, and develop a complete game, including content, level design, user interface, and game mechanics as specified in design documents. Offers a set of brainstorming techniques. Students segment the concepts into individual systems and prototype them in an iterative manner, formally iterating over the whole game to improve the player experience. Requires students to maintain a schedule and project management documents. Results in the presentation of the complete game for critique.

GAME 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

GAME 4155. Designing Imaginary Worlds. 4 Hours.

Offers students an opportunity to learn to conceive, design, and convey imaginary worlds across a wide range of media. The crafting of fictional worlds has become an important skill in the media landscape, whether for video and tabletop games, comic books, novels, film, or television. Analyzes existing works in diverse genres such as fantasy, science fiction, superhero, and supernatural worlds. Explores, through creative projects, the ways in which the use of different media are suited to portray different aspects of an imaginary world.

GAME 4700. Game Design Capstone 1. 4 Hours.

Offers the first course in a two-semester capstone sequence. Offers students an opportunity to take on individual roles in a large-group project, creating a complete game from preproduction through implementation and testing. Students spend the first half of the first semester developing a proposal and testing ideas through simple prototypes, building on their skills from GAME 3700 and GAME 3800. Students then have an opportunity to spend the second half of the first semester, and all of the second semester, developing, play-testing, and iteratively refining a multi-level game.

GAME 4701. Game Design Capstone 2. 4 Hours.

Continues GAME 4700. Offers students an opportunity to continue developing, play-testing, and iteratively refining the multilevel game begun in GAME 4700.

GAME 4970. Junior/Senior Honors Project 1. 4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student's major field. Combined with Junior/Senior Project 2 or college-defined equivalent for 8-credit honors project. May be repeated without limit.

GAME 4971. Junior/Senior Honors Project 2. 4 Hours.

Focuses on second semester of in-depth project in which a student conducts research or produces a product related to the student's major field. May be repeated without limit.

GAME 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

GAME 4992. Directed Study. 1-4 Hours.

Provides study for the student whose unique academic needs or interests cannot adequately be satisfied in any of the scheduled courses of the department. May be repeated up to three times.

GAME 4994. Internship. 4 Hours.

Provides students an opportunity for internship work. May be repeated without limit.

Game Science and Design (GSND)

Search GSND Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=GSND>)

GSND 5110. Game Design and Analysis. 4 Hours.

Provides theoretical background and foundation for analyzing and designing games. Examines fundamental domains that are necessary to understand what games are and how they affect players, including but not limited to interface design, level design, narrative, learning, and culture. Presents relevant concepts and frameworks from a wide variety of disciplines—psychology, phenomenology, sociology, anthropology, media studies, affect theories, learning theories, and theories of motivation—for each domain. Explains the core elements of game design, introduces students to formal abstract design tools, explores several models of design process and iteration, and offers students an opportunity to practice game design in groups.

GSND 5111. Seminar for GSND 5110. 1 Hour.

Offers students an opportunity to discuss and analyze selected games, applying concepts from GSND 5110. Exposes students to a varied mix of AAA and indie titles and demonstrates how to analyze and appreciate them. Open to seniors; restricted to students in selected colleges.

GSND 5122. Business Models in the Game Industry. 1 Hour.

Examines the underlying business structure of the interactive digital entertainment industry and the characteristics of the various participants, notably developers and publishers. Seeks to deliver insight into key business models within the game industry and how the economic challenges interact. Explores the game business landscape across the industry spectrum, ranging from AAA, mobile, casual to indie development. Examines market strategies currently in practice and how they are linked with game analytics. Topics range from retail vs. online, free-to-play modes vs. pay-to-play, as well as basic monetization and distribution channels. Designed to serve as an overview of the various stakeholders in the industry and how they interact.

GSND 5130. Mixed Research Methods for Games. 4 Hours.

Focuses on methods and methodologies from human-computer interaction (HCI) and their use in different applications, including apps, web applications, games, and virtual worlds. Covers the basics of user-oriented evaluation, associated topics, and usability methods. Introduces the design process, usability heuristics, HCI paradigms, task models, and cognitive models. Examines quantitative and qualitative analysis of data. Offers students an opportunity to delve into experimental design, institutional review board approvals, ethics, research subject recruitment, and experiment implementations. Applies concepts through concrete projects, case examples, and exercises. Expects students to be running assignments continually and trying out different evaluation methods and methodologies.

GSND 6240. Exploratory Concept Design. 4 Hours.

Explores the process of designing new modalities of interaction utilizing novel uses of established technology, e.g., pervasive and affective technologies. Focuses on philosophy and practice of creating and evaluating experimental interactions. Recontextualizes gameplay concepts through permutations of basic elements such as controls, platforms, cameras, interfaces, etc. Leverages constraints as vehicles to push the boundaries of accepted design. Explores four key approaches to experimental interaction through course projects and assignments: discovering, examining, and exploring potential new technologies and interaction principles; rapidly designing and prototyping experimental interactions; pitching, justifying, and explaining designs and prototypes to others; and addressing new technologies and forms of interaction from a research perspective, focusing on their larger implications and potential impact on play.

GSND 6250. Spatial and Temporal Design. 4 Hours.

Explores the development and understanding of spaces used by people in 3D and 2D virtual environments. Uses an iterative process of making, criticizing, experiencing, and analyzing spatial form; compositional ideas for form making; and critical thinking. Offers students an opportunity to develop the arbitrary, yet necessary, mind-set needed to make assumptions about aesthetic spatial values and expected player behaviors. Analyzes the connection between spatial-aesthetic elements and their effects on players' psyches. Experiments with how spaces, textures, shapes, and colors can support different synchronous moods. Explores how to shape spaces that fit the rational, emotional, and behavioral profile of different types of players. Applies concepts learned from architecture and game-level design to extend students' creative and critical abilities.

GSND 6320. Psychology of Play. 4 Hours.

Explores theories of perception, motivation, needs, learning, goals, and belief systems as they pertain to games and play. Examines psychological principles, including visual and audio perception, emotions, behavior, personality, and the more recent scientific discoveries around psychological models explaining play behavior or motivation theories behind play. Introduces how players learn in and from games based on the relationship of play to learning theories. Forms a solid theoretical basis for a new segmentation tool—psychographics. Explores visual and cultural archetypes, digging into comics, movie sets, and cartoons to distillate what makes people tick in certain ways relating to universal theories of perception and gestalt theories. Applies the theories through critical analysis of play behavior and games.

GSND 6330. Player Experience. 4 Hours.

Focuses on topics of player psychology—cognition; memory; emotions; attention; and game-focused theories such as engagement, fun, user experience, player-need-satisfaction model, and flow. The development cycle of any game relies on the understanding of the players, the target market of the game product. Covers game usability engineering and game-specific evaluation methods, such as play testing, rapid iterative testing and evaluation (RITE), play-heuristic evaluation, and retrospective play reviews. Offers students an opportunity to learn how to analyze qualitative and quantitative data and to apply parametric and nonparametric statistical evaluation methods, qualitative data coding and analysis, and descriptive statistics. Requires students to apply visualization techniques of data and reporting.

GSND 6340. Biometrics for Design. 4 Hours.

Covers the domain of psychophysiological testing. Introduces theory and research in major areas of human psychology, including cognition, emotions, and attention. Studies the principles, theory, and applications of psychophysiological assessment inside and outside interactive digital entertainment. Offers students an opportunity to understand the basics of eye tracking—eye movements, fixations, saccades. Applies methods of data collection, cleaning, and analysis for both physiological and eye-tracking data. Covers all issues of using such measurements, including validity of conclusions and confounding variables. Covers the process of triangulation and repotting in-depth along the entire process of the game production life cycle.

GSND 6350. Data-Driven Player Modeling. 4 Hours.

Introduces the topic of game analytics, defined as the process of discovering and communicating patterns in data with a goal of solving problems and developing predictions in user behavior supporting decision management, driving action, and/or improving game products. Covers the fundamental tools, methods, and principles of game analytics, including the knowledge-discovery process, data collection, feature extraction and selection, pattern recognition to aid in prediction and churn analysis, visualization, and reporting. Covers analytics across game forms, notably online games and delivery platforms. Presents analytical tools recommended during development and tools designed for ongoing maintenance of games.

GSND 6984. Research. 1-4 Hours.

Offers students an opportunity to conduct research under faculty supervision. May be repeated up to four times.

GSND 7976. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on chosen topics. May be repeated without limit.

GSND 7990. Thesis. 4 Hours.

Focuses on preparing a master's thesis under faculty supervision.

GSND 7996. Thesis Continuation. 0 Hours.

Offers continued work on the thesis project.

General - CPS (GEN)

Search GEN Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=GEN>)

GEN 5962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

General Engineering (GE)

Search GE Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=GE>)

GE 1000. Introduction to the Study of Engineering. 1 Hour.

Presents an introduction to the various disciplines of engineering and strategies for success in the classroom, within the profession, and within the University community. Provides an initial orientation to engineering cooperative education. Covers the support services provided by both college and University and explores the richness of our community's diversity. Defines diversity, and offers students the opportunity to study and understand diverse cultures and communities in the academic environment. Oral presentations are required.

GE 1110. Engineering Design. 4 Hours.

Seeks to develop problem-solving skills used in engineering design, using case studies for a variety of engineering disciplines. Introduces students to the use of spreadsheet tools to solve engineering problems, including data reduction and visualization of data and functions. Design topics include problem formulation and specification, creativity, evaluation tools, patents, ergonomics, system design, manufacturing, ethics in engineering, and presentation techniques. Presents engineering graphics focusing on developing 3D visualization skills and computer-aided design (CAD) application. Students develop an original design solution to a technical problem as a term project. Requires students to have a laptop computer that meets the specifications of the College of Engineering.

GE 1111. Engineering Problem Solving and Computation. 4 Hours.

Uses a structured approach to solve engineering problems. Draws applications from a variety of engineering disciplines, which serve as a tool for introducing students to engineering analysis and design. Introduces a math application package for matrix applications and various real-life engineering problems. Includes the design of problem-solving algorithms using a high-level programming language. Requires students to have a laptop computer that meets the specifications of the College of Engineering.

GE 1201. Alternative Energy Technologies Abroad. 4 Hours.

Offers an interdisciplinary course that seeks to build an understanding of alternative energy systems and technologies and how they can impact the environment. Emphasizes how energy resources are being utilized currently in the United States and abroad and shows the need for new alternative energy technologies and their impact on sustainability. Introduces a variety of alternative/renewable energy technologies and their environmental impact. Lecturers include industry leaders in the field. Offers students an opportunity to visit companies to learn how these engineering technologies are being implemented. Aims to explain relevant alternative energy technologies in an interactive environment, where students engage in the field and examine their impact on society. May be repeated without limit.

GE 1210. Scientific Revolutions Abroad. 4 Hours.

Studies two revolutions in scientific thought—the Scientific Revolution of the seventeenth and eighteenth centuries and the computational revolution of the twentieth century. The Scientific Revolution gave scientists optimism that, in principle, they could understand everything about the world around them. In contrast, the revolutions in complexity, logic, computation, mathematics, and physics of the twentieth century put fundamental limits on what scientists could know and understand. Taught abroad, this course explores the natural connections between the history of science and scientific sites, including local museums, observatories, universities, laboratories, and archaeological sites. This material is contrasted with key results from chaos theory, computational complexity, logic, physics, quantum mechanics, and the theory of computation, all developed in the twentieth century.

GE 1501. Cornerstone of Engineering 1. 4 Hours.

Introduces students to the engineering design process and algorithmic thinking using a combination of lectures and hands-on projects and labs while encouraging critical thinking. Offers students an opportunity to develop creative problem-solving skills used in engineering design, to structure software, and to cultivate effective written and oral communication skills. Topics include the use of design and graphics communication software, spreadsheets, a high-level programming language, programmable microcontrollers as well as various electronic components, and 3-D printing. Requires students to develop an original design solution to a technical problem as a final term project. Requires students to have a laptop computer that meets the specifications of the College of Engineering.

GE 1502. Cornerstone of Engineering 2. 4 Hours.

Continues GE 1501 using a project-based approach under a unifying theme. Covers topics that introduce students to engineering analysis and design. Uses a math application package for matrix applications along with various real-life engineering problems solved using programming. Considers ethical reasoning in design and analysis, including ethical theories, professional codes, and emerging micro/macro issues in engineering. Introduces quantitative tools and ethical topics separately and weaves them into all design and problem-solving stages of the student projects. Covers 3-D assembly drawings and modeling, along with review and further work in design. Students work on open-ended design problems, developing working models and prototypes to demonstrate and present their designs. Requires students to have a laptop computer that meets the specifications of the College of Engineering.

GE 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

GE 1999. Principles of Board Game Development. 4 Hours.

Introduces game design from engineering and innovation perspectives using initial design, rapid prototyping, and iterative design. Covers theory and implementation techniques to enable technical evaluation and game review, including statistical probability of random events; relative balance of player skill to game chance; game mechanics; and incorporating game art, theme, and flavor. Offers students an opportunity to learn game mechanics, development methods, and play-testing techniques. Introduces methods to match a game to its intended audience and designing games to be fun. Surveys roles in the tabletop game industry that impact game design: designers, publishers, manufacturers, distributors, game stores, conventions, and online sales. Students use acquired knowledge in a project-based learning environment to create a game that could be considered for commercialization. GE 1999 and GAME 1999 are cross-listed. .

GE 2010. Introduction to Customer-Driven Technical Innovation: Silicon Valley. 4 Hours.

Studies the role of engineering innovation in addressing customer needs in early startups and the need to conceive successful innovative engineering design as part of a commercialization strategy. Emphasizes understanding how engineering innovation can meet real technical market needs and how to gather the necessary, relevant technical information early in the innovation process to produce a successful engineering design. Uses a series of practical engineering design projects to demonstrate how students can assess the technical capabilities of the startup in producing an innovative design, how to communicate with customers in an iterative engineering design process, and how to correspondingly design and innovate to meet customer technical requirements. Taught in Silicon Valley.

GE 2030. Introduction to Product Prototyping: Silicon Valley. 4 Hours.

Seeks to develop in-depth knowledge and experience in prototyping by focusing on engineering processes and instrumentation that are used in different industries. Studies the prototyping cycle from initial process flow and sketching, to prototype development, to testing and analysis, with an emphasis on iteration. Analyzes how different kinds of engineering prototypes can address design and user-interface needs vs. functional needs, such as looks-like and works-like prototypes. Offers students an opportunity to obtain operating knowledge of methods including 3-D printing, SolidWorks, off-the-shelf hardware-software interfaces, simulation, embedded systems, product testing, prototype analysis, and prototype iteration. Taught in Silicon Valley.

GE 2300. Engineering Structure and Function: Principles of Design in Nature. 4 Hours.

Explores principles of design that are found in nature. Studies evolutionary constraints in design, materials used in nature, structural designs that include hierarchy and multiscale components, methods of motion and how they evolved in nature, biological sensing structures, and ability to adapt. These natural design concepts are related to designs used in buildings, products, and machines. Offered in Oxford, England, a center for learning and evolutionary principles (from Darwin to Dawkins). Site visits include botanic gardens, the Natural History Museum, the Darwin collection, and Royal Veterinary College. A background in biology or engineering is not required; the course is intended for an interdisciplinary group of students (engineering, biology, architecture, product design, health sciences, innovation and entrepreneurship, anthropology) who are interested in exploring natural design.

GE 2310. Engineering and Technological Innovations Abroad. 4 Hours.

Introduces students to the fundamental engineering and technological principles underlying major technical advances throughout history in a specific international context. Investigates how these significant technical innovations impacted local culture, industry, and institutions. Classroom introductory material is complemented by visits to local museums, university and government laboratories, observatories, archaeological sites, and companies. Taught in a study-abroad format.

GE 2361. Mathematical Methods for Engineers. 4 Hours.

Covers applications to applied mechanics, thermofluids, and dynamics/control problems relevant to engineering. Topics include differential equations applied to modeling and characterization of processes, linear algebra used for multidimensional and complex system computations and modeling, and statistics and probability used for controls and signal analysis, among other applications. Introduces the foundational basis for approximate methods of engineering analysis, including its application to finite element analysis.

GE 2500. Design Analysis and Innovation. 4 Hours.

Introduces various analytical and computational techniques. Course content is delivered through a series of modeling and analysis projects, design innovations and improvements, and design testing—including not only the technical performance but also commercialization potential by developing and presenting a business plan. Offers students an opportunity to design a representative model, implement the model through their design, verify and validate using analysis techniques, develop a business plan, report on the design and modelling, and suggest improvements for a revised design and model. Design projects and topics are expanded or reduced depending on class interest.

GE 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

GE 2992. Research. 0 Hours.

Offers an opportunity to document student contributions to research projects or creative endeavors.

GE 3000. Professional Issues in Engineering. 1 Hour.

Provides students with an opportunity to reflect on both academic and co-op experiences in the context of planning for the senior year and beyond. Issues include professional and ethical issues, resolving ethical conflicts, awareness of engineers as professionals in a diverse world, strengthening decision-making skills, career portfolios, and lifelong learning needs, goals, and strategies. Students reflect upon issues of diversity from their experience in the University and in their cooperative education placements. Explores the role of different work and learning styles and diverse personal characteristics on the workplace and the classroom. Professional issues include impact of the cultural context, both in the United States and around the world, on the client, government relations, and the workplace.

GE 3300. Energy Systems: Science, Technology, and Sustainability. 4 Hours.

Offers students an opportunity to obtain a sound scientific, technological, and economic understanding of our modern energy system and the challenge of energy sustainability. Covers principles of energy, work, and thermodynamics; technologies from supply and demand side, including extraction of primary energy, conversion into fuels and electricity, important energy end-uses, and energy losses; fossil, nuclear power plants, and renewable energy technologies (wind, solar, wave, hydro, geothermal, biofuels); transmission and distribution for electricity and fossil fuels; energy demand by buildings, transportation, and industry, emphasizing efficient technologies; sustainability concepts, including net energy/exergy analysis and life-cycle assessment, energy-related emissions, decentralized generation, smart grids, district heating, and net-zero energy facilities.

GE 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

GE 4608. Introduction to Nanotechnology in Engineering. 4 Hours.

Explores a wide range of new technologies based on, or influenced by, breakthroughs in nanoscience. Includes such nanotechnologies (the refinement of functional properties of materials, devices, or systems that are in at least one dimension smaller than 100 nm) as spintronics, quantum computing, carbon nanotube electronics, nanoparticle cancer remediation strategies, biomolecular electronics, and nanomachines. A general goal is the engineering of new or enhanced macroscopic properties from nanostructure or nanoscale materials and components. Offers students an opportunity to become well versed in this important burgeoning field through review of the scientific literature, classroom lecture, seminars by international leaders of nanotechnology, and student team projects.

GE 4892. Engineering Product Design and Prototyping Challenge Project. 4 Hours.

Offers students an opportunity to prepare detailed engineering designs and physical prototypes of technology-based products based on real-world specifications. Projects are carried out under the umbrella of the Generate organization within the Sherman Center for Engineering Entrepreneurship Education. Project proposals are developed in collaboration with the center director, including learning outcomes, project goals, and anticipated results/products. May be repeated up to nine times.

GE 4900. Career Management. 1 Hour.

Provides an interactive course designed to enhance an engineering student's professional and career-related education through a series of classes taught by managers, engineers, and other professionals with industry experience. Topics include career services resources, developing skills to be an effective manager, the balance between personal and professional life, mentors, making career choices, time management vs. energy management, and others. May be repeated without limit.

GE 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

GE 4993. Independent Study. 1-4 Hours.

Focuses on a subject that crosses traditional engineering boundaries. May be repeated without limit.

GE 5010. Customer-Driven Technical Innovation for Engineers. 4 Hours.

Studies the role of engineering innovation in addressing customer needs in early start-ups and the need to conceive successful innovative engineering design as part of a commercialization strategy. Emphasizes understanding how engineering innovation can meet real technical market needs and how to gather the necessary, relevant technical information early in the innovation process to produce a successful engineering design. Uses a series of practical engineering design projects to demonstrate how students can assess the technical capabilities of the start-up in producing an innovative design, how to communicate with customers in an iterative engineering design process, and how to correspondingly design and innovate to meet customer technical requirements.

GE 5020. Engineering Product Design Methodology. 4 Hours.

Studies the iterative engineering design cycle of technology-intensive devices and tools with a focus on end-user technical specifications. Expects students to develop an engineering device or tool in a team-based workshop environment. Functional product concepts are generated by assessing technical needs of the intended user and refining the designs through testing with the end user. Focuses on methods of soliciting and documenting user technical feedback, relating that feedback to technical product requirements and specifications, and considering engineering manufacturing aspects. This course does not cover concepts in lean or rapid prototyping or methodologies relevant to services.

GE 5030. Iterative Product Prototyping for Engineers. 4 Hours.

Seeks to develop in-depth knowledge and experience in prototyping by focusing on engineering processes and instrumentation that are used in different industries. Studies the prototyping cycle, from initial process flow and sketching to prototype development to testing and analysis, with an emphasis on iteration. Analyzes how different kinds of engineering prototypes can address design and user-interface needs vs. functional needs, such as looks-like and works-like prototypes. Offers students an opportunity to obtain operating knowledge of methods including 3D printing, SolidWorks, off-the-shelf hardware-software interfaces, simulation, embedded systems, product testing, prototype analysis, and prototype iteration.

GE 5100. Product Development for Engineers. 4 Hours.

Focuses on the main processes needed to develop a complex, high-technology product. Emphasizes the most important techniques and approaches used in a startup environment. Seeks to benefit students of all engineering disciplines including computer science and biomedical, industrial, electrical, mechanical, computer, and chemical engineering. Includes a running practical project in which a new product is designed and executed through a series of small projects for each phase of the product development process. Topics include the product life cycle, new product development processes, project planning and management, new product idea generation, the systems approach to product development, design for manufacturing, market testing and launch, and escalation to manufacturing.

General Engineering - CPS Specialty (GENR)

Search GENR Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=GENR>)

GENR 1110. Engineering Design. 4 Hours.

Presents the engineering design process using case studies for a variety of engineering disciplines. Develops problem-solving skills used in engineering design. Introduces students to the use of spreadsheet tools to solve engineering problems including data reduction, and visualization of data and functions. Design topics include problem formulation and specification, creativity, evaluation tools, patents, ergonomics, system design, manufacturing, ethics in engineering, and presentation techniques. Presents engineering graphics focusing on developing three-dimensional visualization skills and computer-aided design (CAD) application. Students develop an original design solution to a technical problem as a term project.

General Engineering Technology - CPS (GET)

Search GET Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=GET>)

GET 1100. Introduction to Engineering and Technology. 3 Hours.

Analyzes the diversity, need, and applicability of engineering as the profession that solves technical problems and drives technological innovation. Discusses essential requirements to succeed academically in engineering and introduces useful tools to optimize academic performance, such as the use of computers to perform calculations and mathematics to communicate engineering ideas. Reviews simple concepts of science and mathematics in historical and quantitative context, and uses small projects and in-class demonstrations to acquaint students with engineering concepts behind common technologic innovations. Discusses basic ideas for management of projects; techniques to formulate solutions to technical problems; and general structure for engineering design, manufacturing, and testing of products.

GET 1150. Foundations of Engineering Graphics and Design. 3 Hours.

Offers students an opportunity to obtain basic engineering drafting and introductory design skills needed to function in a computer-aided drafting (CAD) environment. Covers the history of engineering hand drafting and the differences/similarities with respect to CAD tools used today. Discusses the basic steps of the engineering design process and how to apply these steps in small design projects where pictorial sketching and descriptive geometry (isometric and oblique drawings and projections) are used to communicate graphical solutions to proposed problems. Covers basic understanding of mechanical, electrical, and architectural layouts, and introduces basic dimensioning and tolerancing terms. Introduces the general features, capabilities, similarities, and differences among common engineering CAD software—such as SolidWorks, Autodesk AutoCAD, and PTC Creo—through introductory lab sessions.

GET 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

GET 2100. Computer Engineering Programming and Analysis. 3 Hours.

Introduces the C++ programming language. Covers basic programming constructs and manipulation of data types including arrays, strings, and pointers. Offers students an opportunity to learn to isolate and fix common errors in C++ programs, to properly allocate/de-allocate procedures, and to apply object-oriented approaches to software problems in C++. Students use data structures of arrays, stacks, lists, trees, and graphs implemented using conventional programming techniques and class libraries. Students are asked to develop and write small-scale C++ programs using the skills covered during the lectures and practices in the laboratory.

GET 2200. Engineering Economy. 3 Hours.

Studies the financial and economic concepts that are required to analyze engineering project financial performance, from the conceptual stage through the engineering and design stages. Examines time value of money, the tax consequences accruing relating to the project, as well as the advantages of utilizing financial leverage provided by various methods of raising required capital. Covers topics such as inflation, cost estimation, taxes and depreciation, decision trees, and risk and simulation. Stresses problem solving through case studies in order to enforce concepts and guidelines behind sound economic and financial decisions in engineering projects and enterprises.

GET 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

GET 3100. Computer Control of Manufacturing Processes. 3 Hours.

Presents and discusses computer control of manufacturing processes. Offers students an opportunity to learn the fundamentals of manufacturing processes and automation and control technologies. Reviews hardware components such as sensors, actuators, analog-to-digital converters, and I/O devices. Demonstrates computer numeric control, industrial robotics, discrete and programmable logic controllers, and analyzes their functions, applications, advantages, and limitations. Also analyzes a variety of manufacturing systems, including automation production lines, assembly systems, and cellular and flexible manufacturing. Topics include quality control system integration and lean production.

GET 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

GET 4840. Engineering Technology Capstone Project Preparation and Proposal. 2 Hours.

Offers students an opportunity to apply the steps of the engineering design process and develop a comprehensive written engineering project proposal. Includes a review of the engineering design process from problem statement to prototype fabrication and testing. Working closely with the instructor, students are asked to identify a technological need of actual interest for local companies, communities, or students' workplace and to follow the engineering design process. Students document the marketing, patent, and literature search for prior art, customer/engineering specifications, brainstorming process to generate feasible solutions, most viable solution selection process, and detailed labor and materials budget for actual execution of the solution to be completed in GET 4850. .

GET 4850. Engineering Technology Capstone Project Execution. 4 Hours.

Continues the design process initiated in GET 4840. Students implement the solution to the identified need/problem that they previously identified. This course is the culmination of the engineering technology academic curriculum, where students are expected to apply the knowledge and practice needed from a variety of domains in order to execute their plan of action and timeline of activities. The results of their work should culminate in the creation of an actual engineering system prototype along with a comprehensive final written report and oral presentation by team members.

GET 4950. Seminar. 1-4 Hours.

Offers an in-depth study of selected topics.

GET 4955. Project. 1-4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student's major field. May be repeated without limit.

GET 4983. Topics. 1-4 Hours.

Covers special topics in general engineering technology. May be repeated without limit.

GET 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

GET 4991. Research. 1-4 Hours.

Offers students an opportunity to conduct research under faculty supervision.

GET 4992. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic.

GET 4993. Independent Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic.

GET 4994. Internship. 1-4 Hours.

Provides students with an opportunity for internship work.

GET 4995. Practicum. 1-4 Hours.

Provides eligible students with an opportunity for practical experience.

GET 4996. Experiential Education Directed Study. 1-4 Hours.

Draws upon the student's approved experiential activity and integrates it with study in the academic major.

GENS 1101. Transitioning, Learning, and Connecting Seminar. 1 Hour.

Designed to enhance academic success and help students transition to university life and academics. Uses a multimedia approach, diverse perspectives, and collaborative learning to challenge students to examine their assumptions and values by analyzing, synthesizing, and evaluating contemporary social issues and trends in popular culture. Emphasizes exploration of academic and career interests for student life-long success.

GENS 1102. Transitioning, Learning, and Connecting Seminar 2. 1 Hour.

Continues the exploration of academic and career interest for life-long success. Focuses on research, argumentation, and oral presentations. Addresses the sophomore transition process to the destination colleges.

Geographic Information Systems - CPS (GIS)

Search GIS Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=GIS>)

GIS 5101. Introduction to Geographic Information Systems. 3 Hours.

Introduces the use of a geographic information system. Topics include applications of geographic information; spatial data collection; data accuracy and uncertainty; data visualization of cartographic principles; geographic analysis; and legal, economic, and ethical issues associated with the use of a geographic information system.

GIS 5102. Fundamentals of GIS Analysis. 3 Hours.

Provides an in-depth evaluation of theoretical, mathematical, and computational foundations of spatial analysis. Topics include data formats, data display, and data definition queries. Mapping techniques are reviewed as are techniques to select, quantify and summarize features; assess the proximity of features to one another; map spatiotemporal changes; and to apply statistical techniques and tools to find patterns in spatial data and their attributes. Software used: Esri – ArcMap, ArcCatalog, ArcGIS Extensions: Spatial Analyst, Network Analyst, and Geostatistical Analyst.

GIS 5103. Foundations of Geographic Information Science. 4 Hours.

Introduces geospatial data, technology, visualization, and analysis to support spatial inquiry and decision making. Topics include geospatial principles, geospatial data models and data types, metadata and attribute data, data sources, geospatial software options, quality assurance and quality control, and government/industry application areas. Includes technical knowledge of common geospatial analysis tasks. Offers students an opportunity to obtain hands-on experience using professional-grade platforms (ArcGIS, QGIS) and other geospatial software products.

GIS 5201. Advanced Spatial Analysis. 3 Hours.

Provides an in-depth evaluation of theoretical, mathematical, and computational foundations of GIS. Topics include spatial information theory, database theory, mathematical models of spatial objects, and GIS-based representation. Examines advanced concepts and techniques in raster-based GIS and high-level GIS modeling techniques.

GIS 5978. Independent Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic.

General Studies (GENS)

Search GENS Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=GENS>)

GIS 6320. Use and Applications of Free and Open-Source GIS Desktop Software. 3 Hours.

Intended to expose students to free and open source (FOSS) GIS desktop applications (primarily QGIS GRASS GIS) and implementations for them to gain an understanding of the potential benefits or drawbacks of FOSS GIS alternatives compared to proprietary standards such as ArcGIS. Focuses on practical application over GIS theory but students examine historical development of FOSS GIS as well as case studies regarding FOSS GIS utilization to aid in their understanding and appraisal of these applications. Software used: QGIS (Desktop, Browser, Print Composer, DB Manager), GRASS-GIS, Boundless Suite, PostGIS, Spatialite.

GIS 6330. Building Geospatial Systems at Scale. 3 Hours.

Demonstrates how to run real-world geo data analysis over a scalable geospatial database and visualize the results over an interactive map. Examines integration of distributed geo-referenced data, data storage capabilities, and data sharing to explore the benefits of computing capacity. Offers students an opportunity to learn to set up an Azure portal, deploy processes at scale, and solve geospatial business problems with proven combinations of Azure services (including big data, analytics, artificial intelligence, and geolocation).

GIS 6340. GIS Customization. 3 Hours.

Provides an in-depth introduction to the customization of Esri ArcGIS using Python with hands-on experience with ArcGIS, ModelBuilder, Python, geoprocessing, and ArcPy. The focus is on automating tasks and workflows in ArcMap using ModelBuilder; applying Python programming in ArcMap and for ModelBuilder; applying practical methods of debugging, tool input parameters, and tool and code documentation. Students will create a GIS data processing tool, useful to their work or area of interest, using Python or Python and ModelBuilder. The tool must be documented and capable of gracefully handling errors. Software: ArcGIS Desktop, Notepad++, IDLE - Python IDE, other Python IDE according to student choice. .

GIS 6345. Geospatial Programming. 3 Hours.

Introduces basic concepts in computer programming for geospatial data with a focus on the Python language. Applies learned approaches to geospatial analysis and accessing Python packages for spatial data science. Examples include shapely, pandas, NumPy, matplotlib, and SciPy.

GIS 6350. Planning a GIS Implementation. 3 Hours.

Emphasizes the process of planning a GIS implementation so an organization ends up with the "right" GIS. GIS has the potential to benefit many different types of organizations in many different ways. Focuses on understanding the planning process and the issues involved in preparing for the implementation of a GIS within a multiuser environment. Assignments help students grasp the various stages of the process, including the understanding of organization strategy, needs assessments, capability definition, data design, system requirements, and organizational impacts. While the class uses enterprise-level GIS as the context for the planning process, the process discussed can also be applied to smaller-scale organizations and systems. This course assumes a basic understanding of GIS and basic information technology concepts. Software: N/A.

GIS 6360. Spatial Databases. 3 Hours.

Offers students an opportunity to develop skills in acquiring and building spatial data and maintaining spatial databases. Emphasizes Personal, Workgroup, and Enterprise ArcSDE geodatabases, topology, and versioned editing. Analyzes fundamental theoretical knowledge about information systems and the unique demands created by geographic information. Material includes data modeling and knowledge representation for spatial data, database schemas and models, and architectural principles for GIS. Students use database documentation (metadata) and SQL tools to query and update database attributes. Requires a final project to create a complete geodatabase representative of a spatial database used to support a real-world application. Software: ArcGIS Desktop Advanced; ArcSDE/Microsoft SQL Server enterprise geodatabase; OSQL application to query and create data in a Microsoft SQL Server database.

GIS 6370. Internet-Based GIS. 3 Hours.

Introduces the basic concepts associated with publishing spatial data and serving maps on the internet. Topics covered include copyright, federal, state, and local laws about spatial data sharing; map creation with web and desktop client applications; web map coding using Open Source and proprietary APIs; publishing advanced geoprocessing services. Offers students an opportunity to create a polished web mapping application that leverages Open Source or proprietary internet GIS technologies on both server and client side. Software: Google Earth, Google Maps, ArcGIS Explorer Desktop, ArcGIS Desktop, ArcGIS Online, GeoServer, SFTP software (e.g., FileZilla, FireFTP, Cyberduck, etc.), and Carto.

GIS 6385. GIS/Cartography. 3 Hours.

Introduces the principles and concepts essential to thoughtful, informative, aesthetic, and effective map composition and layout. Among the topics included are color theory, typography, data classification and symbology, cartographic design, critique, and production. Focuses on foundational cartographic concepts to improve the student's ability to create geographic visualizations that can communicate GIS information effectively. Software: Required: ArcGIS Desktop (ArcMap) for all hands-on class assignments other than the project. Optional: Students may use software of choice for the project, e.g., QGIS, Illustrator, ArcGIS Pro, or any other software (commercial or FOSS), although no instructional support is provided.

GIS 6390. Business Applications of Geographic Information Systems. 3 Hours.

Explores the use of a geographic information system for business applications. Introduces spatial data analysis as it applies to sales, marketing, and demographic analysis; service and sales territories; call planning and routing; and reporting and presentation mapping. Offers students an opportunity to develop applied methods of conducting a spatial data compilation project through a variety of situational tutorials (e.g., SpatialLabs "Business Trade Area Market Analysis"), including defining the database, writing a research proposal, completing an analysis, and presenting the results in written form. Software: ArcGIS Desktop, with the Esri Business Analyst Premium Extension, and access to Business Analyst Online.

GIS 6391. Healthcare Applications of Geographic Information Systems. 3 Hours.

Examines the concepts, principles, approaches, and techniques of geographic analysis in the context of local, regional, and global public health problems. Examines the application of GIS in the health industry as it is used by local agencies, such as public health units and larger entities, such as the Centers for Disease Control (CDC) and the World Health Organization (WHO). Offers students an opportunity to examine sources of data, create data collection tools for use in a healthcare context, integrate methods, and share these results via a web mapping interface through a variety of situational tutorials, culminating in a final course project. Software: ArcGIS Desktop, Survey123, ArcGIS Online, QGIS, Fulcrum, and Carto.

GIS 6394. Crisis Mapping for Humanitarian Action. 3 Hours.

Uses and critiques crisis mapping technology and work flows that enhance data collection, analysis, and distribution of location-based information used for humanitarian action. Students investigate and contribute to a real-life digital humanitarian deployment via OpenStreetMap (OSM); complete the Standby Task Force workshops to prepare them to assist when a deployment occurs; and are offered an opportunity to become acquainted with FrontlineSMS—a way that mobile devices leverage SMS and radio, for example—in new ways. Draws theories and methods from political science and GIS. Interdisciplinary, involving GIS, collective action and information theory, human security and human rights frameworks, development issues, conflict theory, urbanization, and climate change. Software: Ushahidi/Crowdmap, OSM software, KoBo Toolbox, Afghanistan Spatial Data Center, InaSAFE.

GIS 6395. Geospatial Analysis of Crime. 3 Hours.

Discusses and evaluates different spatial criminological theories. Students analyze spatial crime data using spatial distribution, hot spot analysis, and density mapping, with a focus at the local level using data sets from the Northeastern University Police Department (NUPD). Students formulate and test a hypothesis in a comprehensive project involving data input, manipulation, and analysis in partnership with the NUPD using visualization techniques to demonstrate their analysis. Software: ArcGIS; CrimeStat; Tableau; QGIS.

GIS 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

GIS 6980. Capstone. 1-4 Hours.

Offers students an opportunity to integrate their course work, knowledge, and experiences into a capstone project. Emphasizes student responsibility, development of individual competencies, and geospatial analytical techniques and methods. Learning strategies encourage self-motivation and autonomy to discover work in a supportive environment with guidance and clear expectations. The class proceeds by outlining key milestones and showing examples of deliverables to visualize the process and the desired outcomes; coaching, feedback, and guidance throughout the learning process; and structured discussions, formative assessments, and journaling via e-portfolio to elicit articulation and reflection—two key processes in effective learning. Students are expected to create a conference-ready poster, present their work orally, and assemble a showcase e-portfolio.

GIS 6983. Topics. 1-4 Hours.

Covers special topics in geographic information systems. May be repeated without limit.

GIS 6995. Project. 1-4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student's major field. May be repeated without limit.

German (GRMN)

Search GRMN Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=GRMN>)

GRMN 1101. Elementary German 1. 4 Hours.

Designed for students with very little or no prior knowledge of German. Provides a lively introduction to basic oral expression, listening comprehension, and elementary reading and writing. Each lesson incorporates helpful information about daily life in German. Laboratory practice complements class work, enables students to work aloud at their own speed, reinforces their acquisition of essential structures, and acquaints them with a vast library of audio-visual resources.

GRMN 1102. Elementary German 2. 4 Hours.

Continues GRMN 1101. Includes completion of basic grammatical usage, reading of contemporary German material, and increased stress on oral and aural skills.

GRMN 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

GRMN 2101. Intermediate German 1. 4 Hours.

Emphasizes further vocabulary building. Offers students an opportunity to master the fine points of grammar through written composition, prepared oral reports, and reading and discussion from contemporary German materials.

GRMN 2102. Intermediate German 2. 4 Hours.

Builds on GRMN 2101 and focuses on further development of vocabulary. Offers students an opportunity to continue to master grammar and conversation through written composition, prepared oral reports, and reading and discussion from contemporary German materials.

GRMN 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

GRMN 3800. Special Topics in German. 1-4 Hours.

Focuses on a unique aspect of the German language. The specific topics are chosen to reflect current developments in the language and expressed student interests. Focuses on the use of the language for specific purposes or its use in specialized settings (e.g., media, business, health). Requires at least an intermediate level of skill in the language. May be repeated up to three times.

GRMN 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

GRMN 4800. Special Topics in German. 1-4 Hours.

Focuses on a unique aspect of the German language. The specific topics are chosen to reflect current developments in the language and expressed student interests. Focuses on the use of the language for specific purposes or its use in specialized settings (e.g., media, business, health). Requires at least an advanced level of skill in the language. May be repeated up to four times.

GRMN 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

GRMN 4992. Directed Study. 1-4 Hours.

Offers students a way of going beyond work given in the regular curriculum; may also enable students to complete major or minor requirements in certain situations. Priority is given to language majors and to juniors and seniors. May be repeated without limit.

GRMN 4993. Independent Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated up to three times.

GRMN 5976. Directed Study. 1 Hour.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

Global Studies - CPS (GST)

Search GST Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=GST>)

GST 6100. Globalization and Global Politics and Economics. 4 Hours.

Examines the multifaceted nature of politics and economics in an expanding global world. Analyzes the impact of globalization on political and economic systems, such as capitalism, democracy, socialism, nationalism, totalitarianism, and populism. Introduces students to the use of quantitative methods in the analysis of global relationships. Offers students an opportunity to use these tools to hypothesize the impact of future global trends on contemporary political and economic systems.

GST 6101. Global Literacy, Culture, and Community. 4 Hours.

Introduces basic theories of culture, identity, and communication. Topics may include race, ethnicity, social class, gender, national identity, and religion. Explores these theories and topics through an in-depth study of a particular aspect of culture within a chosen country. Introduces students to the use of qualitative methods in the analysis of culture and communication. Offers students an opportunity to use these tools to hypothesize the impact of future global trends on contemporary cultures and identities.

GST 6102. Global Corporate and Social Responsibility. 4 Hours.

Examines the social responsibilities of corporations and individuals in the global twenty-first century. Topics may include outsourcing, offshoring, international labor laws, global environmental responsibility, global human rights, global citizenship, and sustainable development. Focuses on the use of qualitative and quantitative methods in the analysis of current policies and practices of multinational corporations, nation-states, and international non-governmental organizations.

GST 6109. Basic Field Research Methods. 4 Hours.

Focuses on research and analysis, which are a central part of scholarly learning. To understand the nature of how information is gathered, processed, and communicated, it is imperative that students familiarize themselves with and cultivate basic research methods used in the field of social sciences. Exposes students to the essentials of field research methods, covering various research methods as well as their applications, advantages and disadvantages, and limitations. Examines different types of studies and methods and seeks to help students prepare for field research work, effective online and library data retrieval, analyzing research data and information, and writing of a thesis paper.

GST 6200. The Funders. 4 Hours.

Focuses on the financial organizations and enabling institutions of globalization. Studies the actions of the holders of financial power—"the Funders"—such as the WTO, IMF, G8, and the World Bank.

GST 6210. The Developers. 4 Hours.

Focuses on the community-based groups and movements that shape popular opinion about and activism in response to living in a global world. Beginning with the social movement concept, the course examines the emergence of a global civil society that operates on a dynamic of advocacy and development mobilized by grassroots-based economic organizations and individuals.

GST 6220. Globalization of Emerging Economies. 4 Hours.

Examines the rising status and influence of countries categorized as "emerging economies" and whether this status is sufficient to make them a viable long-term challenge to U.S. political and economic power. Some are significant regional players. Collectively, they are seen as challenging U.S. hegemony in their region and beyond, and they have called for a larger role in global decision making for the developing world. Analyzes how these emerging economies become a potent force in the global economy and their impact on various stages of the international arena. Discussions may include a review of specific regional impacts, implications for international security, and effects on international aid policies.

GST 6300. Security and Terrorism. 4 Hours.

Examines the issues of security and terrorism in relation to globalization. Covers the objectives of terrorism and the implications for defining and implementing global security policy, monitoring and controlling weapons proliferation, and initiating acts of counterterrorism. Examines the impact and linkage of terrorism and security on economic development, human rights in counterterrorism, and counterintelligence activities.

GST 6310. Immigration and Labor. 4 Hours.

Examines the issues of immigration and labor in relation to globalization. Covers the changing role of blue- and white-collar labor in the global world and the impact of these changes on perceptions of work and labor. Explores outsourcing, offshoring, immigrant communities, citizenship, activism, and immigration in their global and historical contexts.

GST 6320. Peace and Conflict. 4 Hours.

Examines peace and conflict from a variety of vantage points: as the two interact and emerge from intrastate violence; terrorism; and such concerns as water scarcity, food security, cyber security, disarmament, and arms control.

GST 6324. Divided Societies in the Modern World. 4 Hours.

Analyzes the importance of culture and ethnicity in understanding conflict. Provides an overview of key concepts, ideas, and debates in the field; causes; dynamics; and policy options for resolution of social conflict using comparative international case studies.

GST 6326. International Conflict and Cooperation. 4 Hours.

Emphasizes conflict resolution theory. Draws upon a broad range of academic disciplines, including economics, law, sociology, psychology, anthropology, and dispute resolution, within a historical context. Provides an in-depth examination of international conflicts and approaches to peace building that enables comparisons between and among key players in international conflict and their impact on world affairs. Offers students an opportunity to prepare for further study of peace and conflict resolution in international affairs or provides transferable perspectives for a variety of professional contexts, such as teaching, nongovernmental organizations, media, business and law, and criminal justice.

GST 6327. Conflict and Postconflict Development. 4 Hours.

Focuses on peace planning and conflict prevention and the vital role that local and international NGOs and public/private partnerships are playing in slowly bringing conflict communities together. Presents case studies on reconciliation and confidence-building measures in societies and countries engaged in long-term conflict and how entities such as the media can hamper or facilitate resolution.

GST 6340. Poverty and Wealth. 4 Hours.

Examines models of economic growth and the underlying theories of development, which shape efforts in both developed and developing countries. Introduces the use of economic indicators and measurements of development with reference to situations that have led to economic crises and subsequent responses by governments and institutions. Examines the predominant policy responses of rich and poor countries to the challenges of development, including issues of international assistance and recent trends in poverty reduction and participatory development.

GST 6350. Global Economics of Food and Agriculture. 4 Hours.

Designed to provide students with a broad-based understanding of the global food system, while assessing its performance in terms of satisfying world food needs. Examines international dimensions of food system performance, including global trade and international aid; supply and demand trends and their implications for global food security; food and agricultural trade policies; ethics and safety regulations; and specific national food systems. Also examines specific commodity chains and their impact on economic development.

GST 6360. Nuclear Nonproliferation. 4 Hours.

Explores the history and development of all forms of nuclear weapons from World War II to the present. Decades after the invention of nuclear weapons, the issue of proliferation continues to occupy a significant position in both U.S. and global political discussions. Traces the history of arms control efforts; the role of science and technology; the impact of international organizations set up to monitor and regulate nuclear weapons; and the proliferation of nuclear weapons and their impact on international relations.

GST 6410. Global Education in the Internet Age. 4 Hours.

Examines education and information technology and their emerging mutuality in the global world. Focuses on the role of information technology in making education more accessible to nontraditional students. Considers education as information technology pushes new subjects to be considered for learning. Ends with a discussion on possible future trends of education and information technology working together and the impact such will have on the next generation of students and industry.

GST 6430. Leadership and Management. 4 Hours.

Examines leadership and management and the changes to both of growing global realities. Considers the evolving understanding of how leadership and management are evaluated when cross-cultural, cross-border, and increasingly complex human and economic transactions take place. Examines real-world examples of changing leadership demands and the economic realities that increasingly drive managerial innovation.

GST 6501. Regional Studies: East Asia. 4 Hours.

Examines regional stability and cooperation, efforts to foster democracy and human rights, and policies that have led toward increased trade and rapid economic prosperity. Explores pressures on traditional societies confronting globalization, changing roles of women, demands for improved education, along with challenges from transnational crime such as money laundering, trafficking in persons, and narcotics smuggling.

GST 6502. Regional Studies: Middle East. 4 Hours.

Examines the Middle East from historical, sociological, political, and economic perspectives. Traces the origins and ongoing efforts toward a two-state solution to the Palestinian-Israeli conflict. Explores ongoing efforts across the region for political and economic reform, the growth of civil society, and the strain on traditional societies in an increasingly globalized world. Studies the roots of sectarian conflicts, the problem of terrorism, and the proliferation of conventional weapons as well as weapons of mass destruction.

GST 6503. Regional Studies: Sub-Saharan Africa. 4 Hours.

Explores issues in Sub-Saharan Africa surrounding democratic governance, civil society, and regional cooperation; the role of economic growth and development; efforts in conflict prevention, mitigation and resolution; challenges in the fields of health, agriculture, energy, education, and the role of women; and the problem of transnational crimes such as narcotics smuggling, the arms trade, and trafficking in persons.

GST 6504. Regional Studies: Europe. 4 Hours.

Covers Europe in the postwar era from political, economic, and security dimensions. Explores the role of modern NATO; the challenges and prospects for increasing regional integration, both within and beyond the European Union; the problems facing postcommunist states; and Europe's efforts to build global support for democracy, human rights, civil society, economic prosperity, and security.

GST 6505. Regional Studies: Southwest and Central Asia. 4 Hours.

Focuses on countries of Central Asia as well as the subcontinent. Explores economic development, political transition, education, security, health, environmental challenges, religion, and the changing role of women in this region.

GST 6506. Regional Studies: Latin America. 4 Hours.

Covers all of Central and South America and the Caribbean. Explores economic development in the poorest regions; managing rapid growth elsewhere; and approaches to challenges including democratization, rule of law, civil society, health, narcotics, environment, and regional economic integration.

GST 6540. Politics of the European Union. 4 Hours.

Explores various political, economic, and social aspects of creation and functioning of the European Union. Introduces the politics, structure of governance, institutional design, and various policies of the European Union. Begins with a historical overview of the European integration process and surveys various theories of integration. Separate sessions cover particular topics, such as history and evolution of the EU integration, major institutions, interinstitutional dynamics of governance, and role member states. The second part of the course deals with current key policy issues, such as environment, enlargement, immigration, EU citizenship, crime prevention and terrorism, monetary union, CFSP, euroscepticism, and democratic deficit.

GST 6550. U.S. Foreign Policy. 4 Hours.

Examines the U.S. role in the world by focusing on the dynamics of power in the international system. Explores the theoretical foundations, historical contexts, and domestic sources of past and present U.S. foreign policy choices. Case materials and topics may include humanitarian intervention, nuclear proliferation, the global economy, tensions in the Middle East, and bilateral relations between the United States and such nations as China, Russia, Cuba, or Colombia. Debates the efficacy and ethics of U.S. global power and the future of the U.S.-dominated liberal world order.

GST 6560. Multilateral Diplomacy. 4 Hours.

Studies how nations, nongovernmental organizations, multinational organizations, and other international actors advance their agendas in global and regional forums. Using an issues-based case study and applied approach, offers students an opportunity to explore how members promote diplomatic initiatives and engage in collaboration, coalition building, and negotiation within the context of multilateral organizations.

GST 6580. Opportunities in International Consulting. 4 Hours.

Explores international business across countries and sectors. Constitutes a first step in introducing students to concepts that cover various aspects of the private sector's role in international relations. Uses consultancy case studies and other readings.

GST 6590. Public Diplomacy. 4 Hours.

Examines how governments communicate directly with foreign publics for the purpose of improving image, advocating policy, and shaping public opinion. Explores radio and television broadcasting across borders, cultural programming, educational exchange programs, visitor programs, libraries and language institutes, and the impact of social media. Case studies illustrate topics such as global media and international journalism, propaganda, media in democracies and totalitarian states, media influence on foreign policy, the digital divide, intellectual property, and privacy.

GST 6600. The Practice of Diplomacy. 4 Hours.

Explores the practice and process of diplomacy and the work of foreign ministries, embassies, and consulates. Introduces students to representation, reporting, negotiation, intercultural contacts, and consular affairs, as well as interaction with the media, the private sector, and civil society. Offers students an opportunity to obtain a knowledge base and develop professional skills important to the diplomatic profession, including policy analysis, written and oral communication, and negotiation. Students use extensive simulations, role-playing, and case studies.

GST 6610. Sustainable Development. 4 Hours.

Examines the basic tools of policy analysis in the area of sustainable development. Introduces various techniques used by states, NGOs, and private corporations trying to create viable policy. These may include game theory, cost-benefit analysis, and critical mass models. Utilizes global case studies to analyze current policy and consider political viability of development programs. At the conclusion of the course, students are required to produce policy recommendations and a policy memo.

GST 6700. Global Health Perspectives, Politics, and Experiences in International Development. 4 Hours.

Examines the linkages between health and development that can only be understood within the broader context of sociopolitical and economic factors. Begins with the recognition that poverty plays a central role in many preventable diseases. With the development of nations have come improvements in health. In the landscape of globalization and international development, there has emerged a vast international health regime. Focuses on these linkages in the context of this international political economy of health. Examines key aspects including the concepts and architecture of global health, the global burden and epidemiology of disease, health and development of nations, and political-economic determinants of health and development. Uses a variety of analytical perspectives including political, legal, economic, and epidemiological.

GST 6710. Critical Issues and Challenges in the Practice of Global Health. 4 Hours.

Examines the critical issues in global health. Focuses on roles of different actors in the delivery of healthcare services, healthcare delivery systems, key initiatives and strategies to meet the burden of major diseases, planning and managing national and global health programs, emerging medical health technologies, pharmaceutical policies, marketization of healthcare, the human resources for health, etc. Begins by recognizing that, despite improvements in health across the world over the last half century, vast challenges remain for a majority of people in developing countries. Analyzes the cutting-edge issues and knowledge that are at the forefront of the global health policy agenda today. Uses a practical and policy-analytical approach with illustrative case-based analysis and extensive coverage of material.

GST 6740. Human Rights. 4 Hours.

Introduces students to the concept of international human rights. Focuses on the role of global, regional, and national institutions to protect human rights as well as create and enforce human rights law. Explores the role of nongovernmental organizations and the media in fact-finding and publicizing human rights violations, along with current issues and case studies.

GST 6810. International Higher Education. 4 Hours.

Explores the phenomenon of global student mobility and internationalization of both campuses and curricula. Looks at historical landmarks in student and faculty exchanges, government-sponsored programs, recruiting practices, and the development of cross-cultural competencies. This is an introductory course.

GST 6820. Managing Study Abroad. 4 Hours.

Focuses on the experience of American students, faculty, and their home institutions as they travel overseas for educational purposes. Begins with historical foundations such as "Junior Year Abroad" and continues to the present day, exploring trends in enhancing cross-cultural learning, faculty-led programs, service-learning, and experiential programs.

GST 6830. Managing International Students. 4 Hours.

Explores how increasing numbers of international students from diverse countries can best be managed to increase campus internationalization, avoid clustering, provide rich experiences for domestic students, and cope with cultural adaptation.

GST 6840. The Business of International Education. 4 Hours.

Explores the role of third-party study-abroad providers, recruiters, program developers, and nonprofit organizations dedicated to student and faculty exchanges and their growing relationship with U.S. university campuses. Examines the financial costs and benefits inherent in offering a growing range of international programs.

GST 6850. Immigration and Legal Issues in International Higher Education. 4 Hours.

Focuses on the necessary legal knowledge for managers running international student offices on campuses. Covers visa and immigration law from the U.S. perspective. Includes legal knowledge study-abroad staff need—such as crisis management, insurance, physical and mental health issues, and liability problems—as staff assist both American students who travel in increasing numbers to nontraditional destinations and international students who come to their campuses.

GST 6920. Case Study in Global Studies. 4 Hours.

Offers an integrative, summative course for the master's degree that builds on the understanding and concepts of global studies learned throughout the program. The curriculum draws heavily upon learning outcomes and acquired skills from both the global studies core courses and advanced electives in the concentration. Throughout the course, the instructor leads students through a step-by-step process of researching and writing a well-defined project, from the initial construction of a research question through the final stages of editing and revision. Course assignments may include group projects and individual presentations. At the conclusion of the course, students should have finished a portfolio piece capable of demonstrating their application of concepts and methods learned throughout their studies.

GST 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

GST 7962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions.

GST 7978. Independent Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic.

GST 7983. Topics. 1-4 Hours.

Covers special topics in global studies. May be repeated without limit.

GST 7990. Thesis. 1-8 Hours.

Offers thesis supervision by members of the department.

Global Studies - CPS Specialty (GBST)

Search GBST Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=GBST>)

GBST 1011. Globalization and International Affairs. 4 Hours.

Offers an interdisciplinary approach to analyzing global/international affairs. Examines the politics, economics, culture, and history of current international issues through lectures, guest lectures, film, case studies, and readings across the disciplines.

GBST 1012. The Global Experience. 1 Hour.

Designed to introduce students to living and learning abroad. Offers students an opportunity to prepare for, gain from, and reflect upon their term abroad as a profound global experience. Uses workshops, seminars, course readings, discussions, and local civic engagement to challenge students to become global citizens and ambassadors by actively participating in their own learning, in their local team and community, as well as in the greater study-abroad community at Northeastern and beyond. Ongoing online reflection offers students an opportunity to articulate their own experiences, to respond to the experiences of others, and ultimately to make connections between global experiences around the world.

GBST 1020. Community Learning 1. 1 Hour.

Offers an introduction to community learning, social justice, and cross-cultural collaboration in Boston. The main objective is to help students prepare for, gain from, and reflect upon their semester in Boston as a profound global experience. Uses lectures, course readings, group discussions, collaborative projects, and semester-long service-learning opportunities to challenge students to ask critical questions and become global citizens and ambassadors by actively participating in their own learning community, as well as the greater Northeastern community, and beyond into Boston. Ongoing, online reflection is designed to help students articulate their own experiences, respond to others' experiences, and ultimately make connections with the global experiences of others.

GBST 1030. Community Learning 2. 0 Hours.

Continues the introduction of community learning, social justice, and cross-cultural collaboration in Boston begun in GBST 1020. Seeks to help students synthesize their growing experiential education of social justice issues, American culture, and the English language. Is wholly dependent on student leadership and builds on the Socratic method as a means of collaborative learning.

GBST 1102. Global Corporate and Social Responsibility. 4 Hours.

Examines the social responsibilities of corporations and individuals in the global twenty-first century. Topics may include outsourcing, offshoring, international labor laws, global environmental responsibility, global human rights, global citizenship, and sustainable development. In addition, the course focuses on the use of qualitative and quantitative methods in the analysis of current policies and practices of multinational corporations, nation-states, and international nongovernmental organizations.

Graduate Engineering - CPS (GSE)

Search GSE Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=GSE>)

GSE 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

Greek (GREK)

Search GREK Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=GREK>)

GREK 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

GREK 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

GREK 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

GREK 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

Health Informatics (HINF)

Search HINF Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=HINF>)

HINF 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

HINF 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

HINF 2991. Research in Health Informatics. 1-4 Hours.

Offers an opportunity to conduct introductory-level research or creative endeavors under faculty supervision.

HINF 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

HINF 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

HINF 5101. Introduction to Health Informatics and Health Information Systems. 3 Hours.

Introduces the history and current status of information systems in healthcare: information architectures, administrative and clinical applications, evidence-based medicine, information retrieval, decision support systems, security and confidentiality, bioinformatics, information system cycles, the electronic health record, key health information systems and standards, and medical devices. Requires enrollment in Graduate Health Informatics Program.

HINF 5102. Data Management in Healthcare. 3 Hours.

Explores issues of data representation in healthcare systems, including patient and provider identification, audit trails, authentication, and reconciliation. Discusses underlying design of repositories for electronic health records (EHRs) and computerized provider order entry (CPOE) systems. Includes an overview of privacy issues, legislation, regulations, and accreditation standards unique to healthcare.

HINF 5105. The American Healthcare System. 3 Hours.

Covers the organization, financing, and outcomes of the U.S. healthcare system. Studies opportunities and challenges to improve the cost and quality of healthcare and expand adequate coverage to all. Non-health informatics students may be able to take the course with permission of the program director.

HINF 5110. Global Health Information Management. 3 Hours.

Studies the challenges of managing health information systems in the United States, Canada, India, China, the United Kingdom, Saudi Arabia, Singapore, Taiwan, Ghana, and Malawi. Differences in healthcare systems and national regulations make the process slightly different in each country. By exploring environments with varying degrees of regulation, students have an opportunity to think critically about the impact that a nation's environment has on health information management. Discusses case studies to encourage students to think about health informatics from a managerial perspective across private companies, government, and nongovernment organizations.

HINF 5200. Theoretical Foundations in Personal Health Informatics. 4 Hours.

Offers an introduction to and foundation for personal health informatics by reviewing major theories and models of health behavior change and health education at individual, interpersonal, and community levels in a wide variety of settings and populations. Health behavior change is arguably our greatest hope for reducing the burden of preventable physical and mental disease and death around the world. A thorough understanding of health behavior change theories is thus essential to developing and translating personal health interface technologies into practice and policy that can result in more powerful interventions and more robust theories. Emphasizes cultural and health disparities, global applications, advances in health communications, and the use of electronic media (e-health) and mobile media (m-health). Open to students with senior standing with permission of instructor.

HINF 5300. Personal Health Interface Design and Development. 4 Hours.

Explores the design of innovative personal health human-computer interface technologies. Examples include assistive technologies that aid persons with disabilities, consumer wellness promotion applications, patient education and counseling systems, interfaces for reviewing personal health records, and elder care and social network systems that monitor health and support independent living. Offers students an opportunity to work in teams to build a prototype personal health interface system to solve a real problem. Topics include needs assessment and participatory research, iterative user interface design methods for health interface development, computational sensing of health states and behavior, software architectures for iteratively testing prototype personal health interface technologies, human-computer interaction issues related to personal health technology, and technology transfer requirements to support future validation studies of technology.

HINF 5301. Personal Health Technologies: Field Deployment and System Evaluation. 4 Hours.

Explores the deployment and evaluation of innovative personal health technologies. In this project-based course, students work in teams to deploy and evaluate a prototype personal health technology that has been previously developed by students in HINF 5300. Offers students an opportunity to develop a research plan to measure the effectiveness, usability, and/or feasibility of the technology; recruit study participants; deploy the technology; and analyze the data collected. Also offers students an opportunity to learn about each of these steps and work toward producing a publishable-quality research paper on the technology and results of the efficacy study, as well as to prepare a grant application that extends the technology and research methodology. Additional topics include technology transfer and implications on health policy.

HINF 5407. Business Application of Decision Support in Healthcare. 3 Hours.

Explores the business of healthcare and the practical application of decision support needed to improve access to care, improve health outcomes, and reduce the cost of care. Discusses the impact of consumerism, risk-based purchasing (including ACOs), the migration from facility to home and community-based care (including medical home models), the implied broadening of the healthcare supply chain, and emerging technology trends such as blockchain.

HINF 5976. Directed Study. 3 Hours.

Offers students an opportunity to examine standard health informatics material in fresh ways or new health informatics material that is not covered in formal courses. May be repeated up to two times.

HINF 6201. Organizational Behavior, Work Flow Design, and Change Management. 3 Hours.

Reviews the concepts, issues, and practices of organizational behavior at the individual, group, and organizational levels. Offers an opportunity to learn how to gather information from users and understand the users' point of view and problems. Examines processes and work flow in healthcare environments. Seeks to explain organizational structures and analyze business processes and how they are translated into specifications to build a RFP for vendors. Also examines fundamentals of organizational behavior and change management.

HINF 6202. Business of Healthcare Informatics. 3 Hours.

Focuses on the business practices relating to health information technology. Includes departmental design and management, capital and operating budgets, the budget planning process, and infrastructure design and strategic planning. Other topics include evaluation of vendors, vendor selection, clinical administration systems, and the design and management of integrated delivery networks.

HINF 6205. Creation and Application of Medical Knowledge. 3 Hours.

Explores the relationship between clinical data and clinical knowledge and how both are developed and deployed in organizations to support improvements in patient care and research. Topics covered include what medical data is available and how it should be accessed, analyzed, and organized to support evidence-based medicine and research. Analyzes current and future approaches to clinical decision support and expert system development and how they can be deployed via new or existing knowledge-management infrastructures.

HINF 6215. Project Management. 3 Hours.

Introduces students to managing healthcare informatics projects, including the tools and techniques used to manage small, medium, and large software and systems projects. Topics include project planning, project management tools, estimating, budgeting, human resource management, and the like. All phases of a project are discussed, and students are required to develop a project plan for a health informatics project as part of the course.

HINF 6220. Database Design, Access, Modeling, and Security. 3 Hours.

Designed to provide an introduction to the theory and application of database management systems. Topics covered include the relational model, basic and intermediate query formulation using structured query language, database design using the entity relational model, and database normalization and optimization. In addition to these traditional topics, this course covers a sample of emerging topics relevant to the healthcare professional, including personal health information, privacy and security considerations, XML as a data model, and clinical data warehousing and mining.

HINF 6240. Improving the Patient Experience through Informatics. 3 Hours.

Explores the current and future dynamics influencing care for patients. The patient experience is a key differentiator in delivery of healthcare. Technology makes a difference for the patient in both the delivery of advanced care applications and innovation. Discusses and explores technology and workflow enhancements that could work to improve the patient experience from a cost, quality, and care perspective. Examines best practices and organizations and evaluates how they are using informatics to deliver a better patient experience. Analyzes change management and why change is difficult within healthcare and explores case studies on how to make change happen and the role that change plays in connection with technology. People, process, and technology all need to be present to offer an ideal experience.

HINF 6335. Management Issues in Healthcare Information Technology. 3 Hours.

Uses case studies to identify typical issues confronting chief information officers in healthcare organizations, including human resource management, strategic planning, project management, vendor contract negotiations, budgeting, service levels, etc. Requires prior completion of HINF 5101.

HINF 6345. Design for Usability in Healthcare. 3 Hours.

Introduces the general principles of usability and user interface design as they relate to healthcare technology. Through a series of hands-on projects, offers students an opportunity to gain skill in user-centered/UX research and design methodologies such as interviewing, persona creation, task analysis, usability testing, prototyping, and iterative design. Class materials, exercises, and discussions cover usability and design for EHRs/ EMRs, connected health, smart home products, and interoperability. While there are no prerequisites for this course, the material is directed toward advanced students who need to understand how to design usable interactive products and software within healthcare so they can either do the work themselves or manage this function within a project.

HINF 6350. Public Health Surveillance and Informatics. 3 Hours.

Offers students an opportunity to learn how public health information is generated, collected, transferred, and shared. Discusses the principles and practice of public health surveillance as well as the application of health informatics standards and methods in the design of surveillance systems. Also reviews the core components of analysis and interpretation of population data. Non-health informatics students may be able to take the course with permission of the program director.

HINF 6355. Key Standards in Health Informatics Systems. 3 Hours.

Reviews the different healthcare informatics standards for storing and exchanging data in healthcare technology systems. Covers where and how they are used, where and why they are not used, and an overview of some of the types of products available to facilitate their use. Seeks to demystify the details behind the standards. Offers students an opportunity to work through examples in small groups in class and discuss issues involving the standards' adoption and use. Non-health informatics students may be able to take the course with permission of the program director.

HINF 6400. Introduction to Health Data Analytics. 3 Hours.

Introduces the field of health data analytics. Topics include understanding stakeholder needs; the variety of types of health data; software tools; as well as case studies from pharma, public health, electronic health records, claims data, and home-monitoring data. Emphasizes the importance of understanding the complexity and potential biases in how health data (direct or indirect) is collected and represented. Presents all data-analytic discussions within a context of health data and stakeholder information needs. Offers students an opportunity to practice presenting the results of analyses.

HINF 6404. Patient Engagement Informatics and Analytics. 3 Hours.

Studies patient engagement and health informatics systems and analyses of data collected from these systems. Patient engagement is the ability and willingness of patients to manage their own health and care combined with interventions to increase patient involvement in their own health and care, as well as other positive health behaviors. In these interventions, health informatics systems and analyses of data are used. Offers students an opportunity to engage in data analytic exercises to investigate the underlying design and implementation of health informatics systems used in patient engagement initiatives. Presents an overview of the current state, new technologies, and other areas (health reform, legal, privacy, quantified self) influencing the future direction of patient engagement.

HINF 6405. Quantifying the Value of Informatics. 3 Hours.

Examines the various ways in which health informatics delivers value to organizations. Organizations invest in informatics because they believe that doing so will enable them to meet their objectives. The course offers students a series of tools to use to quantify value, which can help them to articulate and assess the value of potential investments in informatics. Examines case studies to offer students an opportunity to practice articulating the value of informatics in real settings.

HINF 6500. Predictive Analytics and Modeling. 3 Hours.

Seeks to train students to transform data to useful, actionable knowledge through the use of mathematical and computational models. Reviews popular techniques for data mining and health analytics based on regression and machine-learning methodologies. Introduces students to a spectrum of models—ranging from data-driven to principle-based, mechanistic approaches—and examines how to compare models and use them to improve understanding of data. Introduces model-based methods of artificial intelligence as applied to healthcare problems, covering fundamental principles of AI and a variety of applications in healthcare.

HINF 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

HINF 7701. Health Informatics Capstone Project. 3 Hours.

Offers students an opportunity to integrate knowledge gained in the classroom with real-world problems. Consists of practical work and research in a major area of health informatics. Potential areas of work include design or analysis of health informatics systems, programs, or applications; program planning; and policy development. Encourages community-based participatory projects. To the extent possible, capstone projects have as a goal an active contribution to the health informatics field. Students initiate and design capstone projects in consultation with working professionals. Faculty members provide guidance and mentoring. Requires prior completion of at least three semesters of graduate study in health informatics.

HINF 7976. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

HINF 8982. Readings. 1-8 Hours.

Offers selected readings under the supervision of a faculty member. *Personal health informatics PhD students only.*

HINF 9000. PhD Candidacy Achieved. 0 Hours.

Indicates successful completion of program requirements for PhD candidacy.

HINF 9990. Dissertation. 2-4 Hours.

Offers selected work with the agreement of a dissertation supervisor. May be repeated once.

HINF 9996. Dissertation Continuation. 0 Hours.

Continues work with the agreement of a dissertation supervisor. May be repeated up to 14 times.

Health Information Administration - CPS (HIA)

Search HIA Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=HIA>)

HIA 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

Health Management - CPS (HMG)

Search HMG Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=HMG>)

HMG 1100. Foundations of Healthcare Management. 3 Hours.

Examines the management of health services organizations (HSOs) and health systems from management functions, concepts, and principles to managerial roles, skills, and competencies within the context of HSOs and health systems and their external environment. Introduces managerial tools and techniques for managing effectively in the HSO/health systems environment. Emphasizes how health managers solve problems, make decisions, and conduct strategic planning. Studies the roles played by quality, productivity, and technology in establishing and maintaining a competitive position and how managers seek to manage the complex human relationships that exist within HSOs and health systems as well as other agencies and external stakeholders.

HMG 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

HMG 2100. Healthcare Operations. 3 Hours.

Focuses on operations management planning and execution. Explores the challenges of restructuring and control common to hospitals and other health services organizations.

HMG 2110. Health Law and Regulation. 3 Hours.

Examines the impact of health law and regulation on healthcare systems. Explores how to assess liability in the workplace, the impact of medical malpractice, risk management, and current ethical and legal dilemmas in the practice of medicine. Discusses how to manage the risk of the employer and patient through the use of medical records and specific behavior patterns, how to determine personal risk, and how to recognize potential litigious issues in the practice of medicine.

HMG 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

HMG 3210. Health Informatics. 3 Hours.

Focuses on information systems in healthcare. Topics include information architectures, administrative and clinical applications, evidence-based medicine, information retrieval, decision support systems, security and confidentiality, the electronic health record, integration of key health information systems, and medical devices.

HMG 3220. Risk Management and Quality Assurance. 3 Hours.

Explores aspects of quality management within the healthcare arena. Studies legislative mandates, healthcare agencies' requirements, and methods of assessing and improving the quality of care. Emphasizes the procedures utilized to monitor physician and professional staff reappointment and credentialing. Discusses integration of the research process to conduct performance monitoring, quality improvement, and risk assessment. Emphasizes using statistical analysis to inform decision making.

HMG 3225. Public Health. 3 Hours.

Introduces the history and principles of public health and their application to the development of activities that benefit the health status of populations. Explores the roles of epidemiological studies, biostatistics, healthcare planning and policy development, healthcare administration, and community organization in addressing public health needs.

HMG 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

HMG 4210. Healthcare Policy. 3 Hours.

Examines the healthcare policy environment, including the economics and politics of healthcare policy. Explores institutional, local, regional, national, and international approaches to public health, health systems, and determination of research and development priorities. Discusses a variety of critical, contemporary policy issues such as health insurance, Medicare and Medicaid, the increase of medical expenditures, the malpractice crisis, the evolution of managed care, and a comparison of other nations' healthcare systems.

HMG 4850. Healthcare Management Capstone. 3 Hours.

Offers students an opportunity to integrate knowledge gained in the classroom with real-world problems. Consists of practical work and research in a major area of healthcare management. Students initiate and design capstone projects in consultation with faculty and working professionals.

HMG 4955. Project. 1-4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student's major field. May be repeated without limit.

HMG 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

HMG 4994. Internship. 3 Hours.

Offers students an opportunity to participate in an internship in a healthcare organization.

HMG 6110. Organization, Administration, Financing, and History of Healthcare. 3 Hours.

Provides a historical context for the current healthcare system, the current economic drivers, the leading integrated delivery systems, political pressures, ethical issues, and the roles of insurance and pharmaceutical companies.

HMG 6120. Human Resource Management in Healthcare. 3 Hours.

Examines the complexities and multiple issues involved in human resources management in healthcare organizations. Offers healthcare managers an opportunity to obtain the knowledge and tools to manage people in all aspects of their work from recruiting, to the hiring interview, to compensation and benefits, to motivational strategies and performance appraisals, to promotions and terminations. Seeks to provide the healthcare manager with current thinking, theory, and best practices for the effective management of people in healthcare organizations.

HMG 6130. Healthcare Strategic Management. 3 Hours.

Focuses on analyzing, planning, negotiating, problem solving, and decision making for healthcare systems managers in a risk-based environment. Strategic management as practiced in healthcare functional units, clinics, and hospitals is rapidly changing in today's technology-driven environment. Planning and management strategy at all levels are essential to the organization.

HMG 6140. Principles of Population-Based Management. 3 Hours.

Covers epidemiological analysis of health and health services with an emphasis on assessment of cost and benefits of population-based interventions. Special topics include community health assessments, the monitoring of community health indicators, and the evaluation of community health improvement activities. Includes strategies for the analysis of potential and actual health-risk factors and the discovery and implementation of appropriate risk-reduction strategies.

HMG 6160. Healthcare Information Systems Management. 3 Hours.

Offers students an opportunity to understand how to manage high-technology systems, tools, and products and to provide a conceptual framework for understanding how to use technology to reduce costs and improve productivity, efficiency, and effectiveness in their current and future work situations. Today's health practitioner has to use technology to find medical information and use accounting systems, personal systems, health insurance company systems, inventory systems, patient billing systems, purchasing systems, as well as input and retrieve data. Focuses on the business of healthcare and how to understand, use, and manage technology and information systems that have become such an integral part of the health delivery spectrum in a medical environment.

HMG 6170. Health Law, Politics, and Policy. 3 Hours.

Surveys the legal foundations of healthcare and applies current case law to contemporary situations. Topics include legal aspects of legislation, patient rights, data security, professional liability, labor relations, and the politics of healthcare reform. Issues include the high price of prescription drugs and why they are less expensive in Canada and overseas. Do rising medical costs produce better health? How should a Medicare prescription drug benefit be designed? Should kidneys and other organs be bought and sold? Includes case studies and group projects related to these questions and/or others as they emerge.

HMG 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

HMG 7962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions.

Health Science (HSCI)

Search HSCI Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=HSCI>)

HSCI 1000. College: An Introduction. 1 Hour.

Provides an introduction to the University, college, and health professions to enhance students' understanding of self and the decisions they make academically and socially as members of the University's diverse, multicultural community. Group activities and individual assignments along with active participation in a learning community help students adjust to life on an urban campus, develop a better understanding of the learning process, acquire essential academic skills, and make connections with the faculty and students in the college.

HSCI 1105. Human Nutrition. 4 Hours.

Examines the fundamental role of nutrition in promoting health and how lifestyle and the socioecological model work together. Covers the physiological functions of energy-providing nutrients in the body and interrelationships, including the key functions of macronutrients and micronutrients. Introduces the use of two different diet assessment tools to assist individuals in selecting food for health promotion. Offers students an opportunity to gain a deeper understanding of what it means to make healthy choices and the role nutrients have on a person's wellness.

HSCI 1106. Contemporary Issues in Nutrition. 4 Hours.

Explores the fundamental role of nutrition in promoting health. Offers an overview of nutrient functions, compositions, and digestion/absorption. Relates concepts covered in class to current topics of interest in nutrition. Offers students an opportunity to discuss their dietary behaviors in relation to the Dietary Guidelines for Americans.

HSCI 1107. Nutrition Service Learning. 4 Hours.

Offers an introductory human nutrition course exploring the fundamental role of nutrition in promoting health. Discusses the essential nutrient functions, composition, and digestion/absorption. Utilizes principles from the humanities and sciences in developing nutrition concepts. Explains food nutrition labeling and presents its role in assisting the public with food selection. Emphasizes the relevance of food choices throughout life and their impact on long-term health. Engages students in hands-on service roles. Offers students an opportunity to learn and apply course concepts while addressing the needs/interests identified by community partners. This activity involves planning and participating with after-school programs providing nutrition workshops.

HSCI 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

HSCI 2000. Professional Development for Bouvé Co-op. 1 Hour.

Introduces students to the Bouvé Cooperative Education Program and provides them with the opportunity to develop job-search and career-management skills. Offers students an opportunity to perform assessments of their workplace skills, interests, and values and discuss how they impact personal career decisions. Students also have an opportunity to prepare a professional-style résumé, learn proper interviewing techniques, and gain an understanding of the opportunities available to them for co-op. Introduces career paths, choices, and career decision making. Familiarizes students with workplace issues relative to their field of study and teaches them to use myNEUCOOL database in the job-search and referral process. Presents and discusses co-op policies, procedures, and expectations of the Bouvé Cooperative Education Program and co-op employers.

HSCI 2350. Advanced Nutrition in Health and Disease. 4 Hours.

Designed for health professionals to increase their knowledge and skills in advanced nutrition in health and disease. Builds on a foundation of nutrition and introduces nutrients and their physiological impacts, including the nutritional guidelines for good health and disease prevention. Through case studies, offers students an opportunity to interpret nutrition in the prevention and treatment of diet-related health problems, such as obesity, diabetes, and cardiovascular disease.

HSCI 2500. Public Health Nutrition in the Community. 4 Hours.

Explores the role nutrition plays in promoting and improving health in the community. Examines modern aspects of public health nutrition in the healthcare system by applying the principles of nutrition to design policies, behavior, program planning, food insecurity, marketing, and children and adult nutrition programs. Offers students an opportunity to develop and deliver nutrition education to various populations in the community, including school-age children, college students, and the elderly population.

HSCI 2850. Special Topics. 4 Hours.

Offers students an opportunity to participate in a small seminar to explore selected topics within the vast subject of healthcare. May be repeated up to two times.

HSCI 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

HSCI 2991. Research in Health Science. 1-4 Hours.

Offers an opportunity to conduct introductory-level research or creative endeavors under faculty supervision.

HSCI 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

HSCI 4700. Health Science Capstone Introduction. 0 Hours.

Offers students an opportunity to integrate their course work, knowledge, and experiences to develop a proposal for a health science capstone project. The project is either research based or service based and is a culminating experience in the health science program. Upon completion and approval of the proposal, the student works with a mentor or mentors to implement their project in HSCI 4720 or HSCI 4730.

HSCI 4720. Health Science Capstone—Service. 4 Hours.

Offers students an opportunity to integrate their course work, knowledge, and experiences into a project that results in a written report and presentation regarding an issue within the field of health or healthcare. The project is a culminating experience in the health science program. Includes working with a mentor in a field experience in public health education or health policy, public affairs, social service, or other healthcare environment in which the student is qualified. Requires students to present their projects to the seminar class and possibly to the agency or group with which they are working.

HSCI 4730. Health Science Capstone—Research. 4 Hours.

Offers students an opportunity to integrate their course work, knowledge, and experiences into a project that results in a written report and presentation regarding an issue within the field of health or healthcare. The project is a culminating experience in the health science program. Students may choose to participate in an ongoing research project or create and implement their own research project as their capstone project. Requires students to present their projects to the seminar class and possibly to present a poster at a professional/research expo.

HSCI 4950. Seminar. 4 Hours.

Offers students an opportunity for an in-depth study of selected topics within healthcare.

HSCI 4970. Junior/Senior Honors Project 1. 4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student's major field. Combined with Junior/Senior Project 2 or college-defined equivalent for 8 credit honors project. May be repeated without limit.

HSCI 4971. Junior/Senior Honors Project 2. 4 Hours.

Focuses on second semester of in-depth project in which a student conducts research or produces a product related to the student's major field. May be repeated without limit.

HSCI 4983. Topics. 4 Hours.

Offers students an opportunity to study contemporary issues in healthcare and to expand their breadth of knowledge and engage diverse perspectives.

HSCI 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

HSCI 4991. Research. 4 Hours.

Offers an opportunity to conduct research under faculty supervision.

HSCI 4992. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

HSCI 4993. Independent Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

HSCI 4994. Internship. 4 Hours.

Offers students an opportunity for internship work. May be repeated without limit.

HSCI 5230. Clinical Nutrition Applications in Health and Disease. 3,4 Hours.

Prepares health professionals to effectively communicate principles of diet and nutrition to their clients and the public. Covers public health promotion strategies, techniques used to teach diet and nutrition, and behavioral theories used in diet and nutrition intervention. Emphasizes clinical applications for the treatment of weight disorders, diabetes, cardiovascular disease, eating disorders, and nutrition in the life cycle.

HSCI 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions.
May be repeated without limit.

Health Science - CPS (HSC)

Search HSC Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=HSC>)

HSC 1200. Nutrition. 3 Hours.

Explores the fundamental role of nutrition in promoting health, wellness, and prevention of chronic disease. Topics include nutrients and nutritional needs across the life span; food safety and security; body weight regulation; and the genetic, social, and environmental influences on food choices and nutrition status.

HSC 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions.
May be repeated without limit.

HSC 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions.
May be repeated without limit.

HSC 3300. Epidemiology. 3 Hours.

Introduces the principles, concepts, and methods of population-based epidemiology—the study of patterns and determinants of disease in different populations. Topics include the dynamic behavior of disease; measures of disease frequency and effect; uses of rates, proportions, and other statistics to describe the health of populations; epidemiologic study designs; and bias in investigating the extent of disease problems and the associations between risk factors and disease outcomes.

HSC 3310. Pathophysiology. 3 Hours.

Examines human physiology related to oxygenation, nutrition, elimination, protective mechanisms, neurological functions, endocrine functions, and skin integrity. Topics include neurophysiology; immunology; cardiovascular, respiratory, renal, and gastrointestinal physiology; and endocrinology. Explores how the human body uses its adaptive powers to maintain equilibrium and how alterations affect normal processes.

HSC 3320. Pharmacology. 3 Hours.

Offers the fundamentals of pharmacology to students entering the health professions. Topics include the general principles of drug action, drug distribution, and drug elimination. Focuses on principles of pharmacology and the major drug classifications in relation to the treatment of health problems. Emphasizes dose response, side effects/drug interactions, route of administration, and place in clinical therapy. Drugs are presented according to therapeutic or functional classification.

HSC 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions.
May be repeated without limit.

HSC 4850. Project in Health Science. 3 Hours.

Offers students an opportunity to integrate knowledge gained in the classroom with real-world problems. Students initiate and design a capstone project in health science in consultation with faculty and working professionals.

HSC 4955. Project. 1-4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student's major field. May be repeated without limit.

HSC 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions.
May be repeated without limit.

Health Science - Interdisciplinary (HLTH)

Search HLTH Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=HLTH>)

HLTH 1010. From the Community to the Intensive Care Unit: Approaching Interdisciplinary Research in the Elderly. 1 Hour.

Exposes students to the current interdisciplinary research activities of Bouvé faculty from several professions (e.g., pharmacy, nursing, physical therapy, and counseling psychology) focused on improving the health of the elderly. The dramatic increase in the proportion of Americans who are elderly provides healthcare professionals with a golden opportunity to improve the health outcome of this population through interdisciplinary research efforts. Uses a seminar-discussion format designed to help increase the awareness among students of the importance of clinical research in the elderly and the unique role that different healthcare professionals can play in leading interdisciplinary research teams across a spectrum of different clinical settings.

HLTH 1200. Basic Skills for the Healthcare Professional. 2 Hours.

Introduces health science students to the basic skills necessary to be successful in entry-level healthcare positions. These skills include: Basic Life Support, safe patient handling, vital signs, oxygen transport and safety, and EKG prep and placement. Also covers basic medical terminology, appropriate professional behaviors, and communication skills.

HLTH 1201. Lab for HLTH 1200. 1 Hour.

Accompanies HLTH 1200. Provides students with hands-on opportunities to learn skills in Basic Life Support, safe patient handling, determining vital signs, oxygen transport and safety, EKG prep and placement, and related clinical skills.

HLTH 1510. Introduction to Healthcare Ethics. 4 Hours.

Explores ethical issues in contemporary healthcare. Introduces theories and applies frameworks for analyzing and deciding ethical dilemmas. Considers biomedical, clinical, social, and legal issues related to ethical issues and integrates such considerations into ethical decision making. Offers students an opportunity to explore ethical issues and experiences of individual interest to assist in clarifying professional values and ethics.

HLTH 2000. Foundations of Coordinated Patient Care. 2 Hours.

Introduces the opportunities and challenges of interprofessional collaborative practice in healthcare. Sessions focus on the dynamics of interprofessional teams and teamwork, values and ethics, communication, and roles and responsibilities in influencing patient care. Interprofessional collaborative practice is an important mechanism for improving patient outcomes.

HLTH 2001. Introductory Skills for Healthcare and Rehabilitation. 4 Hours.

Designed to provide a basic practical understanding of introductory skills commonly performed in healthcare and rehabilitation settings for patient/client interaction and/or clinical research. Topics include body mechanics, vital signs, cardiopulmonary resuscitation, exercise equipment, assistive device management, hot and cold application, standard precautions, and healthcare communication. Offers students an opportunity to obtain the ability to integrate topics learned with the future of healthcare and rehabilitation, industry, and entrepreneurship of their chosen profession through a final professional reflection assignment.

HLTH 2100. Interprofessional Ethics for Individual and Population Health. 4 Hours.

Provides case reviews and discussion related to basic theories, principles and contemporary issues of bioethics. Secondly, this course is an interprofessional course that covers specific ethical guidelines for various health disciplines from nursing, pharmacy, health sciences, and others. Offers students an opportunity to develop systematic strategies and analytic frameworks for identifying and examining bioethical issues and for resolving bioethical dilemmas and problems. Students have an opportunity to apply their specific discipline's ethics code and work in multidisciplinary groups to apply ethical principles from different perspectives.

HLTH 2120. Introduction to Interprofessional Healthcare Settings. 1 Hour.

Designed to help students recognize the complex and interprofessional roles in allied healthcare settings prior to a co-op or other clinical experience. Comprised of three four-week units focused on different healthcare environments—acute care, long-term care, and outpatient care. Students explore a case study from the viewpoint of multiple healthcare professionals in each setting.

HLTH 2200. Emergency Medical Technician Training. 6 Hours.

Offers students an opportunity to learn basic healthcare clinical skills and seeks to prepare students to function as emergency medical technicians (EMTs) at the basic life support level. EMTs are an essential component of prehospital emergency medical service (EMS) systems. This course seeks to establish a solid foundation in EMS, broadly including patient assessments, medical emergencies, trauma emergencies, relevant pharmacology, special populations, and EMS operations.

HLTH 2302. Alternative Medicine. 4 Hours.

Presents an objective assessment and discussion of alternative and complementary medical approaches used in the United States and their significant historical, cultural, and cross-cultural implications. The majority of alternative and complementary medical strategies were developed in a specific historical and cultural context. Some of the therapies have had an impact on human health for thousands of years. Others have become popular only recently. Many methods discussed are fused with different cultural practices, such as the concept of "vitalism," a force that modern science does not recognize but is an important attribute in certain cultural practices. Some methods have long and successful histories based upon sophisticated ancient medical theories, such as "Chi," found in Chinese medicine.

HLTH 2992. Research. 0 Hours.

Offers an opportunity to document student contributions to research projects or creative endeavors.

HLTH 3001. The Research Process. 2 Hours.

Explores the processes involved in conducting health-related research from the initial selection of a topic or research area to the written and oral presentation of study results. Offers students an opportunity to obtain the skills required to design and conduct rigorous quantitative research. Students formulate a research question, design an appropriate research approach, prepare an analytic plan, collect or access relevant data, analyze the data, and present and summarize to the class their study and results. Students discuss readings weekly and present elements of their study.

HLTH 4991. Research. 4 Hours.

Offers an opportunity to conduct research under faculty supervision. .

HLTH 4992. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

HLTH 5002. Mindfulness: Theory and Practice. 3 Hours.

Studies key aspects of theory and practical principles of mindfulness practice. Mindfulness is a particular way of paying attention to experiences that has been scientifically researched and found to decrease habitual and destructive cycles of thought and emotion. This course is highly experiential and daily homework practice consists of at least 20 minutes of mindfulness practice. Instructions for the various practices are provided throughout the course. Each class typically includes a didactic portion, a mindfulness practice, and a group discussion. The benefits of mindfulness practice include reduced stress, improved attention, reduced emotional reactivity, and greater mind-body awareness. Offers students an opportunity to develop practical skills of relational mindfulness in interactions with others and to cultivate positive emotions.

HLTH 5135. Developing an Interdisciplinary Approach to Health Management for Older Adults. 4 Hours.

Focuses on health management for older adults, a major issue in contemporary society. Policy, economics, organizational structure, and clinical care are intermingled in responding on societal, institutional, and clinical levels. Challenges the inquisitive and creative student to approach the health of the older adult by addressing these complex issues. Focuses on effective outcomes and understanding the range of roles professionals may adopt. Provides the knowledge base and skill set necessary for interdisciplinary professional practice. Contact the course coordinator at least one month prior to the start of the course for admission.

HLTH 5280. The (in)Visibility of (dis)Ability in Society. 3,4 Hours.

Addresses the issues of disability relative to culture, public policy, rights, and advocacy. Focuses class discussion on the experiences of people with disabilities living in our current society as well as from a historical perspective. Explores the following topics: who is disabled, social attitudes toward people with disabilities, and images and stigma in the media. Also covers the language of disability, disability culture, and the forgotten minority. Affords students an opportunity to gain a broad understanding of the complex and dynamic issues and themes concerning people with disabilities.

HLTH 5450. Healthcare Research. 4 Hours.

Provides an overview of the research process and its application in clinical arenas. Emphasizes the role of the health professional as a consumer of research, with concern for the ethical management and treatment of patients and their families. Elements of research design and their implications in clinical settings provide the framework for the analysis of research and the development of a research proposal. Also emphasizes the use of research findings for evidence-based practice. Encourages interdisciplinary projects.

HLTH 5451. Recitation for HLTH 5450. 0 Hours.

Provides small-group discussion format to cover material in HLTH 5450.

HLTH 5730. Global Perspectives in Disability and Health. 4 Hours.

Addresses the issues of disability relative to culture, public policy, rights, and advocacy. People with disabilities are less likely to receive necessary healthcare and rehabilitation services and, as a consequence, experience poorer health outcomes and mortality. Explores the effects of cultural beliefs, social attitudes, and stigma toward people with disabilities. Evaluates the impact of poverty, sociopolitical conditions, health economics, and resource allocation issues. Analyzes charitable contributions, by human rights and other organizations, to the needs of people with disabilities in underserved areas to identify both desirable and undesirable impacts. This interprofessional course offers students an opportunity to gain a broad understanding of complex and dynamic issues concerning people with disabilities in underserved and globally diverse settings.

HLTH 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

Hebrew (HBRW)

Search HBRW Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=HBRW>)

HBRW 1101. Elementary Hebrew 1. 4 Hours.

Designed for students with little or no prior knowledge of Hebrew. Presents a lively introduction to basic oral expression, listening comprehension, and elementary reading and writing. Uses practical vocabulary drawn from realistic situations, and aims at good pronunciation and ease in response.

HBRW 1102. Elementary Hebrew 2. 4 Hours.

Continues HBRW 1101. Includes continued focus on oral expression, listening comprehension, and elementary reading and writing. Expands functional and practical vocabulary base drawn from realistic situations and focuses on grammatical accuracy. Continues to focus on good pronunciation and ease of response.

HBRW 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

HBRW 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

HBRW 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

HBRW 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

HBRW 4992. Directed Study. 1-4 Hours.

Offers students a way of going beyond work given in the regular curriculum; may also enable students to complete major or minor requirements in certain situations. Priority is given to language majors and to juniors and seniors. May be repeated without limit.

HBRW 4993. Independent Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated up to three times.

History (HIST)

Search HIST Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=HIST>)

HIST 1000. History at Northeastern. 1 Hour.

Intended for first-year students in the College of Social Sciences and Humanities. Seeks to introduce first-year students to the liberal arts in general, to familiarize them with their history major, to provide grounding in the culture and values of the university community, and to help them develop interpersonal skills.

HIST 1120. Public History, Public Memory. 4 Hours.

Explores the politics surrounding the creation and consumption of history outside the classroom. Draws on contemporary debates over memorials, museum displays, television and film, and other popular sources of historical information to answer the questions: How does memory become history? How, where, and why do people encounter and interpret history outside of the classroom? Why are certain versions of the past so controversial? Through readings, discussion, field trips, and assignments, offers students an opportunity to gain a deeper understanding of public history's challenges and opportunities and to develop more informed opinions about its philosophical, ethical, and practical aspects. .

HIST 1130. Introduction to the History of the United States. 4 Hours.

Engages with the major issues in U.S. history. Topics include the interaction of native populations with European settlers, the American Revolution and the Constitution, slavery, the Civil War, industrialization and migration, the growth of government and rise of the welfare state, media and mass culture, struggles for civil rights and liberation, and America's role in the world from independence to the Iraq wars.

HIST 1150. East Asian Studies. 4 Hours.

Seeks to provide an understanding of the constituent characteristics that originally linked East Asia as a region and the nature of the transformations that have occurred in the region over the last two thousand years. Concentrates on China and Japan, and addresses Korea and Vietnam where possible. Also seeks to provide students with effective interdisciplinary analytical skills as well as historical, ethical, cultural diversity, and aesthetic perspectives. ASNS 1150 and HIST 1150 are cross-listed.

HIST 1170. Europe: Empires, Revolutions, Wars, and Their Aftermath. 4 Hours.

Examines how empires, wars, and revolutions have influenced the development of the modern world, focusing on Europe and Europe's connections with the non-European world. Explores how wars and revolutions led to the emergence of modern concepts of sovereignty, the state, and citizenship and how global competition between states led to the emergence of empires. Traces the promise of allegedly liberating ideologies and the political and economic revolutions they fostered, repeated wars and their aftermaths, and the challenges of recent world developments viewed from the perspective of history. Explores how human diversity and difference have shaped modern societies through history and how human difference and multiculturalism have both fostered and posed challenges to civic sustainability. Interrogates the meanings of "modernity," democracy and totalitarianism, capitalism and socialism, and globalization.

HIST 1180. African History. 4 Hours.

Explores the history of the African continent from 1000 C.E. to the present era. Topics include medieval kingdoms (Ghana, Mali, Songhai, Zimbabwe, the city-states of East Africa, and the Kongo kingdom); slave trades (Indian Ocean, trans-Saharan, and transatlantic); the partition of Africa and European colonization; and the decolonization process. Emphasizes the interactions of African peoples with the rest of the world, particularly the relations between Africa and Europe after 1500 C.E.

HIST 1185. Introduction to Middle Eastern History. 4 Hours.

Relies on historical and literary sources, as well as such other cultural artifacts as architecture and photography, and focuses on interaction and changing relations and perceptions between Europe and the Middle East. Surveys the major political and economic events that have linked the trajectory of both civilizations, as well as broad patterns of human activity, such as migrations, conversions, and, cultural exchange. Emphasizes the commonality of encounters, and analyzes the construction of an "other" and its enduring legacy in modern times.

HIST 1187. Introduction to Latin American History. 4 Hours.

Surveys major themes in Latin American history from the arrival of the first human inhabitants until the present through a diversity of primary and secondary sources. Examines the social, cultural, political, and economic transformations that shaped Latin America during this period. Emphasizes how concepts of race, class, gender, and sexuality informed these changes and the people's experiences of them. Topics include migration, colonialism and postcolonialism, war and revolution, slavery and abolition, nationalism and nation building, democracy and despotism, urbanization, modernization, religion, imperialism and underdevelopment, human rights, drug policy and international relations, labor, the arts, popular culture, and the environment.

HIST 1190. Picturing Modernity: The Photographic Image in Culture and Society. 4 Hours.

Explores the role of the photographic image in culture and society from the early nineteenth century to the present day. Examines how the photographic image has altered cultural and perceptual patterns across the globe and investigates how cultural and social power have been influenced by photographs. Offers students an opportunity to read a cross-section of criticism, theory, and history and to study images and exhibitions to analyze how culture and history have been affected by and reflected in photographic images.

HIST 1200. Historical Research and Writing. 1 Hour.

Offered in conjunction with HIST 1201. Introduces incoming history freshmen to the history major in the context of other disciplines within the college and University. Offers students an opportunity to learn and to practice methods and conventions of research and historical writing.

HIST 1201. First-Year Seminar. 4 Hours.

Provides an introduction to historical methods, research, writing, and argument in which all students produce a substantial research project that passes through at least two revisions, and that is presented publicly to other members of the colloquium.

HIST 1206. Drug Trade and Drug War: History, Security, Culture. 4 Hours.

Analyzes the role of drugs in world history. From the early use of stimulants such as coca and sugar to the "war on drugs" and narco-terrorism, the course examines drugs as commodities in the world economy. Focuses primarily on opiates, stimulants, and hallucinogens from the nineteenth century to the present, considering how changing social and cultural mores led different drugs to be coded as licit and illicit. Topics include traditional uses, early medical use, trade networks, prohibition, black market, and drug cultures, as well as the role of drugs in the histories of industrialization, imperialism, and cold war geopolitics. Sources include historical scholarship, declassified intelligence reports, documentaries, novels, movies, songs, and art.

HIST 1215. Origins of Today: Historical Roots of Contemporary Issues. 4 Hours.

Focuses on the historical roots of four pressing contemporary issues with global implications. Our world has grown increasingly complex and interconnected, and the planet's diverse peoples are facing common problems that have tremendous impact on the immediate future. They are (1) globalization, from its origins in the sixteenth century to the present; (2) the potential for global pandemics to alter the course of history, from bubonic plague in the fifth century to H1N1; (3) racial inequality, from religious interpretations in the early modern period to science in the modern era; and (4) gender inequality, from the agricultural revolution forward. For each issue, studies cases and locations spread across the world, examines the links between past and present, and attempts to identify ways forward.

HIST 1218. Pirates, Planters, and Patriots: Making the Americas, 1492–1804. 4 Hours.

Seeks to challenge students to understand more than the outlines of American history—Pilgrims, patriots, plantations— in the broader contexts of events that unfolded in and around the Atlantic Ocean in the Americas, Europe, and Africa. Covers Columbus's first landing in the Caribbean to the Haitian declaration of independence in 1804 and includes the Atlantic trade, piracy, slavery and other forms of labor, cultural and ecological exchange, and independence and emancipation.

HIST 1225. Gender, Race, and Medicine. 4 Hours.

Examines the basic tenets of "scientific objectivity" and foundational scientific ideas about race, sex, and gender and what these have meant for marginalized groups in society, particularly when they seek medical care. Introduces feminist science theories ranging from linguistic metaphors of the immune system, to the medicalization of race, to critiques of the sexual binary. Emphasizes contemporary as well as historical moments to trace the evolution of "scientific truth" and its impact on the U.S. cultural landscape. Offers students an opportunity to develop the skills to critically question what they "know" about science and the scientific process and revisit their disciplinary training as a site for critical analysis. AFAM 1225, HIST 1225, and WMNS 1225 are cross-listed.

HIST 1246. World War II in the Pacific. 4 Hours.

Studies World War II, the most devastating war in history, which began in Asia and had a great long-term impact there. Using historical and literary texts, examines the causes, decisive battles, and lingering significance of the conflict on both sides of the Pacific.

HIST 1252. Japanese Literature and Culture. 4 Hours.

Explores major works of Japanese fiction and poetry in historical and cultural context. All readings are in English translation.

HIST 1253. History of Vietnam Wars. 4 Hours.

Presents a history of military conflicts on the Indochinese peninsula from its precolonial settlement, internal developments and divisions, its stormy relationship with China, French colonization and the resistance to it, the rise of the Viet Minh during World War II, the postwar struggle against the French, the impact of the Cold War, and the involvement of the United States after 1950 in the creation of two Vietnams and in the conflict that engulfed it and its neighbors, Laos and Cambodia, in the decades that followed. Emphasizes the roles of nationalism and communism in the twentieth-century conflicts and the motives for American intervention. Films revealing the reactions of Americans to the escalating conflict are shown and evaluated.

HIST 1270. Ancient Greece. 4 Hours.

Studies the Greek achievement from proto-Indo-European migrations through the Minoan and Mycenaean bronze age, to the evolution of Homeric and Hellenic societies in the iron age, to the rise of the city-states and the age of Alexander. Topics include the coexistence of the rational and the irrational; the paradox of ethical philosophies and exclusionary political systems; the tensions between particularism and cultural unity; and gender ideology and what has been termed "the reign of the phallus."

HIST 1271. Ancient Rome. 4 Hours.

Studies the establishment and origins of civilization in the Italian peninsula from Etruscan, Latin, and Greek foundations through the rise and institutionalization of the republic, to the achievement of empire, to Rome's interactions with diverse peoples and its decline and collapse. Themes include diversity, toleration, uses and dangers of power, Rome's legalistic legacy, and the Latinization of Christianity.

HIST 1272. Europe in the Middle Ages, 500–1500. 4 Hours.

Examines the history of medieval Europe in a period of tremendous fluidity, migration, and flux. Studies the experiences of men and women in European societies before clearly defined nation-states had emerged. Topics include forms of political and cultural integration; the contacts between Europeans and non-Europeans in the Mediterranean and beyond; and the place of religion, art, and ideology, with attention to how Europeans' experiences varied according to their gender, class, and race.

HIST 1279. History of the American Film Industry. 4 Hours.

Examines and analyzes the artistic, commercial, cultural, and political history of the American film industry from its beginnings around 1900 to the present day. Emphasizes the development of the financial and artistic model of the classic "studio system" at the major Hollywood studios. Readings and lectures focus on economic factors that changed this system over time, such as labor-management relations and the rise and fall of the "star system." Studies major genres and styles of film and their evolution, as well as their relationship to American historical and political trends: the Depression, World War II, the cold war, and the impact of the cultural revolution of the 1960s. Considers the changing role of the actor and of the director in Hollywood filmmaking.

HIST 1285. Introduction to Russian Civilization. 4 Hours.

Examines the origins of Russian culture in Eastern Orthodoxy and relations with the Byzantine Empire, and the subsequent evolution of Kiev, Moscow, and St. Petersburg as cultural/political centers, up to the 1917 Bolshevik Revolution. Includes readings in medieval Russian literature and nineteenth-century fiction, with consideration of the development of music and the visual arts. Conducted in English.

HIST 1286. History of the Soviet Union. 4 Hours.

Surveys social, political, economic, demographic, and cultural developments in the former Soviet Union since 1917: the legacies of war and revolution, the civil war between the communists and the anti-communists, famine, the New Economic Policy, competing perspectives on the new regime, the rise of Stalin, the Cultural Revolution, collectivization and industrialization, the Purges, World War II and its impact, the "two camps" and the origins of the Cold War, the Soviet Union and the new East European system, Khrushchev, destalinization, intellectuals and the "thaw," the Cuban missile crisis, the demise of Khrushchev, Brezhnev and the period of stagnation, the Gorbachev Revolution, Yeltsin, nationalism, and the dissolution.

HIST 1290. Modern Middle East. 4 Hours.

Examines the political, social, and cultural history of the Arab countries of the modern Middle East, as well as Iran, Israel, and Turkey. Covers the period from the early 19th century through the late 20th century. Offers students an opportunity to obtain a basis for understanding the politics, social movements, and cultural expressions of the region in the late 20th century. Major themes include imperialism and colonialism; the creation and transformation of the modern states and their political systems since World War I; the transformation of Middle Eastern societies during this same period under the impact of colonialism, independence, regional wars, and oil; women's and labor movements; and revolutions. Uses a variety of sources including memoirs, photography, literature, and political speeches.

HIST 1297. Reformers, Tribes, Saints: North Africa in World History, 1500–Present. 4 Hours.

Covers North Africa (Morocco, Algeria, Tunisia) and its emergence as a key arena in the spread of the global economy, the struggle for human rights and gender equality, the emergence of civil society, and the struggle between moderate and militant forms of political Islam. Analyzes these recent challenges in the context of centuries of authoritarian tribal-based rule, religious reform movements, and popular efforts to withstand considerable foreign political and economic pressure from Europe and beyond. While sultans "ruled" the region for centuries, they did so in varying degrees with the assistance of or under pressure from reformers, tribes, and saints, both moderate and militant. Uses a variety of sources and media to investigate how these factors shape ongoing postcolonial political, social, and economic development.

HIST 1350. Feminist Resistance. 4 Hours.

Engages students in the study of a variety of forms of feminist resistance in recent history, emphasizing the US in the context of cross-cultural examples. Students examine key feminist texts and manifestoes and study feminist activism in coalition with other social movements. Students identify and analyze unique features of gender-based activism in itself and in its intersections with other social movements, including movements and activism focused on race, class, sexuality, and physical ability. WMNS 1350, SOCL 1350, and HIST 1350 are cross-listed.

HIST 1389. History of Espionage 1: Antiquity to World War II. 4 Hours.

Explores the history of espionage through a series of case studies from ancient Rome, Greece, and China; the Reformation; the Age of Discovery; the French Revolution; the American Civil War; World War I and the Russian Revolution; and World War II. Commonly referred to as the world's "second oldest profession," espionage is an intrinsic part of the relationships between communities, institutions, and states. Draws from a wide variety of published and unpublished primary and secondary sources, supplemented by modern theoretical and social science perspectives, literature, and films.

HIST 1390. History of Espionage 2: Cold War Spies. 4 Hours.

Explores the history of espionage during the Cold War era (1943–1991) through a series of case studies. Draws from a wide variety of published and unpublished primary and secondary sources, supplemented by modern theoretical and social science perspectives, literature, and films. Students work individually and in teams to explore the history of covert operations, including the following subthemes: the origins of the Cold War in World War II, the postwar battle for German scientists, containment and rollback, Venona and code breaking, nuclear spies, defectors, proxy wars, insurgencies and counterinsurgencies, terrorism, and technology.

HIST 1500. Modern Chinese History and Culture. 4 Hours.

Introduces modern Chinese history and culture through literary works, films, and historical texts. Examines political, social, and cultural changes in China since 1800: the decline of empire; the New Culture Movement of the 1920s; the rise of nationalism and rural revolution; the changing roles of women; the Cultural Revolution of the 1960s; and China's cinematic, literary, and economic engagement with the world since 1978. Taught in English and open to all undergraduates. CLTR 1500 and HIST 1500 are cross-listed.

HIST 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

HIST 2000. Native American Resistance: Past and Present. 4 Hours.

Introduces the Indigenous peoples of North America and the academic field of Native American and Indigenous studies. Combines public history and public art, field trips, and original research to focus on the ongoing resistance to colonization and erasure and the resilience of Indian nations in New England and beyond. Covers particular themes, including the present-day impact of historical treaties and policies including land allotment, relocation, termination, boarding schools, and natural resource extraction.

HIST 2011. Capitalism and Business: A Global History. 4 Hours.

Analyzes the emergence of capitalism as a global system, from the emergence of early modern market societies to today's globalization and its discontents. Considers how technological and geopolitical developments changed the economic lives of people around the world and how those people responded. Examines historical debates about ethics of redistribution and economic justice. Topics include empire and slavery, industrialization and deindustrialization, moral economy and market societies, and finance and speculation, as well as the histories of money, commodities, and consumer cultures. Sources include historical scholarship, archive documents, economic philosophy, and cultural production such as novels, music, and art.

HIST 2025. Latin American History through Film. 4 Hours.

Uses films to analyze major questions in Latin American history. Topics include conquest, slavery, and revolution. The films are works of fiction, but most of them relate to real events. Course readings include "traditional" primary sources about the events (such as letters and espionage reports). Studies the history represented in the films and the assumptions and ideological perspectives and how these are conveyed through narrative and visual techniques. More broadly, considers how history is presented and represented by different sources. Offers students an opportunity to obtain a deeper appreciation for the complexity of Latin America.

HIST 2211. The World Since 1945. 4 Hours.

Examines the political, economic, social, and cultural relationship between the developed and developing world since the end of World War II. Topics include the Cold War, independence and national movements in developing countries, the globalization of the world economy, scientific and technological innovations, wealth and poverty, the eradication of some diseases and the spread of others, the fall of the Soviet Union, Middle East turmoil, and the enduring conflict between Israel and Palestine.

HIST 2214. War in the Modern World. 4 Hours.

Provides an analysis of the political and economic revolutions that produced modern industrial warfare, and explores the causes, prosecutions, and effects of the major wars fought since the mid-nineteenth century. Large portions of the course focus on World Wars I and II, but attention is also paid to the smaller wars of this period, to unconventional and nonmilitary forms of warfare, to the international trade in arms and training, and to terrorism, both state-sponsored and transnational. Using films, simulations, and team projects, students explore the diplomatic, political, economic, social, cultural, and psychological impacts of these wars as well as their military and technological aspects.

HIST 2217. The Global Far-Right since 1945: Politics, Culture, Violence. 4 Hours.

Explores the emergence of far-right activism globally since the end of World War II. Emphasizes how radical far-right ideology developed and shifted over the course of the last 75 years by focusing on how it globalized through written culture, music, and the internet. Examines a number of case studies in which far-right cultures developed and then spread, which can include South Africa, the United States, the United Kingdom, and Russia, as well as related movements such as radical Hindu nationalism and Hindutva. Explores each case study in terms of culture, politics, and ideologies of violence.

HIST 2241. History of Media in America. 4 Hours.

Focuses on media and mass communications in American history. Emphasizes the roles of books, newspapers, magazines, films, radio, television, and digital media. .

HIST 2280. Hitler, Germany, and the Holocaust. 4 Hours.

Studies historical developments from Germany's defeat in World War I to the end of World War II. Topics include the failure of Weimar democracy; Weimar culture; the rise to power of Hitler and National Socialism; Nazi culture and racial wars against alleged "degenerates"; the roles of party leaders, business and cultural elites, and ordinary Germans in supporting and legitimizing the Nazi dictatorship.

HIST 2282. The Holocaust and Comparative Genocide. 4 Hours.

Examines the origins of the Holocaust, perpetrators and victims, and changing efforts to come to terms with this genocide. The Holocaust, the murder of six million Jews by Germans in Nazi-occupied Europe during World War II, is one of the crucial events of modern history. Investigates the uniqueness of the Holocaust relative to other acts of ethnic cleansing or genocide, including mass death in the New World and mass murder in Armenia, Bosnia, and Rwanda. HIST 2282 and POLS 2282 are cross-listed.

HIST 2285. America and the Holocaust. 4 Hours.

Examines the American response to the Holocaust, in terms of both contemporaneous knowledge and actions and the lasting impact on policy and culture. Starts with early twentieth-century events, such as the Armenian genocide, that shaped later attitudes. Explores the prewar period, particularly U.S. immigration and isolationist policies. Assesses Americans' knowledge of European events as the extermination campaign unfolded and fights ensued over rescue possibilities. Examines changing depictions of the Holocaust that emerged in the postwar period as a result of critical events such as the Eichmann trial and popular television and film portrayals. Finally, considers how perceptions of the Holocaust have shaped subsequent U.S. responses to genocide. HIST 2285, JRNL 2285, and JWSS 2285 are cross-listed.

HIST 2299. Uses and Abuses of History: Historical Reasoning in U.S. Global and Domestic Policy. 4 Hours.

Studies how historical information influenced decision making in the United States during four policymaking episodes of the post-World War II era: the confrontation with the Soviet Union during the Cold War; the expansion of the welfare state during the 1960s; the war in Vietnam; and the Reagan "revolution." Focuses on decisions made by policymakers as these four episodes evolved. Analyzes why decision makers did what they did; what extent they were guided by their understanding of history; how accurate their historical information was; and how usefully they applied their historical understanding to the situation at hand.

HIST 2301. The History Seminar. 4 Hours.

Introduces history majors to advanced techniques of historical practice in research and writing. Offers students an opportunity to conduct original research and write an original research paper. Seminar themes vary; students should check with the Department of History for a list of each year's seminar offerings. May be repeated without limit.

HIST 2302. Historical Writing. 1 Hour.

Covers learning and practicing methods and conventions of historical writing for publication. Adjuncted to a Seminar in History, which fulfills the Advanced Writing in the Disciplines requirement.

HIST 2303. Gender and Reproductive Justice. 4 Hours.

Introduces the social, legal, and economic barriers to accessing reproductive healthcare domestically and internationally. Draws on various theoretical and analytic tools including critical race theory, critical legal theory, sociology of science, human rights, feminist theory, and a range of public health methods. Access to reproductive health services, including abortion, is one of the most contested political, social, cultural, and religious issues today. Covers domestic, regional, and international legal and regulatory frameworks on sexual reproductive health. HIST 2303, SOCL 2303, and WMNS 2303 are cross-listed.

HIST 2304. Topics in History. 4 Hours.

Covers special topics in history, selected by the instructor. May be repeated up to three times.

HIST 2306. The World in a Decade: The 1990s. 4 Hours.

Examines the political, economic, and social dynamics of the first post-Cold War decade. Topics include the geopolitical aftermath of the Cold War, democracy and development in developing countries, the globalization of the world economy and its impacts, the rise of nationalism, genocide, the rise of China as an economic power, and the varieties of Islamic movements.

HIST 2308. Law, Justice, and Society in Modern China. 4 Hours.

Offers an overview of the historical development and function of law in Chinese society from the late imperial era to today and in comparison with other bodies of jurisprudence. Reading a wide range of scholarly articles and monographs, the course looks at "law" beyond jurisprudence and legal codes to examine its changing relationship with social customs, political institutions, religious traditions, popular culture, family and gender relations, and economic exchanges.

HIST 2311. Colonialism/Imperialism. 4 Hours.

Examines the military, economic, political, and cultural expansion of world powers since the fifteenth century, and the ways in which colonized peoples were ruled. Why did colonialist countries feel the need to conquer and dominate, how did they do it, and why did they retreat on some fronts? How did people resist and cooperate with colonialism? How did colonialism affect national and cultural identities? Colonialism is examined as a global phenomenon and from a comparative perspective that looks at particular case studies. Also examines decolonization in the twentieth century.

HIST 2330. Colonial and Revolutionary America. 4 Hours.

Covers the discovery and exploration of the New World, the settlement of the English, French, Dutch, Swedish, Spanish, and Russian colonies on the North American mainland, their development to 1763, the origins of their clashes with England, and the American Revolution.

HIST 2331. The Civil War and Reconstruction. 4 Hours.

Examines the causes and conduct of the U.S. Civil War and the nature and effects of the Reconstruction era. Topics include the experiences of enslaved peoples and the rise of global capitalism; Abraham Lincoln and the birth of the Republican Party; the military conduct of the war; emancipation and the struggles of freed men and women; the expansion of federal power in the South and West during Reconstruction; the rise of the Ku Klux Klan; and the ongoing power of the Civil War, Reconstruction, and race in national memory.

HIST 2332. The United States, 1900–1945: Politics, Culture, and Globalism. 4 Hours.

Explores the history of the United States during the first half of the 20th century, during which the country was transformed from an agrarian to an industrial economy and from a secondary power to global dominance. Central themes include the national government's multiple attempts to create policies, laws, and regulations consistent with maintaining social order, economic stability, and widely shared prosperity under the new economic conditions; the efforts of the United States to establish a world economic and political order in which a capitalist democracy could flourish; and the social, cultural, and political dimensions of the changing experiences of the American people. Topics include the Progressive Era (1900–1919); the 1920s; the Great Depression and the New Deal; and World War II.

HIST 2339. America's Gilded Age, 1865-1896. 4 Hours.

Travels back in time to the original Gilded Age, a period that stretched from the 1870s to the 1890s and which can feel eerily similar to our own. It is often said that the United States has entered a "New Gilded Age" of growing wealth inequality and corporate power. Topics include the shift from an agrarian economy to an urban industrial society; rising immigration and nativist backlash; the emergence of corporate capitalism and consumerism; dramatic new technological inventions; labor movements like the Knights of Labor; social reform efforts like the Women's Christian Temperance Union; the extension of American empire overseas; and ongoing struggles over race, law, and citizenship.

HIST 2341. History of the Western United States. 4 Hours.

Examines the history of the western areas of North America that eventually became the United States. Topics include the history and culture of the area's indigenous peoples; the expansion of European settlers; cultural and military encounters; trade and travel across the Pacific, the importance of water, mining and resource extraction; the rise of conservation and the environmental movement; the experience of Asian-American, Mexican-American, and African-American communities, the "Cowboys and Indians" mythology in American popular culture (film, television, literature, and advertising); the growth of western cities like Phoenix, Denver, Los Angeles, and Seattle; the influence of Hollywood and Silicon Valley.

HIST 2351. Modern Japan. 4 Hours.

Examines state formation, economic growth, imperialism and colonialism, war and defeat, and contemporary culture.

HIST 2360. History of Capitalism in East Asia. 4 Hours.

Traces capitalism's transformation of economic life in East Asia from the early modern era to the contemporary world. Explores changes in the human participation of production, exchange, and consumption. Reading a wide range of scholarly articles and monographs, the course examines key topics, including the great divergence debate, commodification of labor, consumer cultures, birth of industrialization, resilience of family enterprises, gender and the economy, and the role of the developmental state.

HIST 2370. Renaissance to Enlightenment. 4 Hours.

Covers the social, economic, political, and cultural transformations of Europe from the Renaissance to the French Revolution. Traces the rebirth of Catholic Europe from 1300; the Reformation; the religious wars; struggles over religious and scientific beliefs; advances in technology, science, and warfare; overseas expansion; the scientific revolution; and the Enlightenment.

HIST 2373. Gender and Sexuality in World History. 4 Hours.

Introduces key concepts in the fields of gender and identity studies as they apply to world history since about 1800. Offers students an opportunity to understand the critical significance of gender, sex, sexuality, and identity to world events and how these contentious subjects influence the contemporary world. Surveys a series of major movements in geopolitics, labor, economics, culture, and society in order to analyze how individual and group identities, as well as mass assumptions about behavior and performance, have shaped these events. Gender, sex, and sexuality are integral to class discussions of work, welfare, art, culture, violence, war, and activism. HIST 2373 and WMNS 2373 are cross-listed.

HIST 2375. The Tudors, the Stuarts, and the Birth of Modern Britain. 4 Hours.

Examines the history of early modern England as well as Ireland, Wales, and Scotland. Follows the development of England from a small backwater to one of the most powerful European nations by the end of the seventeenth century. Analyzes the constantly shifting relationships between the various cultural identities within Britain. Concentrates on British history not only from the perspective of the elites but also the ordinary people whose names have often been lost to history. Key themes include the growth of the British Empire, issues of gender, the interactions between England and the Celtic fringes, and participation in the political franchise.

HIST 2376. Britain and the British Empire. 4 Hours.

Traces the rise of Britain as a major colonial power and its transformation after the end of empire. Explores the interrelationships between metropole and colonies through sustained attention to critical race, feminist, and socioeconomic frameworks. Units include colonial violence, settler colonialism, anticolonial resistance, decolonization, multicultural Britain in the postcolonial era, and relations with the European Union.

HIST 2390. Africa and the World in Early Times. 4 Hours.

Examines the place of Africa in the world from 1000 C.E. to the mid-19th century. Investigates the histories of ancient Egypt, the savannah and forest regions of West Africa, coastal and interior East Africa, and southern Africa. Explores the rise of medieval city-states and empires, the activities of the Atlantic slave trade and the trans-Saharan and Indian Ocean slave trades, debates over mass migration and the spread of language groups, the rise of agriculture, the development of nonstate political structures, the growth of trading societies, and the development of new cultural forms. Links Africa's early histories to current debates about the role of history in contemporary politics and to present understandings of Africa's historical place in world affairs.

HIST 2397. Modern Africa. 4 Hours.

Covers the history of modern Africa. From the late-19th century to the present day, Africans have shaped, and have been shaped by, transformative events. By the early 20th century, European powers had colonized most of the African continent. By the mid-1960s, most Africans were free from colonial rule; colonialism on the continent did not conclude until the 1990s with the fall of the apartheid state in South Africa. Africans have aimed to achieve political and economic stability, to negotiate cold war politics, harness international development support, and thrive in a globalized world. They have experienced brutal wars, devastating epidemics, and grave natural disasters but have also inspired the world with their rich cultures, profound histories, creative emerging economies, and vibrant democratic movements.

HIST 2431. Immigration and Identity in the American Jewish Experience. 4 Hours.

Examines Jewish political, social, and cultural history from the arrival of the first group of Jews at New Amsterdam in 1654 to the present. Themes include immigration, adaptation, family life, religion, anti-Semitism, Zionism, the Holocaust, and American-Israeli relations. HIST 2431 and JWSS 2431 are cross-listed.

HIST 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

HIST 3304. Topics in History. 4 Hours.

Covers special topics in history, selected by the instructor. May be repeated up to three times.

HIST 3322. The History of Medicine in North America. 4 Hours.

Surveys the history of medicine in what is now the United States between the arrival of European explorers in the 16th century and the end of the Second World War. Introduces exemplary moments in the history of medicine as it is practiced today and examines how these histories connect to the experience of the dispossessed, the enslaved, and the economically and culturally marginalized in American history. Encourages students to consider how the history of medicine has been written both by historians and practitioners. Explores the history of medicine both as a series of events, places, and people and as a method for opening up American history more broadly.

HIST 3325. The City in Middle Eastern History. 4 Hours.

Combines urban history, spatial history, and cultural history from the 18th century to the 21st century. Analyzes various writings on Middle Eastern cities and their inhabitants. Covers topics such as the modernization of cities in the late 19th century; their place in the globalization wave of that period; cities during World War I and the influx of refugees; the making of national capitals; contested cities; cities in the Gulf after the advent of oil; and cities in turmoil. Addresses urban design and ideology; resistance, rebellions, and social movements in the city; gender and the city; violence and the city; and the production of space. Also examines the city's relationship to its hinterland, as well as to empires and later to nation-states.

HIST 3330. The Global Cold War. 4 Hours.

Examines the Cold War, emphasizing how the Soviet-American struggle for global preeminence intersected with decolonization and the rise of the "Third World." Uses primary sources, monographs, and scholarly articles to trace the major events and developments of the Cold War—ideological differences between the capitalist and socialist systems, the Cuban Missile Crisis, the construction of the Berlin Wall, the Vietnam War—while also exploring how and why the Cold War came to pervade economic, cultural, and social relations globally. Examines how unexpected actors—Cuban doctors and Peace Corps volunteers—responded to and shaped superpower rivalry. Considers how the Cold War continues to shape the world today.

HIST 3334. Assassinations in World History. 4 Hours.

Explores the historical antecedents to the unprecedented use of assassination and targeted killing as state policy in the current war on terror: the theory, strategic use, ethics, and legality of assassination. Using film, literature, and primary and secondary readings, explores case studies in the world history of assassination, from ancient times to the current day, including case studies from the Roman Empire, early modern Europe, revolutionary Europe, and the 20th century.

HIST 3335. History of Modern Terrorism. 4 Hours.

Surveys the history of modern terrorism via film, literature, art, social science theory, and historical documents and engages the history of terrorism from 19th-century Europe to the present day. Explores the roots of this global phenomenon via weekly readings and requires students to conduct independent research and create individual or group presentations on selected themes.

HIST 3800. American Conservatism from the New Deal to the Present. 4 Hours.

Explores the history of the modern American Right, from the New Deal to the present. Despite its widespread use as a political label, the term "conservative" is far from self-evident as a subject of historical inquiry. Emphasizes the fact that conservatism is not a fixed set of ideas but a complex social, political, intellectual, and cultural phenomenon. Examines groups and individuals who have claimed the label conservative as well as those who have had the label thrust upon them. Combines readings from the past and present in order to help students more accurately assess and reflect on U.S. political discourse from FDR to the present.

HIST 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

HIST 4701. Capstone Seminar. 4 Hours.

Offers students an opportunity to make use of advanced techniques of historical methodology to conduct original research and write a major, original research paper as the culmination of their work toward the history degree. This is a capstone research and writing seminar for history majors. Not open to students who are receiving credit for HIST 4911, HIST 4912, HIST 4970, or HIST 4971.

HIST 4903. Fieldwork in History 1. 4 Hours.

Offers directed work in historical societies, archives, museums, and other historical agencies. Please consult the department for details.

HIST 4946. Independent Field Research Abroad: Central Europe. 4 Hours.

Provides an introduction to the political, cultural, and intellectual history of major central European cities. Issues discussed include the influence of geography on historical and political destiny, development of each city as a major center within a multinational empire, the flowering of culture in each city at the fin de siècle, and the relationship of political to intellectual and cultural history. Includes visits to major historical and cultural sites in the cities of study. May be repeated without limit.

HIST 4970. Junior/Senior Honors Project 1. 4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student's major field. Combined with Junior/Senior Project 2 or college-defined equivalent for 8-credit honors project. May be repeated without limit.

HIST 4971. Junior/Senior Honors Project 2. 4 Hours.

Focuses on second semester of in-depth project in which a student conducts research or produces a product related to the student's major field. May be repeated without limit.

HIST 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

HIST 4991. Research. 4 Hours.

Offers an opportunity to conduct research under faculty supervision.

HIST 4992. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

HIST 4993. Independent Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

HIST 4994. Internship in World History. 4 Hours.

Offers a formal internship at the World History Resource Center for preservice teachers of history during the fall semester of the fourth year. Students read curriculum units prepared by other teachers and develop at least one substantial, multilesson unit of world history curriculum, under supervision of a history faculty member and in consultation with a practicing teacher. Fulfills experiential education requirement. May be repeated without limit.

HIST 5101. Theory and Methodology 1. 4 Hours.

Examines the following questions in the context of major issues in current historical research and debate. Where do historical questions come from, and how do we answer them? How do we produce knowledge about historical events and processes? What theoretical models guide historians work? Emphasizes interdisciplinary approaches as well as concrete techniques in historical research. Required of all first-year graduate students.

HIST 5102. Theory and Methodology 2. 4 Hours.

Continues HIST 5101. Offers an advanced exploration of the theories and methods used by historians to develop students' ability to understand and critique the work of other historians. Emphasis is on theories and methods in world history, such as comparative models, systemic approaches, and focus on interconnections. Explores what it means to have a local, national, or global perspective, and how world history fits in with other fields of historical scholarship. Required of all PhD students.

HIST 5237. Issues and Methods in Public History. 4 Hours.

Examines and analyzes major issues and methods in public history in the United States and the world. Topics include the nature and meaning of national memory and myth, the theory and practice of historic preservation, rural and land preservation and the organizational structures and activities associated with those efforts, the interrelationship of historical museums and popular culture, the history and organization of historic house museums, historical documentary filmmaking, historical archaeology in world perspective, interpreting "ordinary" landscapes, and the impact of politics on public history.

HIST 5238. Managing Nonprofit Organizations. 4 Hours.

Examines the management of nonprofit organizations, which include historical agencies, museums, archives, historic houses, and various special historical collections. The literature on historical administration is lacking in sufficient conceptual rigor to generalize about the inner and outer workings of a complex management organization. Since historical agencies and museums are complex organizations with missions and goals, and with policies and procedures for involving various "publics" in their activities, explores them as part of the changing and evolving organizational structure of a modern society. Covers public management with all of its institutional components and human complexities. Studies planning in the public sector, budgeting, fundraising, conflict resolution, and the human relations literature as it relates to becoming a functional and successful manager.

HIST 5241. Exhibits and Museums. 4 Hours.

Considers the history of museums and exhibitions from a transnational perspective in order to examine the various roles museums have played in historical and contemporary global culture. Explores museums as cultural institutions and institutional cultures through historical and theoretical readings, museum visits, and the development of students' own exhibitions. Currently among the world's most popular sites of education and leisure, museums have held a wide range of social, political, and cultural roles over the past 500 years. Offers students an opportunity to develop more acute insight into the ways museums and their exhibitions have made and reflected ideas about history, science, art, identity, and culture.

HIST 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

HIST 6964. Co-op Work Experience. 0 Hours.

Provides eligible students with an opportunity for work experience. May be repeated without limit.

HIST 7219. Topics in Cultural History. 4 Hours.

Offers special topics in cultural history. May be repeated without limit.

HIST 7221. Topics in World History. 4 Hours.

Offers readings on selected themes and issues in world history. May be repeated without limit.

HIST 7228. Atlantic Connections. 4 Hours.

Explores the interactions of Europe, the Americas, and Africa from the fifteenth through the seventeenth centuries. With background on societies in each region, the course proceeds through study of the developing concepts and practices of power, race, and gender as these emerged out of the initial encounters and early colonization, and as they led to reshaping of life in each region.

HIST 7238. Colonialism in Contemporary Africa. 4 Hours.

Introduces the various sources, methodologies, and theories employed by Africanist scholars. Traces the development of African studies and of key frameworks within the discipline. Focuses on what kinds of sources Africanists mobilize and how this source base has changed over time; the change in issues that Africanists focus on; how Africanist scholarship fits within history overall; recommendations Africanist scholars make about "doing" history; how Africanist scholarship engages with theory and other "areas" or disciplines; and what sorts of problems theory helps Africanists address.

HIST 7250. Topics in Public History. 4 Hours.

Offers readings, class work, and projects on selected themes and issues in public history.

HIST 7251. Topics in American History. 4 Hours.

Focuses on one or more topics in the history of the United States. May be repeated up to two times.

HIST 7253. Topics in Digital History. 4 Hours.

Offers readings, class work, and projects on selected themes and issues in digital history. May be repeated once for a total of 6 credits.

HIST 7304. Research Seminar in Gender and Society in the Modern World. 4 Hours.

Studies feminists' claims-making; the meanings of masculinity at work and in arguments for citizenship; sexuality and rights; masculinity and femininity; and examines how gender, as a system of cultural practices and power relations, intersected with class and race to influence the meanings of citizenship, work, state policy, and sexuality. Discusses the social practices and political consequences of those meanings. Considers topics such as gender and the "democratic" European revolutions of the eighteenth and nineteenth centuries; the ways in which gender shaped the meanings of work, skill, and the body; the importance of race in European war; and the emergence of modern welfare states. Although this course takes Europe as its point of departure, it also explores how Europeans operated as part of a transnational, if not global, economic and political system from the late eighteenth century to the 1950s.

HIST 7312. Research Seminar in American History. 4 Hours.

Offers research and writing on selected aspects of American history.

HIST 7314. Research Seminar in World History. 4 Hours.

Gives students the opportunity to do research and write a paper that addresses historical issues and processes significant at a global scale. Discussions focus on what it means to be significant on a global scale, how to find and utilize relevant source material, and on previous scholarship relevant in helping shape questions and issues in our own work. Students also read and critique one another's work. May be repeated up to four times.

HIST 7320. Research Seminar in Cultural History of the United States. 4 Hours.

Requires students to conduct research and write an original paper that addresses historical issues in the cultural history—in particular the material culture—of North America.

HIST 7322. Seminar: 1968 in Global Perspective. 4 Hours.

Examines the significance of 1968, when a worldwide wave of largely student-driven unrest signaled that "something happened" during that year. From London to Tokyo, from Chicago to Prague, from Mexico City to Paris, the young generation of the late sixties challenged the old order. But why? Engages students with the growing interdisciplinary theoretical literature on international protest movements, before going on to examine a number of national "1968s." Uses primary and secondary sources to seek to understand what these events meant locally, how they were connected globally, and to what extent they can fit into a larger pattern of a world event known as "1968." Requires a significant research paper dealing with one of these or another question determined in consultation with the instructor.

HIST 7370. Texts, Maps, and Networks: Readings and Methods for Digital History. 4 Hours.

Introduces the methods and practice of history in a digital age. Offers students an opportunity to see the wide variety of work being done computationally by historians and other humanists today and to obtain the background to be creative producers of new work and critical consumers of existing projects. The rise of computing technology and the Internet has the potential to reshape all parts of historical practice, from curation to research to dissemination. Examines the historian's craft in three primary domains: the creation of digital sources, the algorithmic transformations that computers can enact on cultural materials like texts, and the new ecologies of publishing and scholarly communication made possible by new media.

HIST 7701. Advanced Research Seminar in World History. 4 Hours.

Entails research and preparation of a world history paper intended to be part of a larger dissertation. Includes intensive historiographical reading related to the research topic.

HIST 7962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

HIST 7976. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on chosen topics. May be repeated without limit.

HIST 8409. Practicum in Teaching. 1 Hour.

Offers students the opportunity to teach individual college-level courses within the Department of History under the general supervision of a senior faculty member. Open to doctoral students.

HIST 8410. Fieldwork in History 1. 2 Hours.

Offers students the opportunity to get practical experience in historical agencies including historical societies, archives, museums, exhibits, restorations, preservation projects, and the like. Requires students to work in the agency ten hours a week for one semester under the direction of an agency supervisor and departmental adviser.

HIST 8411. Fieldwork in History 2. 4 Hours.

Gives students a second opportunity to acquire practical experience in a historical agency. Requires ten hours a week for one semester under the direction of an agency supervisor and a departmental adviser.

HIST 8960. Exam Preparation—Doctoral. 0 Hours.

Intended to show full-time status during the semester of the PhD qualifying exam. Students are expected to carry a full load of research and/or teaching responsibilities in addition to this course.

HIST 8982. Readings. 1-4 Hours.

Offers selected readings under the supervision of a faculty member. May be repeated without limit.

HIST 8984. Research. 1-4 Hours.

Offers an opportunity to conduct research under faculty supervision. May be repeated without limit.

HIST 8986. Research. 0 Hours.

Offers an opportunity to conduct full-time research under faculty supervision. May be repeated without limit.

HIST 9000. PhD Candidacy Achieved. 0 Hours.

Indicates successful completion of the doctoral comprehensive exam.

HIST 9990. Dissertation. 0 Hours.

Offers dissertation supervision by members of the department. May be repeated once.

HIST 9996. Dissertation Continuation. 0 Hours.

Offers dissertation supervision by members of the department. May be repeated without limit.

History - CPS (HST)

Search HST Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=HST>)

HIST 1100. History of the World 1: Prehistory to the Renaissance. 3 Hours.

Examines the key factors and events that shaped world history from its earliest recordings to the age of the Renaissance. Analyzes history from a thematic and geographic perspective, examining the major moments in the ancient, medieval, and early modern periods. Studies how these periods in history led to the modern era.

HIST 1150. History of the World 2: From Renaissance to the Present. 3 Hours.

Examines the key factors and events that shaped world history from the Renaissance to the present. Analyzes history from a thematic and geographic perspective, examining the major moments in history since the Renaissance. Offers students an opportunity to learn how major periods in history, including the Age of Revolution, the Enlightenment, and the Age of Industrialization, led to the world we live in today.

HIST 1200. American History 1: Precontact to the Civil War. 3 Hours.

Examines American history from the precolonial period up to the end of the American Civil War. From the time of the earliest settlers through the Civil War, religious, ethnic, racial, and cultural differences were important factors in the development of the U.S. as a pluralistic democracy. The important role played by these many differences are explored as students analyze history from social, cultural, and political perspectives and examine key moments and turning points in American history.

HIST 1250. American History 2: Reconstruction to the Present. 3 Hours.

Examines American history from the start of Reconstruction up to the present. Analyzes history from social, cultural, and political perspectives and examines key moments and turning points in U.S. history. Explores the important role played by religious, ethnic, racial, and cultural differences in shaping the continuing evolution of the United States.

HST 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

HST 2125. 20th-Century World Wars. 3 Hours.

Examines the major causes, events, and outcomes of World War I and World War II. Analyzes the period of history prior to World War I to discover the causes of the Great War and then studies the end of the war and the events of the interwar period as a pretext for World War II. Offers students an opportunity to learn how the events of history from 1914–1945 shaped the world we live in today.

HST 2150. The World Since 1945. 3 Hours.

Examines major historical events since 1945. Analyzes the political, social, cultural, and economic relationship between the developed and developing world as a backdrop for major moments in history since the end of World War II. Major topics include the end of World War II, the Cold War, decolonization, the fall of the Soviet Union, the Middle East, and the role of nationalism and globalization in recent historical events. Emphasizes the role of difference—ethnic, racial, gender, religious, etc.—in determining the geopolitical reality.

HST 2425. Coming to America: The American Immigrant Experience. 3 Hours.

Examines the migration of people to North America. Analyzes the migration of Native Americans in ancient times, the arrival of European settlers and explorers, and the various waves of immigration to the United States from Europe, Africa, Asia, and Latin America. Emphasizes the diverse cultures that came, their reasons for coming, their reasons for settling in particular places, and the processes by which they resolved issues relating to “Americanization.”

HST 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

HST 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

HST 4400. Senior Seminar/Project. 3 Hours.

Offers history majors an opportunity to integrate knowledge and abilities gained throughout the program. This capstone course concludes with a detailed research project.

HST 4955. Project. 1-4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student's major field. May be repeated without limit.

HST 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

HST 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

History - CPS Specialty (HSTY)

Search HSTY Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=HSTY>)

HSTY 1130. Introduction to American History. 3,4 Hours.

Introduces students to major topics in American history using some combination of primary documents, biographies, monographs, and film. Topics include the interaction of native populations with European settlers; the American Revolution and the Constitution; slavery; the Civil War; the rise of industrialism and immigration; the growth of government and rise of the welfare state; race, gender, and class in America; and America's role in the world from the emergence of imperialism to collective security.

Homeland Security - CPS (HLS)

Search HLS Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=HLS>)

HLS 6000. Introduction to Homeland Security. 3 Hours.

Offers an overview of the essential ideas that constitute the emerging discipline of homeland security. Seeks to expand the way participants think, analyze, and communicate about homeland security and to assess knowledge in critical homeland security knowledge domains, including strategy, history, terrorism, fear management, crisis communication, conventional and unconventional threats, network leadership, weapons of mass destruction, lessons learned from other nations, civil liberties and security, intelligence and information, homeland security technology, and analytics. The course is organized around an evolving narrative about what homeland security leaders need and how the Center for Homeland Defense and Security program helps address those needs.

HLS 6010. The Unconventional Threat to Homeland Security. 3 Hours.

Introduces the operational and organizational dynamics of terrorism. Considers those who act as individuals, in small groups, or in large organizations and indigenous actors, as well as those who come to the United States to raise money, recruit, or commit their acts of violence. In every instance, the focus is on violent clandestine activity that, whatever its motivation, has a political purpose or effect. Addresses such specific topics as suicide terrorism, the role of the media, innovation and technology acquisition, the decline of terrorism, and ways of measuring the effect of counterterrorism policies and strategies. The course also looks briefly at sabotage.

HLS 6020. Technology for Homeland Security. 3 Hours.

Offers individuals involved in homeland security a broad overview of homeland security technology, information systems, inspection and surveillance technology, communication, knowledge management, and information security. Government agencies in today's information age are more dependent than ever on technology and information sharing. Focuses on technology as a tool to support homeland security personnel regardless of functional specialty. The methodology used in the course frames technology in terms of its contribution to deterrence, preemption, prevention, protection, and response after an attack.

HLS 6030. Intelligence for Homeland Security. 3 Hours.

Examines key questions and issues facing the U.S. intelligence community and its role in homeland security. The September 11, 2001, terrorist attacks on the World Trade Center and Pentagon and the ensuing war on terror have focused the nation's attention on homeland security. Addresses policy, organizational, and substantive issues regarding homeland intelligence support. Course reference materials provide an overview of diverse intelligence disciplines and how the intelligence community operates. Emphasizes issues affecting policy, oversight, and intelligence support to homeland security and national decision making. Covers the 2004 Intelligence Reform and Prevention of Terrorism Act and focuses on homeland intelligence support issues at the state/local/tribal levels.

HLS 6035. Advanced Intelligence Applications for Homeland Security. 4 Hours.

Builds upon the analytical techniques discussed in HLS 6030 and develops actionable intelligence products. Offers students an opportunity to obtain an understanding of how intelligence is gathered and operationalized to support standing requirements and to support specific operations. One of the key roles of intelligence, especially in periods of active war and counterterrorism operations, is the nature, strengths, and weaknesses of intelligence intended to support operations in the field. This course describes how operational requirements are derived, transmitted to, and responded to by intelligence elements and how operational intelligence is collected, analyzed, and then used via practical, real-world situations. Open to U.S. citizens who hold a clearance of secret or higher.

HLS 6040. Critical Infrastructure: Vulnerability Analysis and Protection. 3 Hours.

Focuses largely on protecting the most fundamental critical infrastructures, one of the cornerstones of homeland security. Develops a network theory of vulnerability analysis and risk assessment called "model-based vulnerability analysis," which is used to extract the critical nodes from each sector, model the nodes' vulnerabilities by representing them in the form of a fault tree, and then applying fault and financial risk-reduction techniques to derive the optimal strategy for protection of each sector. At the completion of the course, students should be able to apply the model-based vulnerability technique to any critical infrastructure within their multijurisdictional region, derive optimal strategies, and draft policies for prevention of future terrorist attacks.

HLS 6050. Multidisciplinary Approaches to Homeland Security. 3 Hours.

Explores the homeland security project in relation to the laws that both support and constrain it. Homeland security efforts in the United States constitute a project framed by the rule of law. Constitutional concerns, civil rights issues, and the roles of the various disciplines engaged in the effort are driven and impacted by the various local, state, and federal systems of law. Uses both historical and contemporary references to unpack the various issues and answer related questions. While military, law enforcement, and judicial issues are a central concern of the course, considers the range of issues in relation to many other disciplines engaged in homeland security and defense.

HLS 6060. Strategic Planning and Budgeting. 3 Hours.

Examines a resource management system that allows decision makers to see the long-term implications of the decisions they are making today. Homeland security requires programs in such disparate areas as counterterrorism, information security, border security, counterdrug activities, etc. It also requires coordination of programs at the federal, state, and local levels. Covers how decision makers at the various levels decide which of these programs should be funded, the size approved programs should be and how they fit together, and how plans are translated into budgets. Studies an analytic approach to allocating resources in order to provide maximum security with limited budgets.

HLS 6070. Emergency Management and Geographic Information Systems. 3 Hours.

Explores how emergency management activities can best utilize geographic information technologies (GIT) to solve real-world issues in emergency management. This includes planning and response for both natural disasters and man-made events (accidental and terror-related incidents). Through the use of a variety of tools and analytical techniques, demonstrates and explores the nexus between emergency management and GIT. Exposes students to an understanding and appreciation for that relationship as well as the tools and skills for appropriate utilization of them.

HLS 6080. Continuity of Operations and Planning. 3 Hours.

Seeks to enable students to develop and implement continuity of operations (COOP) plans. COOP is a federal initiative, required by presidential directive, to ensure that executive branch departments and agencies are able to continue to perform their essential function under a broad range of circumstances. Today's changing threat environment and recent emergencies have increased the need for COOP capabilities and plans. Topics include what COOP is and why it is important; how COOP differs from continuity of government (COG); the roles and responsibilities of key players in COOP planning; and family support measures to take in case of COOP implementation.

HLS 6090. Organization and Structural Continuity Planning. 3 Hours.

Covers the importance of protecting critical infrastructure and key resources (CIKR) for continuity planning. Identifies the relevant authorities and roles for CIKR protection efforts and describes the National Infrastructure Protection Plan unifying structure for the integration of CIKR protection efforts, including the sector security partnership model, the risk-management framework, and the information-sharing process. Offers students an opportunity to summarize critical infrastructure responsibilities; identify the range of critical infrastructure protection government and private-sector partners at the state, local, tribal, territorial, regional, and federal levels; describe processes for effective information sharing with critical infrastructure partners; and identify various methods for assessing and validating information as well as planning for continuity in the event of an emergency.

HLS 6100. Maritime Port Security 1. 4 Hours.

Focuses on the elements of U.S. maritime and port security. With over 95 percent of the trade essential to U.S. economic well-being passing through hundreds of U.S. ports, the protection of port and waterways security is critical to homeland security. Examines U.S. and international policies, laws, and agreements governing maritime security, such as the Maritime Transportation Security Act and the International Ship and Port Security Code. Investigates the organizations responsible for maritime and port security in the United States as well as the potential U.S. and global impact of maritime security failures. Offers students an opportunity to explore the response and planning mechanisms for port security as well as irregular and transnational maritime security issues and their relation to the U.S. maritime transportation system.

HLS 6110. Maritime Port Security 2. 4 Hours.

Develops the concepts covered in HLS 6100. Describes the International Port Security Program, which seeks to reduce risk to U.S. maritime interests, including U.S. ports and ships, and facilitates secure maritime trade globally. Discusses port security best practices and the development of mutual interests in securing ships coming to the United States, both U.S. port security and the security of the global maritime transport system. Discusses a port state's implementation of the International Ship and Port Facility Code (ISPS Code) and other international maritime security standards to enhance port security measures beyond the minimum requirements of the code. Additionally, addresses the needs of foreign ports to provide mutual benefits to the United States and our maritime trading partners.

HLS 6120. Aviation Security 1. 4 Hours.

Analyzes the procedures, programs, systems, and security equipment that is currently used in the aviation industry. Reviews relevant legislation pertaining to aviation security from a historical and modern perspective. Also covers the history of terrorism in the aviation sector internationally and how these events have had an effect on aviation security to date and on the future of aviation security. Includes an overview of the many professional associations that play a large role in aviation security from an industry perspective and how they interact with the federal agencies that provide oversight of the aviation security industry. Emphasizes the structure and roles of the federal agencies involved in aviation security, physical security, and aviation legislation.

HLS 6130. Aviation Security 2. 4 Hours.

Continues HLS 6120. Introduces background and specific knowledge of the Transportation Security Agency (TSA), United States regulations, and the International Civil Aviation Organization (ICAO). The course is aimed at training airport executives and supervisory airport managers involved with establishing the direction, mutual aid agreement, and general security of the airport facility and operations. Focuses on planning, developing, and evaluating procedures and methods to secure the airport. Reviews specific content of the 49 Code of Federal Regulations 1542 (Airport Security) and ICAO Annex 17 (Safeguarding International Civil Aviation). Topics include airport security activities and awareness training, case study of practical crisis management exercises, and methodology and processes of law enforcement personnel in airport security.

HLS 6140. Port Security Capstone. 4 Hours.

Offers students an opportunity to utilize all of the port security (maritime and aviation) skills they have acquired to evaluate port and aviation security processes and outcomes of a single event throughout the entire event life cycle. Examines both quantitative and qualitative methodologies, with an emphasis on tactical approaches and strategic/long-range planning. Also examines stakeholder analysis and practical techniques for reporting performance results.

HLS 6150. Essentials of Emergency Management. 3 Hours.

Examines the hazards and phases in emergency management and planning. Includes all levels of public and private sector involvement in discussing the definition of emergencies and disasters, both natural and man-made, and the issues involved with managing situations. Examines frameworks such as the National Preparedness System; the National Incident Management System; and others for organizing, responding, and mitigating crises from an all-hazards, all-threats perspective, including both U.S. and international concerns. Offers students an opportunity to learn a comprehensive understanding of the U.S. emergency management system; how communities mitigate against, respond to, and recover from all disaster events; as well as the U.S. involvement for international disaster response contingencies.

HLS 6155. Critical Infrastructure, Security, and Emergency Management. 3 Hours.

Examines real-world critical infrastructure protection and emergency response to analyze and assess the essential points of protection and prevention combined with emergency response mechanisms for natural and man-made crises. Examines policy, programs, and management of critical infrastructure risk and protection in the context of emergency management and planning for the varying levels of public and private sector involvement. Uses the 16 Critical Infrastructure Sectors as a basis of examining the collaborative responses and complex interactions at all levels of government for today's emergency management concerns. Uses frameworks such as the National Preparedness System, the National Incident Management System, and others to analyze emergency management processes and examples of historical critical infrastructure threats, failures, and incidents.

HLS 6160. Advanced Emergency Management. 3 Hours.

Evaluates real-world disaster scenarios for planning and response to prepare students for roles within the continuum of emergency management and planning. Examines cases and contingencies involving various types of threats and hazards to communities, business, and organizations using a scenario-based approach. Offers students an opportunity to analyze, critique, and develop planning strategies based on existing real-world contingencies using Department of Homeland Security (DHS) and the Federal Emergency Management Agency (FEMA) guidelines for U.S. protection and resilience for communities and organizations. Emphasizes assessing the threats, risks, and vulnerabilities of communities, infrastructure, and organizations, enabling students to plan for and develop strategic assessments for all-hazards, all-threats scenarios within the National Preparedness System.

HLS 6170. Emergency Management Capstone. 3 Hours.

Designed to critique various types of crises within communities, organizations, and government agencies. Using a scenario-based approach, students evaluate crises and develop a systematic response to a critical incident using emergency management planning and preparedness strategies, as well as analyze the crisis in relation to national emergency management guidelines. Simulation and exercise of contingency and emergency management response and planning based on real-world events offers students an opportunity to enhance their critical thinking and assessment skills with a thorough understanding of all phases of the planning and response process.

HLS 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

HLS 6978. Independent Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

HLS 6983. Topics in Homeland Security. 1-4 Hours.

Introduces selected and substantive issues in homeland security. Topics vary from one offering of the course to the next. May be repeated up to seven times for up to 8 total credits.

HLS 7000. Domestic Emergency Practicum in Homeland Security 1. 3 Hours.

Explores the history, features, principles, and organizational structure of the Incident Command System (ICS) and the relationship between ICS and the National Incident Management System (NIMS). Recognizes organizational culture, emphasizing the politically charged atmosphere in which it operates. Offers students an opportunity to obtain a clear understanding of how to operate efficiently during an incident or event within the ICS and the integration of the roles for primary departments and/or agencies during a local, state, and federal response, as well as the knowledge of how to apply critical resources for personnel who are likely to assume a supervisory position within the ICS.

HLS 7010. Domestic Emergency Practicum in Homeland Security 2. 3 Hours.

Introduces the National Incident Management System (NIMS), which provides a consistent nationwide template to enable all government, private-sector, and nongovernmental organizations to work together during domestic incidents. Also introduces the Multiagency Coordination Systems (MACS) as described within NIMS, which consists of a combination of the following elements: personnel, procedures, protocols, business practices, and communications integrated into one common system. Guides students through the National Response Framework, focusing on the principles that enable all response partners to prepare for and provide a unified national response to disasters/emergencies. Offers students an opportunity to learn how to improve the overall coordination with, and support for, incident management by developing and operating within MAC Systems.

HLS 7020. Domestic Emergency Practicum in Homeland Security 3. 3 Hours.

Explores unified command, incident/event assessment and objective development, the Incident Command System (ICS) planning process, incident/event resource management, transfer of command, and demobilization. Focuses on how major incidents create special management challenges, the circumstances in which an Area Command is established, and circumstances in which multiagency coordination systems are established. Examines the key players, their roles and responsibilities within ICS, processes for requesting and obtaining federal assistance, and understanding the emergency support functions that group federal resources and capabilities into functional areas to serve as the primary mechanisms for providing assistance essential in supporting all critical incidents.

HLS 7030. Domestic Emergency Practicum in Homeland Security 4. 3 Hours.

Seeks to familiarize students with Department of Defense (DOD) and other agency personnel in Defense Support of Civilian Authorities (DSCA) for domestic operations. Introduces national, state, local, and DOD statutes, directives, plans, command and control relationships, and capabilities with regard to DOD support for domestic emergencies, for designated law enforcement, and for disaster and emergency response. Focuses on interagency response to enhance the command leadership through specific decision-making processes. Finally, seeks to familiarize students with the plans and systems guiding the nation's emergency response activities to provide a clear understanding of DSCA operations.

HLS 7040. Domestic Emergency Practicum in Homeland Security 5. 3 Hours.

Offers students an opportunity to develop leadership skills and organizational capabilities to respond to twenty-first-century homeland security emergencies. Uses intensive case-study-based discussion of recent events to develop concepts and frameworks for the design and execution of response in complex, multijurisdictional and multisectoral environments. Focuses on leadership and explores what leaders need to do before an event, how they need to operate during an event, and how they make the greatest possible contribution to the nation's security. The course seeks to improve society's capacity to deal with natural disasters; infrastructure, technology, and systems failures; infectious disease; terrorism; and to prepare emergency managers for success before, during, and after a catastrophic event.

HLS 7990. Thesis. 1-4 Hours.

Offers thesis supervision by members of the department.

Honors Program (HONR)

Search HONR Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=HONR>)

HONR 1101. Honors Discovery Supplement. 0 Hours.

Designed to supplement HONR 1102.

HONR 1102. Honors Discovery. 1 Hour.

Offers a team-taught course required for all first-year honors students. Designed to help students prepare for their campus honors years and create a sense of community within the first-year honors experience. During the semester, students have an opportunity to explore the goals of the University Honors Program: taking part in a living learning community, learning through an interdisciplinary perspective, establishing a research focus, participating in experiential learning, experiencing global awareness, and contributing to civic engagement.

HONR 1310. Honors Inquiry. 4 Hours.

Designed to provide an honors introductory-level experience. Draws upon an interdisciplinary perspective to expand individual knowledge and facilitate a deeper understanding of issues. Similar to a topics course, each section of the course offers a new and unique academic experience. May be repeated without limit.

HONR 2991. Research and Creative Endeavors in Honors. 1-4 Hours.

Offers University Honors students an opportunity to conduct research and creative endeavors under faculty supervision. Requires the permission of instructor and University Honors Program.

HONR 2992. Research and Creative Endeavors. 0 Hours.

Offers an opportunity to document student contributions to research projects or creative endeavors performed under faculty supervision. Requires the permission of instructor and University Honors Program.

HONR 3309. Honors Seminar Abroad. 4 Hours.

Seeks to promote knowledge, understanding, and global engagement through course work, language acquisition, travel, and participation in a Northeastern University designed and delivered international academic experience. Targeted toward honors students who may not have the opportunity to complete international work later on in their academic career or who want to have an early international experience prior to a more traditional study abroad or international co-op experience. May be repeated without limit.

HONR 3310. Honors Seminar. 4 Hours.

Designed to provide an honors intermediate-level experience. Draws upon an interdisciplinary perspective to expand individual knowledge and facilitate a more advanced understanding of issues. Emphasizes research and inquiry of urban, historical, or contemporary themes. May be repeated up to nine times.

HONR 4992. Directed Study. 1-4 Hours.

Offers independent work under the direction of the department on a chosen topic. Course content depends on instructor. Requires Honors Program participation. May be repeated without limit.

HONR 4997. Honors Interdisciplinary Thesis. 4 Hours.

Represents a culmination of the diverse topics students encounter while enrolled in the University Honors Program. Offers students an opportunity to work closely with a faculty mentor to conduct intensive original research that includes an interdisciplinary perspective and produces a significant body of work. The thesis should utilize a cross-discipline perspective that includes at least two disciplines, allowing students to express their academic creativity, to discover new ways of synthesizing information, and to test the traditional boundaries between disciplines.

Hospitality Administration - CPS (HPA)

Search HPA Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=HPA>)

HPA 6030. Corporate Strategy for Hospitality. 3 Hours.

Focuses on the stage of the strategy process model devoted to putting the best strategy into action so that hospitality professionals will ensure successful results. Also explores why strategies fail in their implementation and how strategic control systems can ensure that strategic objectives are being met. Other topics include implementation of an action plan, building capabilities to manage stakeholder relationships, and organizational resources to implement and manage a strategy to create competitive advantage.

Human Resources Management (HRMG)

Search HRMG Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=HRMG>)

HRMG 6200. Managing People and Organizations. 3 Hours.

Examines today's evolving environment, in which effective utilization of human resources is a source of competitive advantage. To maximize the contribution of organizational members, managers must be able to understand, diagnose, and influence workplace behavior in the context of change. Topics include management of cross-functional teams and boundaryless organizations. Emphasis is on the role of corporate culture and distributed leadership.

HRMG 6208. Effective Organizational and Human Behavior. 3 Hours.

Introduces theories and concepts designed to help students diagnose, understand, and predict behavior in organizations. Managing the "people" side of organizations has always been one of the greatest challenges for organizations. With today's knowledge workers; flatter, decentralized structures; and rapidly changing competitive conditions, the "human behavior" issues are of even greater strategic importance to organizational success. Among the topics addressed are interpersonal communication, groups and teams, motivation, leadership, organizational culture, and change. In conjunction with BUSN 6201 and other first-year activities, students focus not only on the concepts as applied to others but also on their personal skills and how these can be developed for more productive behavior in organizations.

HRMG 6212. Creating an Innovative Organization. 3 Hours.

Examines the actions that managers must take to stimulate innovation and direct it in ways that allow the organization to accomplish its goals. Topics include what organization forms are most conducive to innovation, what factors hinder innovativeness and how can they be overcome, and what role managers play in bringing about innovation. Focuses on the actions that companies and their managers can take to design their organizations and systems effectively in order to foster innovativeness. Elements of an organization's infrastructure include design, reward mechanisms, communication patterns, boundary spanning, control systems, leadership at all levels, and the organization's culture.

HRMG 6213. Leadership. 3 Hours.

Built on the premise that everyone is capable of leadership. Exposes students to a series of alternative perspectives of leadership, including some contemporary collaborative models. From careful consideration of these perspectives, as well as from practicing them using the course's experiential methods, students have an opportunity to build a personal model of leadership upon which they can expand as they continue to develop as leaders.

HRMG 6214. A Management Perspective of Human Resource Management. 3 Hours.

Takes a general manager's perspective on human resource management. Global competitive challenges are forcing organizations to become increasingly flexible. Workplace trends such as telecommuting, increased information technology, contingent workers, and diversity hiring designed to address this flexibility are fundamentally altering the realm of human resource management in the United States. Explores how these issues affect the management of people in organizations through case analyses, small-group exercises, videos, and lectures. Examines topics traditionally related to the human resources management function, such as planning, staffing, evaluating, and rewarding. Also examines employee rights, labor relations, and international human resources management.

HRMG 6217. Virtual, Vicious Teams: Building and Leading High-Performance Teams. 3 Hours.

Offers an opportunity to learn how to build and lead different types of teams, including co-located, virtual, global, and top management teams. Asks students to identify the roles and responsibilities of team members and leaders and to develop effective communication, collaboration, and commitment among team members and other constituencies. Also examines how to effectively facilitate coordination across functionally distinct teams.

HRMG 6218. Great Companies. 3 Hours.

Studies and debates the criteria for a great company. As suppliers, customers, employees, or students, everyone has experience with a range of organizations. Some are admired, some are mediocre, and some are dreadful. This course focuses on companies with management practices that produce and sustain extraordinary outcomes such as low cost, amazing service, fast growth, and exceptional quality. Often, these companies are great because they dare to be different and the key question is: "How do they do it?" Explores such topics as organizational culture, organizational design, empowerment, business process improvement, reward systems, and employee and organizational learning. Uses a variety of learning approaches, including case studies, articles, lecture/discussion, videos, and exercises.

HRMG 6219. Leadership for Environmental Sustainability. 3 Hours.

Explores how organizational leaders use scientific knowledge to develop effective sustainability strategies around such global issues as climate change and energy depletion. Also explores how key stakeholders—businesses, governments, gray sector organizations, and communities—interact on issues of global sustainability. The course objective is to develop leaders who can research and communicate effectively about global environmental sustainability.

HRMG 6220. Health Organization Management. 3 Hours.

Covers key issues and introduces management principles in health organization management. Offers students an opportunity to apply important theoretical ideas, such as systems thinking and organizational learning, to meet challenges effectively, to learn how the healthcare workplace functions, and how to manage in these workplaces. Emphasizes case-based learning, critical thinking, and evidence-based management using individual and group projects. Introduces cutting-edge tools in areas such as work redesign, performance management, brand enhancement, and quality improvement. Addresses the management imperatives of today's healthcare organizations and how to implement strategies and programs to meet those imperatives effectively. Intended for anyone interested in working or managing within the healthcare industry, including the field of public health.

HRMG 6221. Power and Influence. 3 Hours.

Introduces students to the uses of power and influence in the surroundings in which they work, working with and managing people, and achieving the goals they set for themselves. Offers students an opportunity to make sense of their own on-the-job learning experiences and to explore basic diagnostic and action-planning skills that they can later use on the job. Exposes students to a variety of cases that demonstrate the effective and ineffective uses of power in different types of organizational contexts and at different points in a manager's career and how to consider difficult ethical questions as well.

HRMG 6223. Global Talent Management. 3 Hours.

Offers students an opportunity to obtain the insights, frameworks, and tools to effectively manage and develop talent in teams and organizations. Also explores promotion and cross-functional systems that strengthen the organization as well as retention strategies to promote and reward high-quality talent. Managing and developing talent is one of the top three issues on the minds of CEOs from around the world. In fact, CEOs cite managing and developing their leadership talent as the issue that is most important to the future success of their business but that their organizations are least capable of addressing effectively. Offers students an opportunity to engage in various activities intended to illustrate and practice the skills involved in implementing talent management systems.

HRMG 6230. Leading and Leveraging Diversity in Organizations. 3 Hours.

Examines issues including discrimination and bias, sexual harassment and workplace romance, professional and personal development, power and privilege, work and family, and organizational strategies for promoting equal opportunity and a multicultural approach for leveraging diversity and inclusion. Incorporates readings to generate lively discussions and debates, experiential learning, self-reflection, case studies, and guest speakers who are diversity experts and thought leaders. Diversity in the workplace involves recognizing and capitalizing on individual differences such as religion, gender, race, ethnicity, sexual orientation, national origin, age, and physical ability/disability. Leaders need to address issues of diversity in strategic and ethical ways if they are to compete and succeed in a global economy.

HRMG 6280. The Human Side of Innovation. 3 Hours.

Examines the leadership and managerial skills required for effectively managing multifunctional teams engaged in product, service, and business process innovation. Incorporates fieldwork, corporate visits, and other experiential learning opportunities. Explores strategies for recruiting, motivating, and retaining high-performance people. Introduces models for leading systematic innovative change within established corporate cultures, including understanding senior management attitudes toward innovation and how to create executive sponsors and mentors.

HRMG 6293. Developing and Applying Personal Leadership Skills. 2,3 Hours.

Offers students an opportunity to identify the real challenges in their professional lives, to assess their own leadership skills, and to identify strengths and areas needing further development. Facilitated by faculty and supported by the student's learning team, students have an opportunity to capture the everyday challenges of the workplace and plan effective responses in the form of increased leadership skills and behaviors. Students work individually and together to accomplish their development goals. After workplace application, offers students an opportunity to reflect on how successful their efforts were, identifying additional strategies to further improve their leadership skills, and to learn to deal with their own and other's emotional reactions to stresses presented by leadership challenges.

HRMG 6318. Managing the Organization. 2 Hours.

Offers key insights every business professional should understand working in, managing, and leading organizations in today's complex, diverse, and dynamic business environment. The primary goal of this course is to challenge—and improve—students' understanding of human behavior in organizations so that they are better positioned to strategically leverage human capital. Introduces critical theories and concepts through case analyses, debates, TED Talks, and exercises that aim to help students understand, analyze, and ultimately address real business situations and problems.

HRMG 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

HRMG 7976. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on chosen topics. May be repeated without limit.

Human Resources Management - CPS (HRM)

Search HRM Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=HRM>)

HRM 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

HRM 2320. Human Resources Management. 3 Hours.

Examines and applies principles, practices, and current issues facing organizations as related to attracting, selecting, motivating, and keeping the most talented organizational members in today's competitive environment. Focuses on human resource management strategy, organizational staffing, employee and labor relations, and organizational safety and security. Emphasizes current legal considerations and issues.

HRM 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

HRM 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

HRM 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

HRM 6005. Creating a High-Performance Organization: Strategic Organizational and HRM Choices. 3 Hours.

Covers the choices that are critical and central to a growing organization and the role that HRM plays in the decision-making process. As our global and domestic environments grow more complex, organizations seeking excellence are faced with a myriad of strategic choices, and many of those choices are the responsibility of the HR manager. Major topics include motivation, perception, interpersonal communication, leadership, power and influence, decision making, group dynamics, team building, corporate culture, and socialization. Offers students an opportunity to learn how to motivate employees and create a team-based culture of support, learning, and renewal. Emphasizes the practical application of specific skills, theories, and concepts that empower students to become effective HR managers and leaders in their organizations.

HRM 6010. Compensation and Benefits. 3 Hours.

Examines how organizations determine their merit and incentive plans, wage and salary structures, and compensation methods to give students a close-up look at team-based reward systems, flexible benefits plans, and indirect compensation. Designing the right mix of compensation and benefits is critical to attracting and retaining quality employees. Explores innovative ways to construct and manage the compensation and benefits mix.

HRM 6015. Introduction to Human Resources Management. 3 Hours.

Introduces students to the scope, vocabulary, and strategic environment of a rapidly evolving field. Examines the range of competencies that contribute to effective human capital management in support of organizational performance. Topics include human resources strategy, talent acquisition, performance management, and compensation and benefits.

HRM 6020. Talent Acquisition and Onboarding. 3 Hours.

Underscores the importance of linking recruitment goals with overall company strategy. Finding and hiring the right people is often cited as the number-one concern of businesses. Topics include approaches to job design, market analysis, recruiting and selecting employees, leveraging social media and hiring analytics to ensure better-quality hires, and effective onboarding practices.

HRM 6025. Workforce Analytics. 3 Hours.

Examines the characteristics of high-quality data, key workforce metrics, and introduces common analysis techniques. Human resources management helps drive business performance by delivering competitive advantage through people. This requires a solid grasp of HR analytics: the systematic collection, analysis, and interpretation of data designed to improve decisions about talent and the organization as a whole.

HRM 6030. The Employment Contract. 3 Hours.

Examines the legal relationship between employer and employee. Students will explore issues and topics such as discrimination, affirmative action, the Americans with Disabilities Act, sexual harassment, health and safety, AIDS in the workplace, compliance issues, and legal issues related to downsizing and terminations. Human Resource managers work in a highly complex environment with constantly changing laws and legislation that govern employee rights and employer obligations.

HRM 6040. High-Performance Human Resources Systems and Development. 3 Hours.

Examines the critical role played by human resources in planning and managing talent within the organization. A twenty-first-century workplace defined by constant change has resulted in increased demands for HR managers to act as strategic planners and internal consultants within their organizations. Understanding business strategy, using data to understand and predict labor shortages, and creating employee development plans to manage labor shortages are critical needs in customer- and client-centered organizations. Linking human resource planning and employee development to the strategic business plan is vital to meeting changing organizational demands for adaptation and movement.

HRM 6042. Strategic Workforce Planning. 3 Hours.

Explores the development of talent management programs required to effectively execute corporate strategy. Effective workforce planning and implementation are essential to the maintenance of an organization's competitive advantage and the successful execution of organizational strategy. Reviews topics in human resource planning, gap analysis, overcoming implementation barriers, and promoting the change process.

HRM 6045. Change, Challenge, and Competence. 3 Hours.

Covers cultural diversity, changing work/family patterns, worker burnout and stress, and the need for workplace flexibility. HR managers and professionals must address new tensions and challenges arising from employer demands for higher productivity within complex and increasingly competitive environments. Addresses these changes in the workplace, from internationalization to reorganization and the impact of downsizing.

HRM 6047. Managing the Employee Life Cycle. 3 Hours.

Explores the best practices across a range of sectors in order to enable HR professionals to play the role of business partners with key organizational stakeholders. One of the primary responsibilities of HR professionals is managing talent throughout the employee life cycle in order to enhance employee productivity and career growth. Topics covered include performance management, retention strategies, training and development, and succession planning.

HRM 6050. Employee Engagement. 3 Hours.

Explores the cognitive, affective, and behavioral dimensions of employee engagement in supporting organizational performance. Research demonstrates that high levels of employee engagement contribute to high levels of productivity and innovation, as well as low turnover. Topics include the different dimensions of engagement, the design and interpretation of surveys, trust and transparency, diversity and inclusion, and best practices in employee engagement in a range of sectors.

HRM 6060. Organizational Design. 3 Hours.

Focuses on organizational design with special emphasis on innovative organizational forms that can provide strategic advantage. Topics include structuring and staffing HR functions, workspace design, and structural options for entire organizations, from startups to mature global companies. Explores leading-edge innovations, such as crowd-based organizations, internal resource markets, and other forms of collective intelligence.

HRM 6070. Global Human Resources Management. 3 Hours.

Explores the trends in workforce globalization and their implications for effective human resources management. Topics include intercultural competencies, cultural adaptation, global mobility, and a comparative examination of human resource policies and practices in major global markets. Students explore the skills and knowledge required to manage talent in multinational organizations.

HRM 6072. Global and Comparative Employment/Employee Relations. 3 Hours.

Focuses on institutional, organizational, and managerial perspectives of employment processes, relationships, and outcomes in a globalized economy. Examines cross-national variation in employment relations and labor law through the lens of convergent-divergent HRM theory. Other topics include global and national labor standards and rights, mechanisms through which labor is governed, ways in which workers are organized, as well as cultural and social factors that impact international employment.

HRM 6074. Global Talent Acquisition and Mobility. 3 Hours.

Focuses on organizational staffing issues that are not present in a domestic environment or that increase in complexity in an international context. Examines ethnocentric, polycentric, regiocentric, and geocentric approaches to managing and staffing international subsidiaries. Other topics include the varied types of international assignments; selection criteria and procedures for the same; the roles of expatriates, nonexpatriates, and inpatriates; as well as management, motivation, development, and repatriation of workers on international assignments.

HRM 6076. International Compensation. 3 Hours.

Focuses on the complexities that arise when firms move from compensation at the domestic level to compensation in an international context. Examines the two main approaches to international compensation as well as the key components of designing an international compensation program. Introduces special problem areas of taxation; cost of living; and managing compensation of expatriates, nonexpatriates, and inpatriates, along with potential host country and regional influences on compensation design.

HRM 6940. Projects for Professionals. 4 Hours.

Offers students an opportunity to apply knowledge and skills gained through their master's program to challenging short-term projects under faculty supervision. Matches students with discipline-specific consulting projects provided by a wide range of sponsoring organizations in the private and nonprofit sectors. Students develop a project plan, conduct research, develop and deliver recommendations to the sponsoring organization, and reflect on lessons learned. Mapping human resources management competencies and skills to the consultative process is a primary learning outcome. As the capstone, this course should be the last course taken. Students with less than two years of professional experience must successfully complete a noncredit Experiential Learning project before registering for the capstone course.

HRM 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

HRM 6995. Project. 1-4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student's major field. May be repeated without limit.

Human Services (HUSV)

Search HUSV Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=HUSV>)

HUSV 1000. Human Services at Northeastern. 1 Hour.

Intended for first-year students in the College of Social Sciences and Humanities. Introduces students to liberal arts; familiarizes them with their major; develops the academic skills necessary to succeed (analytical ability and critical thinking); provides grounding in the culture and values of the University community; and helps to develop interpersonal skills—in short, familiarizes students with all skills needed to become a successful university student.

HUSV 1101. Social Change and Human Services. 4 Hours.

Offers students an opportunity to obtain a foundation for understanding social inequality and for practicing in the human services field. Introduces students to a range of specializations in the area of human services through lectures, service-learning, group work, individual projects, papers, debates, and presentations. Analyzes and applies ethical frames for practice using case studies and service-learning experiences. Additionally, students are expected to develop an understanding of the history of nonprofit and government responses to inequality and the social, political, and economic forces that influence social professionals.

HUSV 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

HUSV 2300. Counseling in Human Services. 4 Hours.

Presents an overview of the major theoretical approaches to counseling and therapeutic interventions. Focuses on developing clinical skills and competency in intentional interviewing. Combines systemic group exercises and experiential activities to practice interviewing techniques. Cross-cultural issues in counseling are integrated throughout the course.

HUSV 2320. Techniques in Individual and Group Counseling. 4 Hours.

Provides in-depth understanding of clinical practice with individuals, groups, and families. Focuses on developing practice skills through presentations, case studies, and self-reflection journals. Examines the role of spirituality within one's clinical practice. Explores theoretical techniques and their applications in a variety of settings, with particular attention to populations at risk.

HUSV 2350. Race, Identity, Social Change, and Empowerment. 4 Hours.

Examines racism, racial identity, and theories of social change and racial empowerment primarily within the U.S. context. Highlights different ways in which racism and racial privilege have been experienced by different racial communities, more specifically at the micro-, meso-, and macro-levels. Offers students an opportunity to learn ways to promote racial empowerment and equity. Using theory from primarily psychology and sociology, the course investigates the impact of social systems and institutions on individual-level and group experiences of racism. Investigates students' own racial identities, a deeper understanding of institutional inequalities and intersectionality, and practical skills in leadership and community building that can promote positive social change and racial equality.

HUSV 2400. Food Justice and Community Development. 4 Hours.

Uncovers and examines the key dilemmas of the food system in the United States today using readings, media, discussion, service-learning, and field trips. Working from the foundations of environmental justice and community development, covers production, access, distribution, and key stakeholders from producers to retailers, workers, and consumers. Considers what justice-related issues face stakeholders within the food system in the United States; what policies have most impacted the workforce in the American food system; and what the opportunities and leverage points are for change in improving justice outcomes in this system.

HUSV 2500. Science of Play. 4 Hours.

Examines the scholarship of play. Explores the role and function, benefits, and barriers of play in child development. Topics include the background and significance of play in history; the role of play as a predictor of academic and social functioning; and the use of play in character/moral development and to prevent, intervene, and treat trauma. Explores clinical and nonclinical implications of play, as well as the physiological and social implications of play, using contemporary research on brain science and development. Combines classroom learning with fieldwork experiences throughout the local Boston community and independent research on the role of play as prevention, intervention, and treatment. Students develop service-based research projects with community partners to address key questions related to the science of play.

HUSV 2800. Sexual Orientation and Gender Expression. 4 Hours.

Introduces students to efforts among social and nonprofit organizations working to reduce heterosexism, homophobia, and transphobia in institutions, communities, and the society as a whole. Discusses practice across the life span for social professionals (social workers, counselors, advocates, and educators) in varied settings such as criminal justice, mental health, adoption, adult day health, and residential programs. Applying theories and current scholarship on LGBTQQ identity development, social movements, media, and advocacy, offers students an opportunity to evaluate contemporary issues of controversy for institutions, social practitioners, and policy. HUSV 2800 and WMNS 2800 are cross-listed.

HUSV 2960. Intercultural Studies through Human Services. 4 Hours.

Examines the social, political, and economic forces that influence how nongovernment organizations develop and operate in settings abroad. Compares predominant theoretical and philosophical orientations for poverty reduction and social impact. Students analyze and compare popular preventative and reactive interventions for change such as public health approaches, the use of aid, microlending, philanthropic funding, and sustainable development organizations. This intensive, integrated course applies lectures, presentations, case studies, meetings with local stakeholders, and service-learning.

HUSV 2970. Research Methods for Human Services. 4 Hours.

Offers an introduction to social science research that examines the theoretical and ethical foundations of social research methods. Highlights foundation knowledge and skills in hypothesis testing, research design, sampling strategies, measurement techniques, and basic data analysis and interpretation. Focuses on program evaluation to provide an opportunity for students to link social science research methods to direct human service practice.

HUSV 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

HUSV 3414. The Sociology of Campus Life. 4 Hours.

Focuses on campus life through the lens of classic sociological concerns of race, class, and gender. Offers students an opportunity to address core contemporary issues in higher education; to develop an understanding of campus life from the perspective of learning that occurs both inside and outside the classroom; and to assess how that learning impacts their views of themselves and their larger context. Also offers students an opportunity to develop an understanding of student commitment to issues of social change and social justice. HUSV 3414 and SOCL 3414 are cross-listed.

HUSV 3520. Child Intervention and Treatment. 4 Hours.

Compares and contrasts primary, secondary, and tertiary levels of intervention as they pertain to child welfare systems. Examines specifically the effectiveness and efficiency of home-visiting-based interventions, school-based interventions, child welfare interventions, and programs and practices targeted to reduce and eliminate juvenile delinquency. Considers the availability, distribution, and effectiveness of these prevention, intervention, and treatment programs as they apply to children and their families. Hands-on service learning in the field of child intervention is designed to link the course work on research and theory to human service practice.

HUSV 3540. Addiction and Recovery. 4 Hours.

Explores students' personal and cultural perspectives about substance use, abuse, and addiction through the use of readings, films, and case studies. Students evaluate the causes of chemical dependence, and methods of recognition, intervention, and treatment. Offers students the opportunity to investigate the effects of chemical dependency on the family. CRIM 3540 and HUSV 3540 are cross-listed.

HUSV 3570. The Nonprofit Sector, Philanthropy, and Social Change. 4 Hours.

Offers students an opportunity to explore the nonprofit sector's multifaceted role in U.S. society and its relationship to democracy and social change. Introduces theoretical and practical frameworks for examining contemporary models of nonprofit and philanthropic practice and examines the ethical implications of engaging in and funding activities designed to effect social change. Offers students an opportunity to apply these concepts by mapping the complex systems within which social challenges emerge and by making real dollar grants to local nonprofit organizations.

HUSV 3580. Sexual Violence: Counseling, Programs, and Policy. 4 Hours.

Offers an in-depth examination of sexual violence, its effects, and the resources available to assist survivors. Presents an overview of the criminal justice, medical, legal, and counseling systems and the impact these interweaving systems have on survivors. Offers students an opportunity to develop crisis counseling competency through group exercises and experiential activities. HUSV 3580 and WMNS 3580 are cross-listed.

HUSV 3590. Nonprofit Communications. 4 Hours.

Seeks to provide an understanding of the role of strategic communications in the nonprofit sector and to bridge theory with practice to develop communications strategies that support organizational goals and effectively move targeted audiences to action through appropriate and measured tactics. Examines case studies and engages in group work and individual papers that connect mission and goal setting with audience identification and segmentation, issue framing, message development, and communication. Offers students an opportunity to apply the course concepts in a service-learning partnership with an area nonprofit organization.

HUSV 3700. Research Methods for Human Services. 4 Hours.

Offers an introduction to social science research that examines the theoretical and ethical foundations of social research methods. Highlights foundation knowledge and skills in hypothesis testing, research design, sampling strategies, measurement techniques, and basic data analysis and interpretation. Focuses on program evaluation to provide an opportunity for students to link social science research methods to direct human service practice.

HUSV 3900. Social Policy. 4 Hours.

Examines how social policy influences child, family, and community development. Provides a historical overview and a contemporary examination of many social problems, including poverty, health and mental health issues, child welfare, educational inequality, and consequences of juvenile and adult crime. Examines the policies and programs that help or hinder positive individual, family, and community development and considers the role of human service values and ethics on the American response to social policy. Offers students an opportunity to examine and critique the implementation or lack of implementation of formal social policies at the local, state, and federal level and to suggest initiatives to meet the needs of intergenerational families.

HUSV 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

HUSV 4700. Senior Seminar in Human Services. 4 Hours.

Examines emerging roles and career options within the human services field. Focuses on self-examination of attitudes and values affecting delivery of services, exploration of ethical issues and dilemmas relevant to human services, grant and funding issues, staff supervision and development within human services agencies, and refinement of group leadership skills.

HUSV 4866. Intercultural Studies through Human Services. 4 Hours.

Focuses on students developing an understanding of the social, political, historical, and economic conditions in settings abroad and the corresponding social service and educational interventions. Uses an intensive, integrated study program that includes lectures, visits to cultural sites and government institutions, and a service-learning experience in a human-services or educational setting. May be repeated without limit.

HUSV 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

HUSV 4991. Research. 4 Hours.

Offers an opportunity to conduct research under faculty supervision.

HUSV 4992. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

HUSV 4993. Independent Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

HUSV 4994. Human Services Internship. 6 Hours.

Requires students to fulfill one internship placement during the last two years of the program. Consists of required field site hours and varies according to the students' interests. Examples of placement sites include community centers, nursing homes, vocational workshops, state and federal agencies for children, and recreational facilities. Experiences are supervised by internship supervisor to maximize the student's learning opportunities. Fulfills the experiential education requirement. May be repeated without limit.

Human Services - CPS (HSV)

Search HSV Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=HSV>)

HSV 1100. Introduction to Human Services. 3 Hours.

Serves as an overview to the field of social work and human services, including the skills, abilities, attitudes, and values necessary to be successful; the range of roles and areas of specialization available to those in this profession (counseling, criminal justice, healthcare administration, advocacy, group work, community services); and current issues impacting the field today. Covers community support, case management, crisis intervention, and biopsychosocial rehabilitation best practices to meet the demands for community-based outreach and prevention and treatment programs.

HSV 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

HSV 2200. Introduction to Clinical Practice. 3 Hours.

Presents an overview of the major theoretical approaches to clinical practice. Offers students an opportunity to develop values, skills, dispositions, and competencies needed to serve a wide range of populations, particularly those who are vulnerable. Considers the influence of listening, emotional intelligence, interdisciplinary engagement, and cultural responsiveness on their work with clients.

HSV 2240. Human Behavior in the Social Environment. 3 Hours.

Offers students a foundation for understanding behavior as it applies within the context of dynamic human systems. Interactions with individuals, families, groups, organizations, and communities are at the core of practice. Explores the interrelationship between human development and behavior across the life span, focusing on the impact of surroundings such as culture, community, and social systems. Introduces research-oriented and practice-based perspectives to enhance students' development with regard to professional values, ethics, assessment, and intervention strategies. Emphasizes diverse and at-risk populations.

HSV 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

HSV 3200. Techniques in Individual and Group Counseling. 3 Hours.

Explores clinical practice with individuals, groups, and families. Focuses on developing 21st-century practice skills relevant in today's global social and health services market through a variety of classroom methods. Explores theoretical frameworks and their applications in a variety of settings. Emphasizes marginalized, vulnerable, and underserved populations.

HSV 3220. Health Services Organizations, Opportunities, and Challenges. 3 Hours.

Examines the role of changing systems, such as organizations and communities. Topics include the spectrum of macro practice realms, such as planning, program development, community organizing, advocacy, education, and human services management. Explores a diverse range of macro practice arenas with a wide range of populations. Emphasizes underserved populations such as veterans, children, families, and aging populations.

HSV 3300. Social Welfare, Policies, and Services. 3 Hours.

Explores how social policy influences various aspects of child, family, and community development and welfare. Offers students an opportunity to examine the influence of social policies at the local, state, and federal level, including their impact on service delivery and various populations. Identifies key values, attitudes, skills, and dispositions needed for change agency and to advocate for those who are underserved.

HSV 3350. Research Methods in Human Services. 3 Hours.

Offers a hands-on examination of social and behavioral science research and how it informs and guides practice. Topics include defining problems of practice, research design, theoretical frameworks, surveying of scholarly literature, and applying ethical principles toward prevention and intervention-based program development and evaluation.

HSV 3400. Human Services Volunteer Practicum. 3 Hours.

Offers students an opportunity to engage in a community placement in the field of human services/social work, where they obtain hands-on experience to support the development of necessary skills, attitudes, and dispositions in working with others. Students are supported in finding opportunities within their proximity and are expected to volunteer, participate in discussions, and submit the required writing assignments and documentation of completed hours. May be repeated once.

HSV 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

HSV 4850. Human Services Capstone. 3 Hours.

Offers students an opportunity to reflect on professional identity and development within the field of human services. Students are supported in finding opportunities to engage in agency settings to bolster professional competencies needed to serve individuals, groups, organizations, and communities in our global 21st century. Students end the course by presenting a professional-brand portfolio to demonstrate mastery of content and to clarify ongoing professional goals.

HSV 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

HSV 6100. Theory and Practice of Human Services. 3 Hours.

Examines the development of human service policies and organizations in the United States. Offers students an opportunity to learn the basic issues in contemporary human services and the basic principles of research utilized by human service professionals.

HSV 6110. Human Services Management and Development. 3 Hours.

Explores the issues of organizational behavior and leadership in human service organizations. Offers students an opportunity to learn about issues in human resource theory, policy, planning, and evaluation.

HSV 6120. Social Inequality, Social Change, and Community Building. 3 Hours.

Examines methods for involving community residents in decision-making systems at the local level. Features ways in which residents are empowered through community-based business and economic development, health and human services, and housing and neighborhood revitalization projects. Offers students an opportunity to learn methods for facilitating community involvement, constructively engaging diverse groups of stakeholders in strategic partnerships, and building communities.

HSV 6160. Introduction to Employee Assistance Programs. 3 Hours.

Introduces the history and conceptual framework of Employee Assistance Programs (EAPs), their essential components, program models, and EAP account management. Offers students an opportunity to learn about policy development, legal issues, pricing, and funding EAPs.

HSV 6630. Research and Evaluation in Human Services. 3 Hours.

Surveys current theoretical and methodological practices across the field of human services and examines the applicability of the scientific research approach to the field of professional human service work. Addresses key approaches and practices in the area of evaluative research, including design, implementation, and assessment.

HSV 6640. Policy Issues in Human Services. 3 Hours.

Examines current social policy issues in the realm of human services. Possible topics include privatization of welfare, trends in mental healthcare, the impact of immigration, issues in education, and issues in reproductive rights.

HSV 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

HSV 6980. Capstone. 1-4 Hours.

Provides students with an opportunity to complete a service-learning project. Covers how to conduct a community needs assessment of a community and how to develop skill and sophistication in assessing community strengths and identifying community needs. The final project requires drafting a program proposal and making policy recommendations.

HSV 7962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions.

Humanities - CPS (HUM)

Search HUM Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=HUM>)

HUM 6100. The Philosophical Understanding. 4 Hours.

Surveys the theories and arguments of classical and contemporary philosophers. Emphasizes the skills and techniques of reasoning, stressing applications to issues in diverse professional, personal, and social contexts. Topics include the basis of morality, free will vs. determinism, the existence of God, the problem of suffering, and the nature of knowledge.

HUM 6120. Issues in Critical Theory. 4 Hours.

Introduces the terms and discourses of literary theory as it is currently practiced and debated and provides the historical context for such practices and debates.

HUM 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

HUM 7962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions.

Industrial Engineering (IE)

Search IE Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=IE>)

IE 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

IE 2310. Introduction to Industrial Engineering. 4 Hours.

Provides an overview of the history of industrial engineering and of the most common methods that industrial engineers use to solve problems and design efficient processes. The emphasis is on how these methods are used to study, improve, and/or optimize a product or process. Topics include work design, ergonomic design, engineering statistics, quality engineering, engineering economics, project management, and process optimization. Also discusses the design of the production processes, facilities, and material handling systems. Studies applications in manufacturing, product design, and service industries. Laboratory experiments and written reports are required.

IE 2311. Recitation for IE 2310. 0 Hours.

Provides small group demonstration and hands-on labs for IE 2310.

IE 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

IE 3412. Engineering Probability and Statistics. 4 Hours.

Presents probability theory axiomatically, with emphasis on sample space presentation of continuous and discrete random variables. Covers descriptive statistics, expected value of random variables, covariance and correlation, sampling distribution, and point and interval estimations. Introduces hypothesis testing including tests for means, variances, and proportions.

IE 3425. Engineering Database Systems. 4 Hours.

Examines the representation of data and its creation and management in engineering enterprises. Discusses the client/server model of database access. Presents the fundamentals of data modeling and management, data mining and warehousing, multitier applications, and the use of the SQL query language. Emphasizes the use and applications of database systems in engineering including design and manufacturing. Topics include design schema of tables, records and fields of databases, SQL statements, security issues, and the use of a scripting language such as Perl or Visual Basic.

IE 3426. Recitation for IE 3425. 0 Hours.

Provides small group demonstration and problem solving for IE 3425.

IE 3500. Introduction to Healthcare Systems Engineering. 4 Hours.

Introduces systems engineering methods in healthcare system applications for students who are not industrial engineering majors. Using principles drawn from operations research and industrial engineering, this course focuses on analysis, design, management, and control of health systems (e.g., hospitals, emergency departments, surgery departments, and outpatient clinics) and processes which are critical to the delivery of quality healthcare. Topics include an overview of queueing, simulation, data envelopment analysis, and spreadsheet modeling as applied to real-world healthcare problems such as staffing and scheduling, resource allocation, patient flow management, process improvement, and medical decision making.

IE 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

IE 4510. Simulation Modeling and Analysis. 4 Hours.

Covers process model design and development, validation, and experimentation for discrete-event simulation models. Topics include problem formulation, data collection and analysis, random-variable generation, model development, scenario experimentation, statistical analysis of output, and resultant decision management. Utilizes a major industry-standard simulation software application with animation capabilities.

IE 4512. Engineering Economy. 4 Hours.

Introduces students to economic modeling and analysis techniques for selecting alternatives from potential solutions to an engineering problem. Presents basic methods of economic comparison such as present worth, annual worth, rate of return, and benefit/cost techniques. Studies effects of taxes on investment analysis. Also covers decision tree analysis and statistical decision techniques.

IE 4515. Operations Research. 4 Hours.

Introduces deterministic models including linear programming; duality and postoptimality analysis; transportation and assignment problems; and network flow problems such as the shortest path, minimum spanning tree, and maximum flow.

IE 4516. Quality Assurance. 4 Hours.

Reviews the distributions and statistical approximations commonly applied in statistical quality control methods. Introduces analysis of variance and simple linear regression. Covers basic principles to state-of-the-art concepts and application of statistical process control and design. Applies principles to a variety of products. Topics include product quality measures and controls, Shewhart control charts, quality cost, Pareto analysis, discrete and variable sampling, and military standards in quality control.

IE 4520. Stochastic Modeling. 4 Hours.

Covers the analytical development and solution to stochastic models in operations research. Topics include Markov chains, queuing theory, and dynamic programming.

IE 4522. Human-Machine Systems. 4 Hours.

Emphasizes and addresses human sensory and motor performance, information processing, learning and training methodology, skilled-task development, psychophysical models, response time, and relevant aspects of attention and memory. Topics include system design and development, hazard and error evaluation, and properties of effective visual displays. Endorses experimentation as a source of knowledge of human performance characteristics. Covers research and statistical analyses related to human-asset engineering, fundamentals of vision, audition, somesthesia, signal detection, and some aging effects. Safety and usability of environments, machines, products, and devices consider principles of human-machine interaction, decision making, and anthropometric characteristics. Laboratory experiences include literature review, experimental design, data collection and analysis, hypothesis testing, and generation of reports to inform the design of safe, usable, and marketable engineering products, processes, and systems.

IE 4523. Lab for IE 4522. 1 Hour.

Accompanies IE 4522. Covers topics from the course through various activities.

IE 4525. Logistics and Supply Chain Management. 4 Hours.

Introduces the analysis, design, control, and operation of logistics and supply chain management systems. Includes the integration of supply chain components, logistics information systems, forecasting, production scheduling, inventory management, transportation and warehousing, and facility location planning.

IE 4530. Manufacturing Systems and Techniques. 4 Hours.

Focuses on manufacturing and design and their impact on each other. Covers the basics of design-manufacturing integration, manufacturing systems, manufacturing processes and techniques, manufacturing automation, and production planning and control. Topics include concurrent engineering, design for assembly, design for manufacturability, rapid prototyping, mechanical tolerancing, bill of materials, group technology, computer-aided process planning, NC part programming, programmable logic controllers, flexible manufacturing systems, computer-integrated manufacturing, and just-in-time philosophy. Topics also include traditional manufacturing processes such as casting, forming, machining, welding, molding, and particulate processing, and nontraditional manufacturing processes such as electrical discharge machining, laser machining, and water-jet machining. Students are required to conduct manufacturing-related experiments in the manufacturing lab to gain hands-on experience.

IE 4531. Lab for IE 4530. 1 Hour.

Accompanies IE 4530. Covers topics from the course through various activities.

IE 4600. Systems Design for Sustainability. 4 Hours.

Covers the fundamental process of designing and building systems, from systems identification to the entire systems life cycle. Discusses sustainability, functionality, and capability of systems with respect to systems' objectives. Presents factors affecting systems design, operation, and sustainability. Focusing on design of sustainable systems and improvement of systems, encompasses communications, defense, logistics, manufacturing, transportation, and others. Discusses concept and preliminary design phases to detail, production, and operation phases of design. Seeks to provide the concepts, methodologies, models, and tools needed to understand and implement a total life-cycle approach to systems analysis. Includes different categories of systems, various applications of analytical methods, and related problems and cases. Students who do not meet course prerequisites may seek permission of instructor.

IE 4625. Facilities Planning and Material Handling. 4 Hours.

Explores engineering tools, techniques, and concepts for the design of facilities. The term facility is defined broadly. Industrial plants, schools, hospitals, or places in which things are produced or services are provided to a customer are all considered facilities. Provide students with a broad but practical understanding of the facilities planning and design process. The critical nature of material handling is discussed and approaches to designing optimal handling systems are examined. The tools of operations, research, statistical methods, and software applications are the focus of the problem-solving activities.

IE 4699. Special Topics in Industrial Engineering. 4 Hours.

Focuses on advanced industrial engineering project agreed upon between the student and instructor. May be repeated without limit.

IE 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

IE 4991. Research. 4 Hours.

Offers an opportunity to conduct research under faculty supervision.

IE 4993. Independent Study. 1-4 Hours.

Offers theoretical or experimental work under individual faculty supervision. May be repeated without limit.

IE 5137. Computational Modeling in Industrial Engineering. 4 Hours.

Builds computational models for industrial engineering applications. Offers students an opportunity to learn how to identify the problem, split it into subsystems, develop mathematical models of each sub-system, and implement in Python. Selected problems are specific to industrial engineering applications with examples of inventory systems, queuing systems, production planning and control, supply chain management, transportation, network flows, forecasting, scheduling, Monte Carlo simulation, regression analysis, sensitivity analysis, and decision support systems in data science and machine learning to test and learn from models. Students also have an opportunity to learn how to use Python libraries to implement the corresponding data structures and algorithms.

IE 5374. Special Topics in Industrial Engineering. 4 Hours.

Offers topics of current interest in industrial engineering. May be repeated up to two times.

IE 5390. Structured Data Analytics for Industrial Engineering. 4 Hours.

Covers fundamental knowledge and skills for using structured data analytics for IE applications. Offers students an opportunity to learn data cleaning and preparation, as well as analytics of data sets, and coding in VBA (writing macros and creating GUI), both as a driver of spreadsheet formulas and as a stand-alone programming language. A final project involves the development and presentation of a structured data analytics application that addresses industrial engineering concepts.

IE 5400. Healthcare Systems Modeling and Analysis. 4 Hours.

Discusses the key functions of healthcare operations management, such as patient and process flow, process improvement, facility layout, staffing and scheduling, capacity planning, and resource allocation. Focuses on analysis, design, management, and control of health systems and processes that are necessary to provide clinical care. The applications of systems engineering methods, such as optimization, simulation, and queuing models, are discussed through papers and case studies in different care settings (e.g., hospitals, emergency departments, surgery departments, and outpatient clinics) for different diseases (e.g. diabetes, cancer, mental health, cardiovascular disease). Uses spreadsheet tools to model and solve simulation and optimization problems. Requires equivalent course work if prerequisites are not met.

IE 5500. Systems Engineering in Public Programs. 4 Hours.

Introduces the design, development, analysis, and application of mathematical modeling for addressing public programs and societal needs. Systems engineering and mathematical models form the basis for decision making in both public and private applications. Focusing on societal applications, offers students an opportunity to discover how to incorporate public objectives and characteristics of large systems in the development of models and policies. Examines applications in the operation of public programs (e.g., public health systems, government programs) and public safety (e.g., security, emergency preparedness, and disaster response). Modeling techniques include game theory, data envelopment analysis, cost-benefit analysis, simulation, differential equations, and stochastic optimization. Requires equivalent course work if prerequisites are not met.

IE 5617. Lean Concepts and Applications. 4 Hours.

Covers the fundamentals of lean thinking and how to apply this knowledge to practical problems. Lean thinking is imperative for organizations aspiring to stay competitive in global markets. It calls for process changes to eliminate waste, shorten product delivery time, improve product quality, and curtail costs, while improving customer satisfaction. Offers students an opportunity to learn concepts, a kit of process improvement tools, implementation methods, and best practices for lean workforce development. Makes extensive use of active learning exercises and simulations, and case studies from different disciplines, to help students learn how lean principles are applied in manufacturing and also in less traditional areas such as knowledge work and healthcare systems.

IE 5618. Recitation for IE 5617. 0 Hours.

Accompanies IE 5617. Provides small group demonstrations, exercises, and team activities.

IE 5620. Mass Customization. 4 Hours.

Provides students with conceptual understanding and implementation strategies of mass customization (MC). MC is both a business and production paradigm where a company provides the customers with goods and services that suit their individual needs but does so with the efficiency and costs of mass production. MC is important in many sectors including computers, automotive, healthcare, banking, insurance, and tourism. It is based on principles of industrial engineering, mechanical engineering, management science, and marketing. Topics include typology of mass-customized production systems, manufacturing processes for MC, information needs of MC, customer focus, marketing issues, technology enablers, implementation methods, and case studies. Methodology includes lectures, case discussions, plant visits, guest lectures, and a term project. Cross-disciplinary activities, particularly between engineering and business students, are encouraged wherever possible.

IE 5630. Biosensor and Human Behavior Measurement. 4 Hours.

Emphasizes the measurement of human behavior in complex human-machine interaction. Topics include introduction of complex human-machine interactions; research methods in complex human-machine interactions; various kinds of human psychophysiological signals/cues, including physiological cues, facial expressions, eye-gaze movement, head movement, contextual cues; human cues and behavior relationship; transducers and measurement for these human cues/signals; basic principles of biosensors; general classification of biosensors; current technologies for building biosensors; conventional transducers and new technologies including micro-/nanotechnology; general systematic design process for biosensors; application of biosensors to understand human behavior in human-machine interactions. Also introduces the latest relevant research advancements in sensor fusion, affective computing, and emotion recognition.

IE 5640. Data Mining for Engineering Applications. 4 Hours.

Introduces data mining concepts and statistics/machine learning techniques for analyzing and discovering knowledge from large data sets that occur in engineering domains such as manufacturing, healthcare, sustainability, and energy. Topics include data reduction, data exploration, data visualization, concept description, mining association rules, classification, prediction, and clustering. Discusses data mining case studies that are drawn from manufacturing, retail, healthcare, biomedical, telecommunication, and other sectors.

IE 6200. Engineering Probability and Statistics. 4 Hours.

Studies fundamental concepts of probability. Topics include events, sample space, and discrete and continuous random variables; density functions, mass functions, cumulative probability distributions, and moment generating functions; expectation of random variables; common discrete and continuous probability distributions including binomial, Poisson, geometric, uniform, exponential, and normal; multivariate probability distributions, covariance, and independence of random variables; sampling and descriptive statistics; and parameter estimation, confidence intervals, and hypothesis testing. Also introduces analysis of variance. Requires knowledge of multivariate calculus.

IE 6300. Manufacturing Methods and Processes. 4 Hours.

Focuses on manufacturing and its relationship to design and computers. Examines the relationship between design and various aspects of manufacturing. Covers manufacturing systems, manufacturing processes, bill of materials, group technology, mechanical tolerancing, QC, SPC, QPC, TQM, process planning and CAPP, NC part programming, supply chain management, production scheduling, JIT, lean manufacturing, flexible manufacturing systems, CIM cells, and manufacturing control via, say, programmable logic controllers.

IE 6500. Human Performance in Sociotechnical Systems. 4 Hours.

Studies the integration of sociotechnical systems in order to improve productivity, efficiency, safety, and quality of work life. In particular, this involves designing of jobs, machines, operations, and work environments in systems and organizations so that they are compatible with human capabilities, characteristics, and limitations. Covers a wide range of sociotechnical systems and is focused on human performance, human system integration, and evaluation. Discusses a variety of sociotechnical systems and interactions, including transportation, healthcare, manufacturing and service industries, and human-computer and human-robot interaction.

IE 6600. Computation and Visualization for Analytics. 4 Hours.

Offers students an opportunity to learn how to use visualization tools and techniques for data exploration, knowledge discovery, data storytelling, and decision making in engineering, healthcare operations, manufacturing, and related applications. Covers basics of Python and R for data mining and visualization. Introduces students to static and interactive visualization charts and techniques that reveal information, patterns, interactions, and comparisons by focusing on details such as color encoding, shape selection, spatial layout, and annotation.

IE 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

IE 7200. Supply Chain Engineering. 4 Hours.

Presents modern quantitative techniques for designing, analyzing, managing, and improving supply chains using deterministic and probabilistic models. Topics include a macro view of supply chains, demand forecasting, aggregate planning, sequencing and scheduling, inventory analysis and control, materials requirement planning, pricing and revenue management, contracts decisions, transportation decisions, location and distribution decisions, supplier selection methods, and global supply chains.

IE 7215. Simulation Analysis. 4 Hours.

Covers elementary queueing models, simulation and modeling, simulation model design, a survey of simulation languages with one language covered in detail, input data analysis and distribution fitting, model verification and validation, output analysis and transient/steady-state response, terminating/nonterminating systems, model experimentation and optimization, random number/random variate generation, and variance reduction techniques.

IE 7270. Intelligent Manufacturing. 4 Hours.

Covers advanced and emerging topics in manufacturing. Discusses fundamentals of digital and cyber-physical manufacturing including machine communication protocols, control architectures, agent-based and holonic systems, cloud-based and service-oriented manufacturing, and applications of artificial intelligence in manufacturing.

IE 7275. Data Mining in Engineering. 4 Hours.

Covers the theory and applications of data mining in engineering. Reviews fundamentals and key concepts of data mining, discusses important data mining techniques, and presents algorithms for implementing these techniques. Specifically covers data mining techniques for data preprocessing, association rule extraction, classification, prediction, clustering, and complex data exploration. Discusses data mining applications in several areas, including manufacturing, healthcare, medicine, business, and other service sectors. Students who do not meet course prerequisites may seek permission of instructor.

IE 7280. Statistical Methods in Engineering. 4 Hours.

Discusses statistical models for analysis and prediction of random phenomena. Topics include review of descriptive statistics and hypothesis testing, linear models, both regression and ANOVA. Introduces design of experiments. Covers experiments with single and multiple factors of interest, and considers experiments with high-order experimental restrictions.

IE 7285. Statistical Quality Control. 4 Hours.

Designed to study the fundamental concepts of quality planning and improvements. Studies analysis and application of modern statistical process control methods including cusum, EWMA, multivariate, and modified control charts. Covers inspection error and design of sampling plans. Topics include software quality assurance, and study of the concepts of Deming, Ishikawa, Feigenbaum, and Taguchi's approach in quality planning, organization, and improvement.

IE 7290. Reliability Analysis and Risk Assessment. 4 Hours.

Studies principles of the methods of risk assessment and reliability analysis including fault trees, decision trees, and reliability block diagrams. Discusses classical, Bayesian, and median rank methods for analysis of components and systems reliability. Presents various factors that determine the stress and strength of components and their impact on system reliability. Uses practical applications, examples, and problems to cover a broad range of engineering fields, such as mechanical, electrical, industrial, computer, structures, and automatic control systems.

IE 7315. Human Factors Engineering. 4 Hours.

Offers students an opportunity to acquire the necessary knowledge and skills to recognize and analyze existing or potential human factors problems and to identify, design, and possibly implement feasible solutions. Includes introduction to human factors and ergonomics; engineering anthropometry and biomechanics; physiology related to human factors and workstation design; cognition and information processing; decision making, attention, and workload; human error and accidents; human-machine interface design; controls and displays; and human factors applications in transportation, aerospace, consumer product design, and so forth.

IE 7374. Special Topics in Industrial Engineering. 4 Hours.

Offers topics of interest to the staff member conducting this class for advanced study. May be repeated without limit.

IE 7440. Industrial Engineering Leadership Challenge Project 1. 4 Hours.

Offers students an opportunity to develop and present a plan for the demonstration of a marketable technology product or prototype with an industrial-engineering focus. Constitutes the first half of a thesis-scale project in technology commercialization. Requires work/training with a sponsoring organization or employer to improve a process or develop a project that is of significant value to the organization and demonstrates a quantifiable market impact while enhancing the student's technological and engineering depth and fostering the student's leadership development.

IE 7442. Industrial Engineering Leadership Challenge Project 2. 4 Hours.

Continues IE 7440, further developing a thesis-scale project in technology commercialization. Offers students an opportunity to demonstrate their development of a marketable technology product or prototype with an industrial engineering focus and produce a written documentary report on the project to the satisfaction of an advising committee. Requires work/training with a sponsoring organization or employer to improve a process or develop a project that is of significant value to the organization and demonstrates a quantifiable market impact while enhancing the student's technological and engineering depth and fostering the student's leadership development.

IE 7615. Neural Networks and Deep Learning. 4 Hours.

Covers the theory and applications of neural networks in engineering. Reviews basics of machine learning, discusses important neural network architectures, and presents neural network training methods and algorithms. The specific neural network models covered in this course include feedforward neural networks such as deep learning architectures, radial basis function networks, support vector machines, self-organizing feature maps, and recurrent networks. Discusses neural network applications in several areas including manufacturing, healthcare, medicine, business, and diagnostics and prognostics.

IE 7945. Master's Project. 4 Hours.

Offers theoretical or experimental work under individual faculty supervision.

IE 7962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

IE 7978. Independent Study. 1-4 Hours.

Offers theoretical or experimental work under individual faculty supervision. An independent study must be petitioned and approved by the academic advisor. The petition must clearly state the reason for taking the course; a brief description of goals; as well as the expected outcomes, deliverables, and grading scheme. Master's degree students in thesis or project options are not eligible to take independent study.

IE 7990. Thesis. 1-8 Hours.

Offers analytical and/or experimental work conducted under the direction of the faculty in fulfillment of the requirements for the degree. Requires first-year students to attend a graduate seminar program that introduces the students to the methods of choosing a research topic, conducting research, and preparing a thesis. Requires successful completion of the seminar program. May be repeated without limit.

IE 7996. Thesis Continuation. 0 Hours.

Continues thesis work conducted under the supervision of a departmental faculty member.

IE 8960. Candidacy Preparation—Doctoral. 0 Hours.

Offers students an opportunity to prepare for the PhD qualifying exam under faculty supervision. Intended for students who have completed all required PhD course work and have not yet achieved PhD candidacy; students who have not completed all required PhD course work are not allowed to register for this course. May be repeated once.

IE 8986. Research. 0 Hours.

Offers students an opportunity to conduct full-time research under faculty supervision. May be repeated without limit.

IE 9000. PhD Candidacy Achieved. 0 Hours.

Indicates successful completion of program requirements for PhD candidacy.

IE 9986. Research. 0 Hours.

Offers students an opportunity to conduct full-time research under faculty supervision. May be repeated without limit.

IE 9990. Dissertation. 0 Hours.

Offers dissertation supervision under individual faculty supervision. May be taken twice for course credit. May be repeated once.

IE 9996. Dissertation Continuation. 0 Hours.

Offers continuing dissertation supervision under individual faculty supervision. May be repeated without limit.

Information Assurance (IA)

Search IA Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=IA>)

IA 7990. Thesis. 2-4 Hours.

Offers selected work with the agreement of a project supervisor. May be repeated without limit.

IA 9990. Dissertation. 4 Hours.

Offers selected work with the agreement of a thesis supervisor. May be repeated once.

IA 9996. Dissertation Continuation. 0 Hours.

Continues work with the agreement of a thesis supervisor. May be repeated without limit.

Information Resources Management - CPS (IRM)

Search IRM Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=IRM>)

IRM 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

Information Science (IS)

Search IS Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=IS>)

IS 1500. Introduction to Web Development. 4 Hours.

Introduces Web development and networks. Discusses HTML5, CSS, and client-side scripting with JavaScript and jQuery; embedding of media: images, video, and sound; the use of back-end data (either from databases or XML) to create dynamic Web sites; Web hosting, operating systems, and network infrastructure; and the automation of website construction using content management systems. Considers the construction of Web forms and the underlying protocols for information exchange: HTTP and HTTPS. Emphasizes the need for testing both correctness and usability. Offers a brief introduction to server-side scripting. Surveys the security problems faced by dynamic websites. Hands-on laboratory work is built into the course. May be taken as a general elective by CCIS students but does not count as a CS or IS elective.

IS 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

IS 2000. Principles of Information Science. 4 Hours.

Introduces information science. Examines how information is used to solve problems both for individuals and organizations and how information systems interface with their users. Considers the technical, economic, social, and ethical issues that arise when working with information. Discusses how to collect, manage, classify, store, encode, transmit, retrieve, and evaluate data and information with appropriate security and privacy. Storage models include lists, tables, and trees (hierarchies). Examines applications of information: visualization, presentation, categorization, decision making, and predictive modeling. Introduces key concepts in probability. Explains Bayesian analysis for information classification and modeling. Teaches intensive programming in Excel, including VBA macro development. Introduces programming in R.

IS 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

IS 2991. Research in Information Science. 1-4 Hours.

Offers an opportunity to conduct introductory-level research or creative endeavors under faculty supervision.

IS 3500. Information System Design and Development. 4 Hours.

Discusses the planning, analysis, design, and implementation of computer-based information systems, focusing on the methodologies and procedures used in organizational problem solving and systems development. Topics include the systems development life cycle; project management; requirements analysis and specification; feasibility and cost-benefit analysis; logical and physical design; prototyping; and system validation, deployment, and postimplementation review. Additional topics may include platform and database selection and integration issues; CASE tools; end-user training; maintenance; and object-oriented analysis and design.

IS 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

IS 4200. Information Retrieval. 4 Hours.

Introduces information retrieval (IR) systems and different approaches to IR. Topics covered include evaluation of IR systems; retrieval, language, and indexing models; file organization; compression; relevance feedback; clustering; distributed retrieval and metasearch; probabilistic approaches to IR; Web retrieval; filtering, collaborative filtering, and recommendation systems; cross-language IR; multimedia IR; and machine learning for IR.

IS 4300. Human Computer Interaction. 4 Hours.

Studies the principles of human-computer interaction and the practice of user interface design. Discusses the major human information processing subsystems (perception, memory, attention, and problem solving), and how the properties of these systems influence the design of interactive systems. Reviews guidelines and specification languages for designing user interfaces, with an emphasis on tool kits of standard graphical user interface (GUI) objects. Introduces usability metrics and evaluation methods. Additional topics may include World Wide Web design principles and tools; wireless/mobile device interfaces; computer-supported cooperative work; information visualization; and virtual reality. Course work includes designing user interfaces, creating working prototypes using a GUI tool kit, and evaluating existing interfaces using the methods studied.

IS 4600. Software Project Management. 4 Hours.

Covers both technical and managerial aspects of software project management, which is critical to the success of software projects. Emphasizes the differences between traditional software life-cycle models and modern iterative and agile practices. Includes project manager responsibilities, stakeholder management, staffing, resource allocation, estimation, activity scheduling, budget control, quality management, risk assessment, communication, scope control, and project metrics. Introduces standard project management tools combined with control mechanisms including PERT, burndown, and Gantt charts. Examines these methods in the context of standard frameworks, including the Project Management Body of Knowledge (PMBOK), applicable IEEE Standards, ISO 9001, CMMI, Unified Process, Scrum, and Kanban-driven continuous delivery models.

IS 4700. Social Information Systems. 4 Hours.

Analyzes popular social information systems, including online social networks, blogging platforms, recommendation engines, and content sharing sites. Studies the objectives, user interaction modes, policies, and design issues for social information systems. Introduces relevant theories, both computational and sociological, that model the behavior of social networks and their users. Offers students an opportunity to learn to apply such models, both theoretically and by analyzing real-world interaction data from social information systems, to answer questions such as: What causes users to form links? What mechanisms work best for encouraging collaboration? How does information spread through cyberspace? How can security and privacy goals be achieved?

IS 4800. Empirical Research Methods. 4 Hours.

Evaluates and conducts empirical research, focusing on students' use of empirical methods to study the effectiveness and organizational/social impact of information systems and technologies. Empirical research involves a number of broad steps including identifying problems; developing specific hypotheses; collecting data relevant to the hypotheses; analyzing the data; and considering alternative explanations for the empirical findings. Some of the most commonly used research techniques, such as surveys, experiments, and ethnographic methods, are discussed. Additional topics include the ethics of data collection and experimentation in behavioral science. Although the course focuses primarily on the relationship between formulating research questions and implementing the appropriate methods to answer them, students can expect to apply the statistical techniques learned in the course prerequisites.

IS 4900. Information Science Senior Project. 5 Hours.

Helps students develop a sophisticated understanding of the interaction between technology and its context. Students write an in-depth research paper that reflects upon and analyzes the observations and experiences of the field study using the information science literature to interpret and better understand those experiences. Students then participate in a seminar in which they present the results of their research.

IS 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

IS 4991. Research. 4,8 Hours.

Offers an opportunity to conduct research under faculty supervision. May be repeated up to three times.

Information Systems Program (INFO)

Search INFO Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=INFO>)

INFO 5100. Application Engineering and Development. 4 Hours.

Covers the basics of Java programming such as arrays, control structures, class definitions, class hierarchies, inheritance, objects, streams, constructors, collections, and GUI components. Describes how to develop and execute Java applications and incorporates several programming projects, which strengthen the understanding of object-based and event-driven programming. Provides the student with the opportunity to achieve a strong working competency in object-oriented programming using the Java programming language.

INFO 5101. Lab for INFO 5100. 0 Hours.

Accompanies INFO 5100. Provides additional instruction in Java programming.

INFO 6101. Data Science Engineering with Python. 4 Hours.

Studies the Python programming language with data science as the application domain. Offers students an opportunity to learn how to perform complex numerical calculations, fixed data types, space efficiency, and vector manipulations. Covers tools and techniques for manipulating tables, spreadsheets, and group and pivot tables involving extremely large data sets. Covers large multidimensional arrays and matrices and the high-level mathematical functions to operate on these arrays. Studies how to use Python to manipulate the classic math and science algorithms. Analyzes helper functions such as linear and nonlinear regression, integration, Fourier transformations, numerical optimization, etc. Includes higher-level classes for manipulating and visualizing data. Applies tools and techniques to classical data science using cases such as time series forecasting, social network analysis, text analytics, and big data processing.

INFO 6105. Data Science Engineering Methods and Tools. 4 Hours.

Introduces the fundamental techniques for machine learning and data science engineering. Discusses a variety of machine learning algorithms, along with examples of their implementation, evaluation, and best practices. Lays the foundation of how learning models are derived from complex data pipelines, both algorithmically and practically. Topics include supervised learning (parametric/nonparametric algorithms, support vector machines, kernels, neural networks, deep learning) and unsupervised learning (clustering, dimensionality reduction, recommender systems). Based on numerous real-world case studies.

INFO 6150. Web Design and User Experience Engineering. 4 Hours.

Exposes students to both conceptual and technical aspects of Web design. User experience design is the discipline of creating a useful and usable website or application that is easily navigated and meets the needs of both the site owner and its users. Covers Web standards and best practices. Studies the fundamental concepts, techniques, practices, work flows, and tools associated with the practice of user-experience design in Web interfaces. Offers students an opportunity to learn the core principles of information architecture, usability, marketing hierarchy, and user experience for contextual, value-driven websites. Additional areas of focus include typography, color theory and composition, responsive design, CSS3 concepts, basic scripting, and JavaScript libraries to create functional, effective, and visually appealing websites.

INFO 6205. Program Structure and Algorithms. 4 Hours.

Presents data structures and related algorithms, beginning with a brief review of dynamic memory allocation. Discusses the fundamental data structures in detail, including the abstract representation, supporting algorithms, and implementation methods. Focuses on understanding the application of the abstract data structure and the circumstances that affect implementation decisions. Covers lists, stacks, queues, trees, hash tables, and graphs. Covers recursion and searching and sorting algorithms in detail. Emphasizes data abstraction and encapsulation in code design. Explores external storage structures, time permitting.

INFO 6210. Data Management and Database Design. 4 Hours.

Studies design of information systems from a data perspective for engineering and business applications; data modeling, including entity-relationship (E-R) and object approaches; user-centric information requirements and data sharing; fundamental concepts of database management systems (DBMS) and their applications; alternative data models, with emphasis on relational design; SQL; data normalization; data-driven application design for personal computer, server-based, enterprisewide, and Internet databases; and distributed data applications.

INFO 6215. Business Analysis and Information Engineering. 4 Hours.

Covers computer information systems and the decision-making process, determination of information requirements, system development life cycle, and system modeling and analysis. Uses a hands-on approach to introduce the student to software engineering methodologies and practices, business requirements specification, business process design, model-driven object-oriented design, software development, and maintenance. Emphasizes the effective leverage of the Unified Modeling Language (UML) to transform business issues and objectives to concrete software solutions that meet business needs and usability and user interface design as critical elements of a successful software engineering engagement.

INFO 6245. Planning and Managing Information Systems Development. 4 Hours.

Provides an overview of the most popular information systems needs' assessment methodologies including portfolio analysis, stage assessment, business systems planning, and the Alloway survey technique. Topics include utilities IS strategic plan prioritization techniques of business goal alignment, architectural compatibility, and cost/benefit and risk analysis to demonstrate how businesses match needs to budgetary constraints. Describes and evaluates options for the placement of the IS function within the organization and a variety of methods to manage the function. Introduces a generic application development and project planning methodology used as a model to facilitate the development of a four-stage project plan for a prototype project. Uses the Project Management Institute's PMBOK and Harvard Business School case studies extensively.

INFO 6250. Web Development Tools and Methods. 4 Hours.

Explores advanced server-side technologies and tools necessary to design and engineer complete web-based enterprise applications quickly. Designed to build on previous experience to cover the life cycle of a web-based application. Focuses on MVC web development frameworks to build server-side, data-intensive, and multitier web applications. Additionally, discusses designing rich internet applications (RIA) using AJAX and service-oriented architecture (SOA) using REST.

INFO 6251. Lab for INFO 6250. 0 Hours.

Accompanies INFO 6250. Offers additional instruction in Web tools discussed in class.

INFO 6255. Software Quality Control and Management. 4 Hours.

Examines techniques for the management and evolution of software systems. Topics include managing software as an asset; life cycle development and rapid development technologies; maintainability; quality assurance of software systems including testing strategies and problem analysis; software risk analysis; analysis of software project failures; process models, such as CMM and ISO 9001; configuration management; and the impact of new development technologies on software management.

INFO 6350. Smartphones-Based Web Development. 4 Hours.

Covers application development for mobile devices using advanced development platforms. Focuses on how to write mobile applications using cross-platform development tools and processes. Topics include user interfaces, the software life cycle, persistent storage, networking using HTTP and other REST interfaces, and mobile/handheld data applications. Requires a final project.

INFO 6660. Business Ethics and Intellectual Property for Engineers. 4 Hours.

Seeks to support successful engineering careers by offering students an applied understanding of ethical principles in the workplace and fundamentals of intellectual property and the American legal system. Seeks to increase students' awareness of the ethical implications of their work and to influence colleagues to think and act in a socially cognizant manner. Introduces ethical principles and codes of professional ethics; types of intellectual property (patents, trade secrets, trademarks, copyrights); and fundamentals of the American legal system (sources of American law, contracts, torts, intellectual property, antitrust). Offers students an opportunity to practice verbal communication and presentation skills; develop an applied understanding of the relationship and differences between legal liability and ethical behavior; and develop applied critical thinking, communication, and presentation skills.

INFO 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

INFO 6964. Co-op Work Experience. 0 Hours.

Provides eligible students with an opportunity for work experience. May be repeated without limit.

INFO 6965. Co-op Work Experience Abroad. 0 Hours.

Provides eligible students with an opportunity for work experience abroad. May be repeated without limit.

INFO 7225. Accounting and Budgetary Systems for Engineers. 4 Hours.

Covers the latest engineering principles necessary for building complex software systems that comply with recognized standards in the financial industry. With automated business processes today, risk and responsibility are shifting to information technology (IT) systems. Offers students an opportunity to learn how to incorporate information-based controls related to the financial industry that signal trouble, detect violations, and provide accountability, as well as a working approval process. Emphasizes software design. Seeks to help engineers construct complex software from a sophisticated engineering perspective. Examines how to put together cutting-edge organizational systems that people in the financial world can put to good use. Designed to prepare students for jobs in the building, maintaining, and employment of such information systems.

INFO 7245. Agile Software Development. 4 Hours.

Offers students an opportunity to achieve a high level of practical understanding of software development life cycle (SDLC) with emphasis on agile and adaptive incremental methodologies. Examines techniques for the management and evolution of software systems, including project planning from requirements gathering, analysis, estimation, and releasing using a hands-on approach to implement agile methodologies. Also covers maintainability, including software risk analysis, project retrospectives, and process models such as capability maturity model, configuration management, and their practical implementation.

INFO 7250. Engineering of Big-Data Systems. 4 Hours.

Introduces a general framework for thinking about big data. Services such as Web analytics and intelligent e-commerce have promoted a rapid increase in the volume of data generated, analyzed, and archived. In order to solve the problems related to big data, a newer type of database product has emerged. Covers how to apply technologies like Hadoop, Accumulo, MongoDB, and various NoSQL databases to build simple, robust, and efficient systems to manage and analyze big data. Also describes an easy approach to big data systems that can be built and run by a small team of students. Guides students through the theory of big data systems, how to implement them in practice, and how to deploy and operate them once they are built.

INFO 7255. Advanced Big-Data Applications and Indexing Techniques. 4 Hours.

Studies advanced indexing techniques and algorithms for big-data platforms such as Hadoop and NoSQL databases. Covers big-data design and indexing patterns to organize, aggregate, manipulate, and analyze huge amounts of data beyond human scale. Offers students an opportunity to learn advanced techniques to improve the performance and robustness of the advanced big-data programming models. Additional areas of focus include scalable graph databases, advanced indexing, and full-text searching in graph databases.

INFO 7260. Business Process Engineering. 4 Hours.

Addresses the question of how to understand and specify the flow of work responsibility and movement of information throughout the enterprise. For businesses to maximize the benefits of technology, they must transform their ad-hoc and often poorly defined ways of doing things to formal business processes. Analyzes the specification and implementation of complex information systems that integrate well into core business operations. Offers students an opportunity to learn how to use agile process specification techniques, dynamic process execution, and real-time measurement and reporting to support continuous business improvement and change.

INFO 7275. Advanced Database Management Systems. 4 Hours.

Introduces the skill set required to become a serious database applications developer. Offers an overview of the Oracle9i object-relational database system for those who have mastered the fundamental principles of database design and are competent with basic SQL. Gives students the opportunity to develop a strong understanding of the PL/SQL programming language, which is used to create triggers, user-generated functions, stored procedures, and packages for programming Oracle objects. Emphasizes advanced SQL features and Oracle-specific SQL enhancements. Covers optimization and tuning issues. Covers corresponding material for Transact-SQL (used for Microsoft SQL Server and Sybase database systems) as time and resources permit.

INFO 7285. Organizational Change and IT. 4 Hours.

Focuses on the change effort needed to integrate a project into the firm's organizational structure, culture, business, and process metrics. Geared for students undertaking enterprise resource planning systems, or those involved in small or large organizational reengineering projects designed to make IT a primary focus of the firm's business strategy. Topics include management theories and organizational design principles; strategy and critical success factor formulation; methods to reach information systems maturity; business process modeling techniques; quality, the mindset, and the problem-solving tools; human resource, cultural, and technical change enablers; how to plan a business reengineering project; and implementation of major organizational change.

INFO 7290. Data Warehousing and Business Intelligence. 4 Hours.

Examines the technical and management aspects of building a data warehouse. Explores the architecture, infrastructure, processes, data quality, database design, and data analysis involved in building the data warehouse for business analysis. Management issues include business goals, tool selection, project management, personnel skills, training, and user requirements. Topics include dimensional data modeling, extraction/transformation/load processes, data quality problems, datamarts, operational data stores (ODS), staging databases, and online analytic processing (OLAP).

INFO 7300. Engineering Cybersecure Software Systems. 4 Hours.

Addresses design and implementation issues critical to producing cybersecure software systems by using a software development perspective. Deals with the question of how to make the requirements for confidentiality, integrity, and availability integral to the software development process from requirements gathering to design, development, configuration, deployment, and ongoing maintenance. Covers emerging software life-cycle practices that address both cybersecurity problems caused by bad software practices that leave software vulnerable to cyberattack and other software vulnerabilities that are caused by deficiencies in modeling of security requirements, architecture, and design issues.

INFO 7325. Introduction to Information Technology Auditing. 4 Hours.

Designed to provide a foundation for the study and professional career development of information technology (IT) auditing. Introduces the fundamentals of IT auditing, core reasons why this is a specialized area of auditing, and the principle objectives of IT auditing and its relationship to integrated financial or operational auditing. Offers an insight into management's objectives regarding IT risk management. Uses the Cobit governance and control framework to emphasize management issues regarding control of IT and the achievement of value through managed IT processes. Introduces three primary types of IT audits: the audits of computerized information systems, IT processing environments, and the process of developing and implementing information systems.

INFO 7330. Information Systems for Healthcare-Services Delivery. 4 Hours.

Addresses the important information systems questions facing the delivery and assessment of healthcare services from administrative, financial, and clinical perspectives. These include the use of electronic medical records; health information exchanges; and performance evaluation of providers, patients, and payers. Provides an introduction on how healthcare is delivered. Also focuses on various information management tools being implemented as well as those needed to move care delivery and quality forward.

INFO 7365. Enterprise Architecture Planning and Management. 4 Hours.

Defines IT strategies for implementing business-driven and technology-based modernization programs, companywide. Covers how to institute improved IT infrastructures to facilitate strategically informed decisions, at all hierarchical levels, across all business units and functional boundaries. Studies the strategies, programs and projects, business models, methods, and technologies needed to bring about deliberate enterprise-scale change as business strategies evolve. Offers students an opportunity to learn how to construct enterprise architectures and use them as road maps to budget scarce capital investment resources to IT development projects. Topics include system interoperability, business and technology alignment, system flexibility and adaptability to change, IT planning, and effective communication with the management leadership.

INFO 7370. Designing Advanced Data Architectures for Business Intelligence. 4 Hours.

Focuses on designing advanced data architectures supporting structured, unstructured, and semistructured data sources; hybrid integration and data engineering; and analytical uses by casual information consumers, power users, and data scientists. Technologies include databases (relational, columnar, in-memory, and NoSQL); hybrid data, application, and cloud integration; data preparation; data virtualization; descriptive, diagnostic, predictive, and prescriptive analytics; and on-premise and on-cloud deployments. Topics include data structures, data models, data integration workflow and data engineering, data integration, data preparation, and data virtualization.

INFO 7374. Special Topics in Information Systems. 1-4 Hours.

Covers state-of-the-art material of current interest. May be repeated without limit.

INFO 7375. Special Topics in Artificial Intelligence Engineering and Applications. 1-4 Hours.

Covers recent advances in neural nets and deep learning techniques with applications to large-scale engineering problems.

INFO 7385. Managerial Communications for Engineers. 4 Hours.

Focuses on communication strategies and tactics for engineers at the interpersonal, team, and organizational level. Course topics include forms (oral and written), styles, and differences in communication; coaching and giving feedback to staff; and building teams, managing conflict, and special topics in organizational communication. The primary goal is to strengthen the students' social and emotional intelligence skills to help them progress along their engineering career path. Combines academic content with practical skill-building activities.

INFO 7390. Advances in Data Sciences and Architecture. 4 Hours.

Covers a wide range of skills and responsibilities that are necessary for managing complex business performance and operational data. Such data tend to be fragmented, poorly organized, and often flawed. Offers students an opportunity to learn how a more up-to-date mapping of complex data works and to be alerted to the care and attention they must give to such a task as well as the implications of the results. Covers best practices for managing all aspects of the data transformation life cycle, covering broad areas such as requirements gathering, meta-model design, data integration and transformation, as well as implementation and ongoing operations. Discusses tools for mapping fragmented data into business intelligence solutions that guide successful strategies.

INFO 7405. Advances in Engineering Medical Information Systems. 4 Hours.

Focuses on the fundamentals of engineering patient medical records as timelines of medical encounters that capture critical clinical decisions made in various contexts such as assessments, diagnoses, treatments, etc. Emphasizes semantically rich clinical information models to support predictive analysis in order to recognize patterns of disease early. Record systems typically focus on data recording for legal purposes, ignoring the critical needs of patients and caregivers. Introduces innovative software design and architecture techniques that recognize the complex interaction between patients and caregivers, provide immediately available detailed information for both, and thus invigorate clinical workplaces. Covers techniques for engineering medical applications as sociotechnical systems that promote the safety, effectiveness, and efficiency of core clinical operations.

INFO 7500. Cryptocurrency and Smart Contract Engineering. 4 Hours.

Seeks to provide a detailed understanding of the function and deployment of smart contracts using the Solidity language. Digs deep into the technical design and operation of blockchain platforms and specifically the implementation of smart contracts for operationalizing business processes. Offers students an opportunity to practice the development of decentralized autonomous organization applications using blockchain scripting languages.

INFO 7510. Smart Contract Application Engineering and Development. 4 Hours.

Emphasizes the essential coding skills for implementing self-enforcing, multiparty, mutually beneficial, contractual rights and obligations on top of blockchain technologies. Offers students an opportunity to learn how to leverage the principles and mechanisms of “decentralized autonomous organization” to programmatically coordinate the interaction between participating parties at a global scale without the need for trusting a third party and how to build blockchain-type applications that automate the interaction of a network of participating entities such as buyers, sellers, suppliers, insurance, and finance.

INFO 7520. Engineering of Advanced Cryptocurrency Systems. 4 Hours.

Addresses programming and information systems aspects of bitcoin and other cryptocurrencies. Topics covered include fundamentals of bitcoin mining, the theory of distributed consensus, principles of strong anonymity and untraceability, smart contract security, and peer-to-peer networking. Offers students an opportunity to learn about current developments in, and challenges facing, the use of cryptocurrencies in terms of the computing platform and systems integration. Students also have an opportunity to gain practical experience through challenging programming projects.

INFO 7525. Regulatory Aspects of Smart Contract Automation. 2 Hours.

Addresses the legal implication of using the blockchain to transfer and exchange money, perform trade transactions, maintain ownership of property, and enforce contractual obligations in secure and cost-effective ways. These applications present significant legal challenges in finance, property rights, and general commercial contracts in all industries. Offers students an opportunity to acquire the tools to engineer systems that adhere to existing and evolving regulatory frameworks. Highlights challenges around the issues of taxation, financial crimes, and money laundering, since blockchain technologies were designed to facilitate cross-border transactions.

INFO 7530. Engineering Multiparty Autonomous Agent Systems. 2 Hours.

Examines how to extend multiagent distributed systems methods and tools to solve complex problems meant to run on the blockchain using smart-contract programming languages such as Solidity and others. Blockchain technology and multiagent distributed systems theory share common ground. Both are characterized by autonomy, localized knowledge, and independence. Offers students an opportunity to deepen their studies of how to build systems that deliver system-level results through the interaction of simple agents or participants. Each party independently determines its response to the state of its local environment and the interactions with other parties on the blockchain.

INFO 7535. Digital Smart Contracts Product Innovations. 2 Hours.

Addresses the issue of how blockchain technology creates new ways of doing business. Blockchain technology uses bitcoin cryptocurrency to create value in a virtual setting. By linking the blockchain with real currency and the financial system, data, as well as business processes, a new breed of products and services can be realized. Explores innovative and disruptive applications of the blockchain.

INFO 7610. Special Topics in Natural Language Engineering Methods and Tools. 4 Hours.

Covers the latest techniques in natural language processing with applications to unstructured data.

INFO 7962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

INFO 7978. Independent Study. 1-4 Hours.

Offers work performed under individual faculty supervision. May be repeated without limit.

Information Technology - CPS (ITC)

Search ITC Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=ITC>)

ITC 1000. Computer Applications. 3 Hours.

Offers a beginning course in computer productivity tools for those with little or no prior experience. Introduces basic elements of organizing computer files and folders and of creating word processing documents, spreadsheets, and presentations. Requires a Windows environment.

ITC 1100. Human-Computer Interaction. 3 Hours.

Surveys human-computer interaction concepts, theory, and practice, focusing on its interdisciplinary nature. Describes the principles of human-computer interaction and the practice of user interface design. Discusses the major human information processing subsystems (perception, memory, attention, and problem solving), and introduces usability metrics and evaluation methods.

ITC 1200. Operating Systems Concepts. 3 Hours.

Introduces students to the basic structure and organization of computer operating systems. Examines the functional characteristics of major computer components and their relationship to control by software. Topics include general computer organization and configuration. Compares characteristics of different operating systems such as Windows and UNIX.

ITC 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ITC 2000. Principles of Systems Analysis and Design. 3 Hours.

Introduces the methodologies, models, tools, and techniques used in modern system development. Topics covered include project life-cycle models, project management techniques, requirements elicitation, use-case analysis, business rules, system design approaches, and graphic modeling with the Unified Modeling Language (UML). Offers students an opportunity to analyze and document a business case; complete a system analysis; and design, model, and prepare a project plan.

ITC 2016. End-User Data Analysis Tools. 3 Hours.

Focuses on technical skills used for acquiring and analyzing data with advanced spreadsheet tools and with end-user database software. Students use advanced word processing techniques to present the results of data analysis. Expects students to already have basic skills in word processing and spreadsheet applications. Course uses Windows-based applications.

ITC 2020. Digital Collaboration and Team Building. 3 Hours.

Offers a course for students with advanced skills in productivity tools who would benefit from learning about effective strategies in using online collaboration tools in order to be more effective communicating with classmates and colleagues who are not colocated. Utilizes the main functionalities of collaborative platforms. Emphasizes data gathering, analysis, and sharing.

ITC 2100. Introduction to Programming (Java). 3 Hours.

Offers a hands-on first programming course for those with no prior programming experience. Covers basic programming logic and syntax. Uses object-oriented programming concepts, including arrays, methods, classes, and instantiation. Offers students an opportunity to code stand-alone computer applications with graphical user interfaces (GUI) using modern interactive development tools.

ITC 2200. Networking Foundations. 3 Hours.

Introduces principles of computer networks, network architectures, network topologies, network protocols, and layering concepts. Addresses both theoretical aspects, such as performance modeling and analysis, and practical considerations of implementing Internet protocols.

ITC 2300. Database Management Systems. 3 Hours.

Introduces Structured Query Language (SQL). Topics include designing normalized data tables for use in a relational database management system, creating entity-relationship models, database transaction processing, and security.

ITC 2400. Web and Mobile Development. 3 Hours.

Studies modern markup languages and standards (HTML5 and CSS) for cross-platform webpages and applications. Through lectures, discussions, and hands-on projects, offers students an opportunity to learn common best practices in graphical interface design and usability for different target audiences. They then have an opportunity to apply these design skills by refining creative designs into websites through an iterative process of creating hand-drawn storyboards, then coding wireframes, adding basic web content, and finally making pages responsive so that they are suitable for a variety of mobile devices. Webpage artifacts include tables, images, links, and simple apps.

ITC 2430. E-Commerce Systems. 3 Hours.

Introduces the theory and practice of doing business on the Internet. Begins with the infrastructure that makes e-commerce possible, including Internet protocols, Internet applications, and Internet languages. Examines e-commerce software, e-commerce security issues, and e-commerce payment systems. Topics in business strategies for e-commerce include purchasing, electronic data interchange, supply chain management, virtual communities, and Web portals. Offers students an opportunity to understand how tools and strategies may be applied to e-business models, including business-to-business (B2B) and business-to-consumer (B2C). Examines international, legal, and ethical issues as they relate to e-commerce.

ITC 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ITC 3100. Advanced Applications Development. 3 Hours.

Extends introductory programming concepts. Focuses on developing complex end-user applications that address a business problem or opportunity. Topics include utilizing database interfaces and managing user sessions.

ITC 3150. Database Websites. 3 Hours.

Offers students an opportunity to integrate relational databases into webpages. Covers how to query, update, and manage databases. Emphasizes using basic programming techniques (loops, conditionals, built-in functions) to interact with existing relational databases. All software used in the course is open source and runs on a variety of platforms.

ITC 3220. Mobile and Wireless Networking. 3 Hours.

Covers technologies used for wireless and mobile business applications. Topics include wireless network protocols, cellular phone carriers, wireless platform operating systems, and wireless security issues.

ITC 3250. UNIX Systems Administration. 3 Hours.

Covers the essential skills needed to manage the day-by-day operations of a UNIX computer system. Topics include techniques for adding new users and groups and management of the file system, focusing on access controls. Covers backup plans and techniques as well as job scheduling and basic networking in the UNIX environment. Offers students an opportunity to build shell scripting skills.

ITC 3300. Structured Query Language (SQL). 3 Hours.

Covers concepts and techniques for manipulating relational databases. Offers students an opportunity to learn to code native SQL for creating and accessing data tables, indexing, arithmetic operations, loops, arrays, multiple table processing, I/P operations, data-type conversions, and views.

ITC 3320. Data Warehousing Technologies. 3 Hours.

Offers students an opportunity to learn how organizations construct and maintain data warehouses built from operational databases. Topics include a comparison of data warehouse architectures, how to build a data warehouse, and how to structure databases for efficient data analysis.

ITC 3400. Web Design and Multimedia. 3 Hours.

Covers the history of multimedia technology, focusing on the uses of multimedia in website development. Examines the technical and design aspects of basic components of multimedia: text, audio, graphics, video, sound, animation, and virtual reality. Emphasizes the use of multimedia in user interfaces. This is a hands-on course in which students practice techniques throughout the course.

ITC 3620. Legal and Ethical Issues in Cybersecurity. 3 Hours.

Describes the legal and ethical issues associated with information security. Emphasizes national and international laws relating to information assurance and data use and emerging technologies for management of digital rights. Examines criminal activities such as computer fraud and abuse, desktop forgery, embezzlement, child pornography, computer trespass, and computer piracy.

ITC 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ITC 4200. Network Security. 3 Hours.

Explores the theory and practice of computer security, focusing on the security aspects of multiuser systems and the Internet. Topics include cryptography concepts, firewalls; viruses; two-tier authentication; Trojan horses; password security; biometrics; VPNs; Internet protocols such as SSL, IPsec, PGP, SNMP, SSH; and others.

ITC 4260. Database Administration. 3 Hours.

Offers students an opportunity to obtain a conceptual understanding of the database architecture and how the various components work and interact with each other. Topics include the creation and maintenance of a relational database. Practical hands-on training includes management of database instances, log files, control files, backup management, and an understanding of the data dictionary.

ITC 4500. IT Project Management. 3 Hours.

Covers the tools and techniques used to manage information technology (IT) projects. Topics include project planning, scheduling, and budgeting and project management tools (PERT/CPM/Gantt). Discusses all phases of IT projects from proposal evaluation through postimplementation reviews. Offers students an opportunity to plan and develop a project that provides a practical application of the topics covered in class.

ITC 4600. Information Security Management. 3 Hours.

Covers management issues occurring within the field of information security. Topics include asset classification and control (protecting the most valuable information of the organization); personnel security (employee awareness); security as a part of everyday communications and operations; business continuity management; and compliance (legal, internal/external, audit, and other concerns).

ITC 4650. Compliance and Risk Issues in Information Technology. 3 Hours.

Explores questions such as: Are your IT systems built, used and managed according to organizational policies? Are they in compliance with international, national, and local legal requirements? What are the potential risks and legal liabilities associated with your IT systems and procedures? Seeks to develop frameworks for assessing gaps between what your organization is doing and should be doing to protect the organization and its stakeholders.

ITC 4660. Encryption Concepts. 3 Hours.

Surveys the principles and the practices of encryption and cryptography and the core encryption algorithms used in digital communication. Discusses core information assurance building blocks—such as authentication, digital signatures, key management, and digital certificates—and applies these concepts to important security architectures, including the IP networks and the cellular system.

ITC 4670. Software Vulnerabilities. 3 Hours.

Seeks to help students to become aware of systems software security issues and to gain a basic understanding of software security measures. Discusses software in use today, their related vulnerabilities, and how they are exploited. Examines protection and detection techniques and the secure software development life cycle.

ITC 4680. Forensics in Information Technology. 3 Hours.

Explores the techniques used in computer forensic examinations. Examines computer hardware, physical and logical disk structure, and computer forensic techniques. Builds awareness of the tools and techniques to investigate, seize, and analyze computer-based evidence.

ITC 4840. Preparation for Information Technology Project. 3 Hours.

Offers students an opportunity to apply their knowledge of systems analysis to develop a comprehensive written business case for an IT project. Reviews the principles of developing a business case and high-level solution model. Working closely with the instructor, students are asked to identify a technological need of actual interest for local companies, communities, or students' workplace; research the legal, marketing, social, and organizational viability of providing a solution; and follow the systems analysis process to develop a comprehensive written proposal that documents user requirements, alternative solutions, and the selection of the most appropriate solution. The goal is to develop a formal project plan for actual execution of the solution in ITC 4850.

ITC 4850. Information Technology Project. 3 Hours.

Offers students an opportunity to apply their knowledge of systems analysis to develop a comprehensive written business case for an IT project. Reviews the principles of developing a business case and high-level solution model. Working closely with the instructor, students are asked to identify a technological need of actual interest for local companies, communities, or students' workplace; research the legal, marketing, social, and organizational viability of providing a solution; and follow the systems analysis process to develop a comprehensive written proposal that documents user requirements, alternative solutions, and the selection of the most appropriate solution. A formal project plan is then developed for actual execution of the solution.

ITC 4955. Project. 1-4 Hours.

Provides students with an opportunity to demonstrate the skills they have learned throughout the program by developing an end-to-end proposal and plan for an IT application and the infrastructure it relies on. The project requires a justification, a budget, an architecture document, a presentation, and a project plan. May be repeated without limit.

ITC 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ITC 6000. Database Management Systems. 3 Hours.

Covers the use and capabilities of modern database management systems with an emphasis on performance and reliability. After a brief review of conceptual data models and database design, the focus moves to the underlying technology—database engines, storage and indexing, memory use, the relational model, normalization/de-normalization, query processing, and SQL. Also discusses the need for and design of concurrency control, integrity, security, and recovery capabilities.

ITC 6010. Information Technology Strategy and Governance. 3 Hours.

Focuses on the strategic use of information technology (IT) from a business perspective at the enterprise level. Covers business fundamentals and a strategic framework for aligning organizational strategy, core competencies, and information systems. Covers strategic IT management, including IT policy and governance, accountability frameworks, financial analysis, risk management, and legal compliance issues.

ITC 6015. Enterprise Information Architecture. 3 Hours.

Introduces the theory, framework/model, methodology, and tools that enhance business and organizations' ability to discover, access, and understand data and to integrate IT and information resources, with an ultimate goal to produce information needed to make critical decisions and support business functions. Data and information management is critical to modern businesses. Covers best practices using cases studies in a more practical, comprehensive approach to delivering the subject matter involving the application of tools.

ITC 6020. Information Systems Design and Development. 3 Hours.

Discusses the planning, analysis, design, and implementation of computer-based information systems, focusing on the methodologies and procedures used in organizational problem solving and systems development. Topics include the systems development life cycle; project management; requirements analysis and specification; feasibility and cost-benefit analysis; logical and physical design; prototyping; system validation, deployment, and postimplementation review. Additional topics may include platform and database selection and integration issues, CASE tools, end-user training, maintenance, and object-oriented analysis and design.

ITC 6030. Computer Systems and Networks. 3 Hours.

Introduces the basic concepts of computer systems and networks. Covers operating system services, file systems, resource management, synchronization, the concept of a process, and process cooperation and interference. Introduces networks, including network architectures, network protocols, and communication paradigms (point-to-point, multicast/broadcast, and connectionless vs. connection-oriented). Uses examples from real operating systems and networks (Unix, Linux, Windows, TCP/IP, and Ethernet) to reinforce the concepts.

ITC 6035. Information Technology Project Management. 3 Hours.

Covers the tools and techniques used to manage information technology (IT) projects. Topics include project planning, scheduling, and budgeting; project management tools (i.e., PERT/CPM/GANTT); and human resources management. Discusses all phases of IT projects from proposal writing through postrelease maintenance issues. Offers students an opportunity to plan and develop a project that provides a practical application of the topics covered in class.

ITC 6040. Informatics Capstone. 3 Hours.

Offers students an opportunity to produce a polished paper, presentation, or product that reflects their training and focus in the fields of information systems (IS) and information technology (IT). Emphasizes aspects of integrating IS systems, technical architectures, and enterprise functions. Also offers students an opportunity to incorporate issues involving research and development or business and market strategies. Strongly encourages students to create a portfolio piece that can be shown to potential employers or current supervisors.

ITC 6045. Information Technology Policy, Ethics, and Social Responsibility. 3 Hours.

Explores the policy choices, ethical issues, and legal obligations faced by organizations in the information age. Topics include intellectual property, freedom of expression, privacy, national security, impact of information technology (IT) on the work and home lives of employees, and ethical codes of conduct for IT professionals. Intended to sensitize IT managers and professionals to the issues that arise when doing business in an interconnected world and to develop an understanding of how to ethically and legally operate and use modern computer systems and networks.

ITC 6080. Network Security Concepts. 3 Hours.

Focuses on security concepts, issues, terms, and definitions, as well as the strategic value of being secured. Key topics include planning for network security, security and network protocols, end-user and administrator training, and securing existing networks. Addresses management issues related to network security, including the ethical considerations that arise from decisions regarding access, reporting, monitoring, and use.

ITC 6082. Network Protection. 3 Hours.

Examines the technical methods used to ensure that information using wired and wireless media reaches only those for whom it was intended. Covers the technical tools to protect information from external compromise. Explores load balancing, wireless access, Web security issues, and network intrusion detection. Offers students an opportunity to develop a detailed understanding of authentication, firewall configuration, and rule sets and to learn to address and prevent security issues related to intranets, extranets, enterprise networks, and the Internet.

ITC 6300. Foundations of Information Security. 3 Hours.

Offers an overview of the threats to the security of information systems, the responsibilities and basic tools for information security, and the levels of training and expertise needed in organizations to reach and maintain a state of acceptable security. Topics include an introduction to confidentiality, integrity and availability, authentication, encryption and access controls, intrusion detection and response, social engineering, physical security, policy formation and enforcement, legal and social issues, and risk management.

ITC 6305. IT Infrastructure (Systems, Networks, Telecom). 3 Hours.

Introduces the elements of IT infrastructure—systems, networks, and telecommunications. Telecommunication fundamentals include data, voice, image, and video. Covers the concepts, models, architectures, protocols, standards, and security for the design, implementation, and management of digital networks. Discusses the essentials of local area networks (LANs), metropolitan area networks (MANs), and wide area networks (WANs).

ITC 6310. Information Security Governance. 3 Hours.

Covers the foundations for the policy, law, regulatory, and ethical accountability frameworks that information security risk managers must work within. Information security governance is an overarching consideration in all risk-management-related endeavors, and it is understood to be of supreme importance for information security since many issues have legal, regulatory, policy, and ethical considerations.

ITC 6315. Information Security Risk Management. 3 Hours.

Focuses on assessing, modeling, communicating, and addressing risk issues. Covers statistical, financial, technical, and other risk-assessment and risk-modeling techniques and tools. Explores policy and governance frameworks for information security risk management and the legal, behavioral, and social issues that arise in implementing security policies. Offers students an opportunity to develop risk assessments and present and justify mitigation proposals.

ITC 6320. Information Security Technology. 3 Hours.

Covers key information security technologies and the context needed for deploying them successfully. Security technology has come a long way, and organizations need to deploy a variety of security devices and tools, such as intrusion detection systems and firewalls, to solve the most pressing information security problems.

ITC 6325. CISA Preparation. 3 Hours.

Includes all seven domains that make up the body of knowledge covered by the CISA examination. Offers students an opportunity to obtain the knowledge and technical concepts required to achieve this certification. Topics include technical infrastructure and operations, management planning and organization of information systems, applications development, protection of information assets, business process evaluations and risk management, disaster recovery planning, and the formal audit process.

ITC 6330. CISSP Preparation. 3 Hours.

Includes all ten domains that make up the body of knowledge covered by the CISSP examination. Offers students an opportunity to obtain the knowledge and technical concepts required to achieve this certification. Topics include security management practices; access control systems; telecommunications and network security; cryptography; security architecture and models; operations security; applications and systems development; business continuity planning and disaster recovery planning; law, investigation, and ethics; and physical security. The CISSP certification is governed by the International Information Systems Security Certifications Consortium and is universally recognized as a key component in the selection process for management-level information security positions.

ITC 6335. Data Warehousing and Data Mining. 3 Hours.

Focuses on the management, mining, and interpretation of patterns in large databases. Offers students an opportunity to learn how organizations construct data warehouses from operational databases, about different data warehouse architectures, how to build a data warehouse, and how to structure databases for efficient data mining. Introduces data mining techniques such as rule-based learning, decision trees, association rule mining, and statistical analysis. Also covers interpretation of the mined patterns using visualization techniques.

ITC 6340. Mobile and Wireless Networks and Applications. 3 Hours.

Presents the latest in wireless technologies and mobile business (m-business). Topics include wireless networks, wireless carriers, location-based technologies, wireless platform operating systems and micro-browsers, wireless marketing and customer/client relationship management, wireless security issues, and Wireless Application Protocol (WAP). Offers students an opportunity to engage in the applied design and development of mobile applications using Web technologies and tools.

ITC 6345. Systems and Network Administration. 3 Hours.

Focuses on the skills, tools, and best practices required to provide and support computing infrastructure and services. Covers system installation and configuration, defining users and groups, user authentication, file systems, configuring and managing system and network services, client/server systems, and Web site administration. Also discusses troubleshooting, backup/recovery, security issues and policies, user/customer interaction, and the ethical and legal responsibilities of a system administrator.

ITC 6355. Web Application Design and Development. 3 Hours.

Introduces the development of Web applications. Topics covered include Web servers, Web application servers, Web application development methods, client-side and server-side scripting, and Web application development techniques. Offers students an opportunity to learn to construct and maintain a well-designed Web site and use state-of-the-art Web application development tools and languages to develop Web applications. Other topics include Web application security, session management, design patterns, and reusable Web application components.

ITC 6400. Foundations of Informatics. 3 Hours.

Introduces the fundamental properties of information, technologies, and people within an increasingly complex infrastructure and social system. Offers students an opportunity to learn theoretical foundations and applications of informatics and to explore technical and social issues—including policy choices, ethical issues, and legal obligations—with IT applications and solutions in various specific settings, such as business, education, healthcare, and government. Offers students a broad perspective and understanding of informatics as both a scientific field as well as a highly applied discipline in specific contexts that may help direct them to future career concentrations.

ITC 6410. Fundamentals of Human Behaviors for Interactive Systems. 3 Hours.

Introduces basic principles of cognitive and social psychology relevant to the design and use of interactive systems and applications. Offers students an opportunity to examine topics including human perception (e.g., how we identify, organize, and interpret information); human memory capacity and operation (e.g., how we recognize and recall information, and how we learn to develop skills and expertise); and human reasoning and decision making. Understanding how the human mind works and the limitation of our mental capacities may ultimately provide valuable insights to apply user-centered approaches in interface design as well as interactive systems development.

ITC 6420. Introduction to Cloud Computing Applications and Management. 3 Hours.

Offers an overview of theoretical and practical aspects of distributed systems and cloud computing. Cloud computing and web services are creating a huge demand for IT professionals to manage large-scale infrastructure and vast networks. Examines frameworks, techniques, and existing IT solutions to manage internet services at different levels (infrastructure, platform, and software) and to support the key characteristics of cloud computing, including virtualization, requirement for high reliability and security, extendability, and versatility.

ITC 6430. Enterprise Information Technology Service Management. 3 Hours.

Examines frameworks and strategic approaches for the life cycle management of IT products—including planning, designing, developing, delivering—and for improving the IT services from a higher-level enterprise perspective—including managing disparate servers throughout the organization. In the context of cloud computing, this course focuses on the strategic management of IT infrastructure, agile IT service, configuration, data and information security, and disaster recovery. Explores the strategies to provide values to customers.

ITC 6440. Mobile Technology and Security. 3 Hours.

Seeks to provide a comprehensive learning experience in the many domains that comprise mobile device technology and related security topics. Mobile technology is ubiquitous in business and personal life to the point that this technology has become a requirement in every facet of the world. Offers students an opportunity to gain an in-depth history and overview of this industry; the current providers that transform the technology; mobile designs; wireless communication technologies; user experiences, which inherently correlate to their own utilization of mobile devices; and security topics related to mobile technology.

ITC 6450. Advanced Cloud Computing Applications and Management. 3 Hours.

Offers a comprehensive learning experience in advanced concepts within cloud computing. Cloud computing has become a disruptive technology that has dramatically transformed the IT industry by offering scalability and delivery options that had not existed previously. Offers students an opportunity to gain an in-depth knowledge of concepts, programming models, virtualization options, file systems, architectures, storage, and secure computation, as well as to learn contemporary industry trends and what the future holds in the advanced concepts of cloud computing.

ITC 6460. Cloud Analytics. 3 Hours.

Introduces students to a set of techniques, tools, and applications to help clients extract and harvest information from massive data (e.g., social media sites, e-commerce websites) through a cloud platform adopted by a business. Also introduces techniques to help clients migrate historical data to cloud systems, as new cloud systems provide contemporary analytics solutions. Offers students an opportunity to gain the technical strength to assist data analytics process and business intelligence in the context of a cloud computing platform. Cloud analytics is an emerging topic that helps establish a cloud computing service mode, aiming to assist and facilitate data analytics process through a public or private cloud.

ITC 6470. Enterprise Data Storage and Management Technologies. 3 Hours.

Provides a comprehensive learning experience in many domains that comprise data storage and storage management technologies. Students have an opportunity to gain in-depth knowledge of storage system architecture, business continuity, storage security, and storage infrastructure management processes. Technology trends such as shared-service infrastructures, cloud computing, Big Data, and the Internet of Things are all changing the way data is processed, stored, and used in enterprises. There is an increasing need for skilled data storage architects and managers to handle manage massive amounts of data in enterprise and cloud environments.

ITC 6480. Amazon Web Service (AWS) Cloud Architecting. 4 Hours.

Exposes students to advanced technical topics to assist in the development of expertise in AWS cloud computing. Offers students an opportunity to gain the skills needed to pursue certification as an AWS Certified Solutions Architect–Associate, one of the most valuable IT certificates. Includes reading materials provided by AWS Academy, guided instruction in the classroom, hands-on labs operated by AWS, project work, and free practice exam if students wish to pursue certification after completing the course. Successful students have the ability to demonstrate knowledge and skills of how to architect and deploy secure and robust applications on AWS technologies.

ITC 6490. Ethical Hacking. 3 Hours.

Exposes students to the different phases of hacking, specific skills for penetration/intrusion testing, and demonstrates hands-on techniques in ethical hacking. Offers students an opportunity to gain technical capabilities to secure information systems and protect networks from hackers.

ITC 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ITC 7120. Healthcare Information Systems. 3 Hours.

Explores the administrative and research applications of computers in today's healthcare delivery system. Discusses emerging trends in the field of healthcare informatics.

ITC 7962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions.

Intellectual Property - CPS (ITP)

Search ITP Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=ITP>)

ITP 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

Interdisciplinary Studies - CPS (INT)

Search INT Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=INT>)

INT 2000. Experiential Project Preparation. 0 Hours.

Seeks to prepare students for an experiential learning placement. Offers students an opportunity to develop a job search strategy, gain greater understanding of their career field and the skills and traits required, and understand the key components of business professionalism. The goal is for the student to gain a greater understanding of the College of Professional Studies cooperative education and academic internship policies, procedures, and expectations.

INT 2001. Experiential Project. 0 Hours.

Offers students an opportunity to apply their curricular learnings in an applied project setting. Working with a sponsor, students refine an applied research topic, perform research, develop recommendations that are shared with a partner sponsor, and create a plan for implementing their recommendations. Seeks to benefit students with a curriculum that supports the development of key business communication skills, project and client management skills, and frameworks for business analysis. Offers students an opportunity to learn from sponsor feedback, review lessons learned, and incorporate suggestions from this review to improve and further develop their career development and professional plan. May be repeated twice.

INT 2992. Research. 0 Hours.

Offers an opportunity to document student contributions to research projects or creative endeavors. .

INT 5100. SAIL Lab. 0 Hours.

Creates an experience that aligns with the dimensions and skills incorporated in the five learning dimensions: intellectual agility, global mindset, social consciousness and commitment, professional and personal effectiveness, and well-being. The foundational masteries, skills, and attributes are meant to be cross-cutting among industries, so learners from all educational domains and programs can learn collaboratively through an interdisciplinary approach.

INT 5900. Experiential Project Preparation. 0 Hours.

Seeks to prepare students for an experiential learning placement. Offers students an opportunity to develop a job search strategy, gain greater understanding of their career field and the skills and traits required, and understand the key components of business professionalism. The goal is that the student should gain a greater understanding of the College of Professional Studies cooperative education and academic internship policies, procedures, and expectations.

INT 5964. Experiential Project. 0 Hours.

Offers students an opportunity to apply their curricular learnings in an applied project setting. Working with a sponsor, students refine an applied research topic, perform research, develop recommendations that are shared with a partner sponsor, and create a plan for implementing their recommendations. Seeks to benefit students with a curriculum that supports the development of key business communication skills, project and client management skills, and frameworks for business analysis. Offers students an opportunity to learn from sponsor feedback, review lessons learned, and incorporate suggestions from this review to improve and further develop their career development and professional plan. May be repeated twice.

INT 6000. Writing Lab. 1 Hour.

Requires students to analyze and draft writing assignments from topics covered in graduate level courses.

INT 6100. Recitation for Graduate Level Course Work. 0 Hours.

Provides small-group discussion format to cover material in graduate level course work.

INT 6900. International Field Study Experience. 3,4 Hours.

Seeks to prepare students for an increasingly global workplace and to help them gain a deeper understanding of current issues in their fields of study in an international context. Includes a period of required on-site instruction in the region of study. Offers students an opportunity to conduct in-depth field study based on specific themes pertinent to the locality and to meet with representatives from local organizations such as schools, businesses, the arts, government officials, and others. Culminates in a professional-quality research project or presentation. May be repeated up to two times.

INT 6940. Experiential Learning Projects for Professionals. 1-4 Hours.

Offers students an opportunity to apply knowledge and skills gained through their master's program to work on challenging short-term projects under faculty supervision. Students are matched with discipline-specific consulting projects provided by a wide range of sponsoring organizations in the private and nonprofit sectors. Students develop a project plan, conduct research, develop and deliver recommendations to sponsoring organizations, and reflect on lessons learned. Mapping academic course concepts and skills to the consultative process is a primary learning goal. Requires an application process.

INT 6943. Integrative Experiential Learning. 3 Hours.

Offers students an opportunity to clarify their vision of a successful professional future, identify goals to achieve that vision, and assess career growth opportunities. Explores how to frame a growth strategy using internal and external scanning mechanisms, negotiation and persuasion, research, and critical reflection. Students refine an applied research topic, perform research, develop recommendations for addressing a key performance area within their existing workplace, and create a plan for implementing their recommendations. Students review "lessons learned" and incorporate suggestions from this review to improve and finalize their integrated plan. With permission from their host organization, students may go on to implement elements of their project in a current or upcoming project, where feedback is provided from stakeholders, including their corporate sponsor.

Interdisciplinary Studies - CPS Specialty (INPS)

Search INPS Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=INPS>)

INPS 5184. Interdisciplinary Professional Foundations. 3 Hours.

Offers an opportunity for professional exploration and orientation through reflection and self-assessment to identify unique professional skills, experiences, and strengths. Exposes students to a broad vision of the contemporary workplace and the competencies required for success as individuals, as members of organizations, and as global citizens.

Interdisciplinary Studies - Office of the Provost (INPR)

Search INPR Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=INPR>)

INPR 0081. College Mathematics. 0 Hours.

Covers the laws of exponents; roots; linear, polynomial, exponential, and logarithmic functions; and operations of functions. Emphasizes understanding and manipulating these basic functions and their inverses and compositions. If time permits, additional topics such as complex numbers and matrices are also covered.

INPR 0082. Academic Writing and Critical Reading. 0 Hours.

Involves a thorough examination of writing as a means of self-expression and refining one's thinking to achieve academic success at the college level. Rests on the assumption that good writers are good readers; therefore, emphasizes developing critical reading strategies in order to interpret texts based on content, meaning, and style. Offers students an opportunity to experience breaking down, processing, taking notes on, and reflecting on the types of challenging texts ahead of them in the college years.

INPR 0083. Immersion College Seminar. 0 Hours.

Designed for Torch Scholars. Seeks to prepare each student for the transition from high school to college. Offers students an opportunity to learn about the Northeastern culture and what it takes to be a successful Torch Scholar. Seeks to provide students with the support necessary to excel during their time at the university as well as the tools to build strong and empowering relationships with their peers, faculty, advisors, and mentors. The assignments of the course offer students opportunities to explore their resources on campus and beyond and learn vital skills for college success. Restricted to Torch Scholars and other Opportunity Scholars by invitation only.

INPR 1100. University Scholars Seminar on Innovation and Research. 0 Hours.

Offers a weekly seminar designed to introduce University Scholars to the most innovative research, best ideas, and provocative people at Northeastern. May be repeated once.

INPR 2183. Interdisciplinary Special Topics: Pop-up Course. 1,2 Hour.

Addresses timely trends, issues, and events as they unfold. Offers students an opportunity to learn about and respond to issues of the day in an immersive, interdisciplinary, short-course format. Content and instructors vary by offering.

INPR 2200. Design in Nature. 4 Hours.

Explores principles of design that are found in nature. Studies evolutionary constraints in design, materials used in nature, structural designs that include hierarchy and multiscale components, methods of motion and how they evolved in nature, biological sensing structures, and ability to adapt. Uses design methods to explore biomimetic designs. Examines the design of buildings, products, machines, and systems that build upon natural design concepts.

INPR 4100. Research-Visiting Student. 0 Hours.

Offers visiting students enrolled and in good standing at another institution an opportunity to work with a sponsoring faculty member on a topic related to current research. Detail of visit is described in the sponsoring faculty member's proposal approved prior to visit. Faculty member and student negotiate a written agreement as to what topic(s) are covered and what written or laboratory work forms the basis for the grade.

INPR 6100. Research-Visiting Student. 0 Hours.

Offers visiting students enrolled and in good standing at another institution an opportunity to work with a sponsoring faculty member on a topic related to current research. Detail of visit is described in the sponsoring faculty member's proposal approved prior to visit. Faculty member and student negotiate a written agreement as to what topic(s) are covered and what written or laboratory work forms the basis for the grade.

INPR 9100. Research-Visiting Student. 0 Hours.

Offers visiting students enrolled and in good standing at another institution an opportunity to work with a sponsoring faculty member on a topic related to current research. Detail of visit is described in the sponsoring faculty member's proposal approved prior to visit. Faculty member and student negotiate a written agreement as to what topic(s) are covered and what written or laboratory work forms the basis for the grade.

Interdisciplinary Studies in Arts, Media, and Design (INAM)

Search INAM Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=INAM>)

INAM 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

INAM 2183. Interdisciplinary Special Topics: Pop-up Course. 1,2 Hour.

Addresses timely trends, issues, and events as they unfold. Offers students an opportunity to learn about and respond to issues of the day in an immersive, interdisciplinary, short-course format. Content and instructors vary by offering.

INAM 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

INAM 2992. Research. 0 Hours.

Offers an opportunity to document student contributions to research projects or creative endeavors.

INAM 3510. Applied Sound Design. 1-3 Hours.

Introduces students to the specific aesthetic considerations, technical background, practical skills, and design strategies needed to produce original sound design work. Concerned with the design of sound in time and space. Focuses on sound in film and video work, live performance, the radio, and the internet, as well as sound installation and its diffusion. As many of these applications require co-operation with other individuals or groups, the course facilitates discussion around the issues that arise while working collaboratively. Offered at the University of Arts London for students pursuing international study.

INAM 3520. Collaborative Project. 4-6 Hours.

Offers students an opportunity to work within interdisciplinary teams on live, competition, or set projects using subject-specific skills, in collaboration with those of other disciplines, to achieve a common goal. Requires students to establish teams with specific roles and responsibilities related to the research, analysis, concept generation, presentation, and communication of solutions. Offered at the University of Arts London for students pursuing international study.

INAM 3530. Compositional Strategies. 4 Hours.

Offers students strategies for structuring their practical composition work in light of past and contemporary practice and introduces and explores ideas and methodologies for structuring sound work. Also offers students an opportunity to engage in two particular specialisms, developing technical as well as conceptual skills in a particular area of sound art practice. A major project provides a platform for applied research, by enabling students to investigate and apply different artistic and technological ideas underpinning the chosen specialisms. The seminars and tutorials supporting the project encourage an integrated approach to theory and practice, while allowing the development of a portfolio of individual work. Students select two specialisms from among seven or eight options. Offered at the University of Arts London for students pursuing international study.

INAM 3540. Sound Culture: Perception and Communication 2. 2-4 Hours.

Seeks to develop students' critical awareness of the primary themes that emerge from sound culture in the 20th and 21st centuries. Emphasizes sound culture in terms of contemporary aesthetic, ideological, technological, and sociopolitical concerns. Deals with issues of context, presentation, perception, and the relationship of sound with other media. Offered at the University of Arts London for students pursuing international study.

INAM 3550. Sound Practitioners 2. 2-4 Hours.

Explores the interplay between media and cultural theory and students' own personal practice. Seeks to contextualize both students' work and that of the artists/practitioners who have influenced it in relation to the theoretical concerns specific to sound arts practice. Offers students an opportunity to develop an understanding of the relationship of theory to the creative process and the differing but related roles of the practitioner and the theorist. Focuses on careers, enterprise promotion, and ethical questions within the professional world and copyright issues. Offered at the University of Arts London for students pursuing international study.

INAM 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

INAM 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

INAM 5100. Performance Studies. 4 Hours.

Examines how live performance operates within the contexts of everyday life, interpersonal communication, performance art, music, games, and theatrical events. Defines "performance" broadly, encompassing performance installations, interactive events, theatrical performance, etc. Explores the interdisciplinary field of performance studies by investigating performance as a method of creating new knowledge. Examines foundational performance theory using theoretically grounded methods of creating performance and developing performances as research. Culminates in the creation of original performance projects, in which students use their varied disciplinary skills and talents to craft an encounter between a work and an audience. Students who do not meet course restrictions may seek permission of instructor.

INAM 6100. Critical Foundations of Creative Practice Leadership. 4 Hours.

Introduces core theoretical foundations of the creative practice and creativity studies fields. Considers interdisciplinary, contemporary, and critical frameworks alongside themes such as creative economies; performance and reception studies; placemaking; social and ecological justice; critical race and gender studies; and the intersection of ethics, culture, politics, and public policy around modes of creative practice.

INAM 6200. Topics in Communication Strategies. 4 Hours.

Explores methods and techniques of professional writing to build creative narratives for cultural leaders as well as written and nonwritten communication. Covers strategies for advocacy, including artists/program notes, grant opportunities, business plans, blogs, op-eds, new media, marketing/promotion, and strategic positioning. Offers students an opportunity to develop a portfolio of documents (written and nonwritten) to establish a core for future communication platforms.

INAM 6210. Projects in Creative Practice Leadership. 4 Hours.

Focuses on project management and assessment for creative projects and related entrepreneurial enterprises; critiques of creative work and creative organizing projects; analysis and application of multiple forms of assessment of the professional practice; and planning for intellectual property, branding, and marketing challenges. Offers students an opportunity to learn how to articulate and implement medium-to-long-range strategies for reaching next career stages and achieving larger goals in their creative enterprises.

INAM 6300. Models for Applied Inquiry in Creative Practice. 4 Hours.

Focuses on thoughtful engagement with diverse and emerging forms of critical inquiry, professional engagement, and creative practice for artists, entrepreneurs, and administrators. Through course work and interaction with leading practitioners, offers students an opportunity to gain an understanding of the impact that forms of production and business models have on potential contribution to fields of critical practice and their diverse culture, while developing innovative models for their own creative, critical, and entrepreneurial endeavors.

Interdisciplinary Studies in Science (INSC)

Search INSC Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=INSC>)

INSC 1000. Science at Northeastern. 1 Hour.

Introduces first-year students with majors in the College of Science to the liberal arts in general. Offers students an opportunity to become familiar with their college and majors; to develop the academic skills necessary to succeed (analytical ability and critical thinking); to become grounded in the culture and values of the University community; and to develop interpersonal skills—in short, presents students with the skills needed to become a successful university student.

INSC 1501. Research Methods in the Sciences A. 2 Hours.

Examines selected topics, methods, and skills useful in various forms of experiential education. Topics vary each semester and may be illustrated through examples drawn from the sciences or from student-initiated problems. May be repeated without limit.

INSC 1502. Research Methods in the Sciences B. 2 Hours.

Examines selected topics, methods, and skills useful in various forms of experiential education. Topics vary each semester and may be illustrated through examples drawn from the sciences or from student-initiated problems. May be repeated without limit.

INSC 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

INSC 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

INSC 2992. Research. 0 Hours.

Offers an opportunity to document student contributions to research projects or creative endeavors.

INSC 3000. Science Behind Innovation and Entrepreneurship. 4 Hours.

Elucidates the role of scientific discoveries behind innovation to aspiring innovators and entrepreneurs. Outlines how science translates to technologies that drive emerging enterprises in sustainability, healthcare, defense, space, and security industries. Explores the role of science in disrupting market paradigms and innovating customer solutions. Seeks to equip non-science-based aspiring entrepreneurs with tools to apply science-driven solutions for unaddressed customer needs, pivot expeditiously while seeking a product-market fit in early stage startups, and conceptualize novel applications and use-cases for existing innovations. Seeks to enable aspiring entrepreneurs with a pure science background to take the first steps toward translating scientific discoveries into technologies and products. The course is designed to empower individuals to improve engagement, productivity, and solutions discovery by establishing communications between the science and business worlds.

INSC 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

INSC 4000. Bridging Scientific Discovery and Innovation. 4 Hours.

Explores how scientific discovery can lead innovation for the creation of agile ventures with high disruptive potential and broad societal impact. Illustrates the need for science innovation in the face of changing markets and technologies. Introduces *The Innovator's Dilemma* and offers solutions for overcoming obstacles in scientific discovery-led innovation. Describes metrics for measuring the impact of science innovation. Uses examples drawn from industries undergoing disruption to explore the key discoveries and innovations that distinguish the competition landscape, how industry leaders have created new opportunities and challenges for scientific advancement, and societal implications of the resulting technologies. Simulates the processes that companies use to identify, develop, and market disruptive science innovations through the creation of a personal learning network as a model for discovery-driven planning.

INSC 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

INSC 5000. Translating Scientific Discoveries: From Lab to Fab and Beyond. 4 Hours.

Introduces how to effectively present the value of a scientific discovery in the language of investors, customers, and end-users. Examines the tools necessary to translate a scientific discovery that addresses real-world problems, and explores pathways to take it from a laboratory-research stage to a product or service. Showcases successful strategies of science innovation-based products and solutions. Uses existing science innovations with commercialization potentials as a template to scout for use-cases. Offers hands-on opportunities for discovering end-users/customers. Outlines approaches to identify beachhead markets for innovations based on discoveries and validate or pivot the technology development steps to meet the product-market fit. Offers insights on obtaining non-equity-diluting resources and partnerships for de-risking the early stage technology and customer discovery. Discusses industry standards, compliance, and regulatory institutions.

Interdisciplinary Studies in Social Sciences and Humanities (INSH)

Search INSH Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=INSH>)

INSH 1000. Social Sciences and Humanities at Northeastern. 1 Hour.

Intended for freshmen in the College of Social Sciences and Humanities. Introduces freshmen to the liberal arts in general. Offers students an opportunity to become familiar with their major, to develop the academic skills necessary to succeed (analytical ability and critical thinking), to become grounded in the culture and values of the university community, and to develop interpersonal skills—in short, to become familiar with all the skills needed to become a successful university student.

INSH 1102. Food in Contemporary Context. 4 Hours.

Offers a multidisciplinary set of perspectives on an intrinsic part of daily life—food. Food is not just about survival—it is about being human. Producing it, making it, eating it, obsessing about it is woven throughout our lives. It defines, and is defined by, culture. It is the basis of economies, has produced great fortunes, defines entire communities, and is the cause of conflicts. It is at once natural and artificial, grown and manufactured. It nourishes us and makes us sick. It is the source of sublime pleasure and no small anxiety. Food defines us, as much as we define it. With these considerations, this course uses food as a lens into contemporary life.

INSH 1300. Introduction to Health and Humanities. 4 Hours.

Explores the ways in which narrative and other forms of creative and cultural expression help shape conceptions of illness, healing, and the body. Offers students opportunities to consider the health and humanities through a variety of interdisciplinary perspectives and genres. Includes small-group and classwide experiential field outings. Culminates in the composition of reflective responses, a medical ethics/medical journalism piece, and a team-based experiential e-portfolio project. Course objectives include differentiating between healing and curing; knowing how to elicit, listen to, and analyze stories to determine how participants in the healthcare system experience illness and healing; being able to articulate the ways health is a cultural construct; and using this analysis to identify an empathic response as a future professional.

INSH 1500. Digital Methods for Social Sciences and Humanities. 4 Hours.

Introduces programming skills and computational methods through application to topics in the social sciences and humanities. Methods include computational text analysis, network analysis, mapping software and analysis, computational approaches to data, big data, and/or social simulation. Offers students an opportunity to develop an understanding of the use and significance of computational tools for social sciences and humanities. No previous programming experience required.

INSH 1600. Cultures of London - Abroad. 4 Hours.

Offers students in London an opportunity to learn about and interact with visual art and architecture and literary representations of the city. Examines how different peoples and different art forms have helped to shape the culture of this multicultural city over a span of some 400 years (from the Renaissance to contemporary London). Students read poetry, prose, and drama; attend theatrical events; and explore the city through walking tours and visits to historic sites. Seeks to develop familiarity with the critical, historical, and theoretical tools necessary to understand how imperial and colonial histories have shaped the cultures of London and the experiences of its citizens of diverse races, ethnicities, and regional or national identities.

INSH 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

INSH 2101. Love and Hate: Social, Psychological, and Literary Approaches. 4 Hours.

Studies materials that define and describe love and hate from the fields of literature and literary criticism, social psychology, and criminology and criminal justice. "Love" and "hate" are small words describing powerful emotions with profound effects on individuals and on social groups. Focusing largely on contemporary examples, offers students an opportunity to analyze the differences and areas of overlap in the above fields' approaches to love and hate, to discuss societal responses to these emotions, and to apply the methodologies of each field to research questions of their own. INSH 2101 and PSYC 2101 are cross-listed.

INSH 2102. Bostonography: The City through Data, Texts, Maps, and Networks. 4 Hours.

Uses Boston as a case study for integrating computational methods with the social sciences and humanities to provide new insights into major cultural, historical, and societal questions as they relate to and extend beyond the city of Boston. Through lectures, discussions, and labs, the course examines a variety of data sets that measure geographic, historical, literary, political, civic, and institutional landscapes. Offers students an opportunity to combine analytical tools, such as geospatial mapping, data visualization, and network science, with readings, hands-on class activities, and museum or site visits, enabling a comprehensive view of complex cultural and social phenomena.

INSH 2110. Culture and Resilience. 4 Hours.

Examines how communities draw on cultural resources to develop resilience in response to adverse events or trauma, whether institutional, political, or environmental. Focuses on creative and expressive production—such as literature, visual arts, and performing arts—that aims to repair or resist trauma. Offers students tools and opportunities to research, analyze, and share examples of such cultural resilience.

INSH 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

INSH 2992. Research. 0 Hours.

Offers an opportunity to document student contributions to research projects or creative endeavors.

INSH 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

INSH 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

INSH 5301. Introduction to Computational Statistics. 4 Hours.

Introduces the fundamental techniques of quantitative data analysis, ranging from foundational skills—such as data description and visualization, probability, and statistics—to the workhorse of data analysis and regression, to more advanced topics—such as machine learning and networks. Emphasizes real-world data and applications using the R statistical computing language. Analyzing and understanding complex data has become an essential component of numerous fields: business and economics, health and medicine, marketing, public policy, computer science, engineering, and many more. Offers students an opportunity to finish the course ready to apply a wide variety of analytic methods to data problems, present their results to nonexperts, and progress to more advanced course work delving into the many topics introduced here.

INSH 5302. Information Design and Visual Analytics. 4 Hours.

Introduces the systematic use of visualization techniques for supporting the discovery of new information as well as the effective presentation of known facts. Based on principles from art, graphic design, perceptual psychology, and rhetoric, offers students an opportunity to learn how to successfully choose appropriate visual languages for representing various kinds of data to support insights relevant to the user's goals. Covers visual data mining techniques and algorithms for supporting the knowledge-discovery process; principles of visual perception and color theory for revealing patterns in data, semiotics, and the epistemology of visual representation; narrative strategies for communicating and presenting information and evidence; and the critical evaluation and critique of data visualizations. Requires proficiency in R.

INSH 6300. Research Methods in the Social Sciences. 4 Hours.

Surveys methods of social research, including field study and participant observation techniques, survey techniques, interviewing and questionnaire construction, sampling procedures, experimental design, content analysis, and use of available data.

INSH 6302. Qualitative Methods. 4 Hours.

Introduces the principles and use of common qualitative methods with a particular focus on their application in the social sciences. Offers students an opportunity to engage in primary data collection and to learn how to use a variety of analytic techniques, including transcription, field-note preparation, memos, development of coding schemes and conceptual frameworks, and data-verifying techniques.

INSH 6404. Computational Social Science. 4 Hours.

Introduces the fundamental techniques of quantitative data analysis, ranging from foundational skills—such as data description and visualization, probability, and statistics—to the workhorse of data analysis and regression, to more advanced topics—such as machine learning and networks. Emphasizes real-world data and applications using the R statistical computing language. Offers students an opportunity to finish the course ready to apply a wide variety of analytic methods to data problems, present their results to nonexperts, and progress to more advanced course work delving into the many topics introduced here.

INSH 6406. Analyzing Complex Digitized Data. 4 Hours.

Introduces cutting-edge ways of structuring and analyzing complex data or digitized text-as-data using the open-source programming language Python. Scholars across multiple disciplines are finding themselves face-to-face with massive amounts of digitized data. In the humanities and social sciences, these data are often in the form of unstructured text and un- or under-structured data. Encourages students to think about novel ways they can apply these techniques to their own data and research questions and to apply the methods in their own research, whether it be in academia or in industry.

INSH 6500. Statistical Analysis. 4 Hours.

Studies the use of social science quantitative techniques, emphasizing applications of value to public-sector analysts and scholars alike. Introduces probability and statistical analysis. Topics include measures of central tendency and dispersion, probability and probability distributions, sampling distributions and hypothesis testing, bivariate correlation, regression, and forecasting. Examines how to generate and interpret statistical analyses.

INSH 6864. Experiential Integration. 1 Hour.

Offers an integration course providing an opportunity for students on experiential placement to connect conceptual course material to experiential components. Students are expected to: interact with students from other disciplines, apply knowledge and skills across educational and experiential contexts; connect experiential components to different disciplines and domains of knowledge; and situate experiential components in the context of their own field and beyond. Requires department signature.

INSH 6964. Co-op Work Experience. 0 Hours.

Provides eligible students with an opportunity for work experience. May be repeated once.

INSH 7400. Quantitative Analysis. 4 Hours.

Studies the use of social science quantitative techniques and how to generate and interpret statistical analyses. Topics include measures of central tendency and dispersion, probability and probability distributions, sampling distributions and hypothesis testing, bivariate correlation, regression, and forecasting. Builds upon the concepts of correlation and inference to present analytic procedures involving several variables (including multiple regression, logistic regression, causal analysis, and multiway ANOVA) and introduces more advanced multivariate analytic methods.

INSH 7500. Advanced Quantitative Analysis. 4 Hours.

Designed to build upon the foundations provided by INSH 6404, INSH 6500, or an equivalent introductory statistics course with the goal of students becoming proficient with selected quantitative multivariate analysis techniques. Covers the ordinary least squares (OLS) regression model and the assumptions underlying it in detail, as well as the techniques for analyzing data when OLS assumptions do not apply, such as simultaneous equation models, time-series models, and maximum likelihood techniques for limited and discrete dependent variables. Requires prior completion of INSH 6404, INSH 6500, or an equivalent introductory statistics course. PhD students only or by permission.

INSH 7600. Advanced Methodological and Quantitative Techniques. 4 Hours.

Builds upon the foundations provided by INSH 7400 and INSH 7500 (and their equivalents) with the goal of students becoming proficient with selected advanced specialized quantitative analysis techniques or platforms. Taught throughout the semester by different faculty members with expertise in particular statistical methods. Example modules include hierarchical linear modeling, structural equation modeling, path analysis, and time-series analysis.

INSH 7910. NULab Project Seminar. 2 Hours.

Offers students an opportunity to learn and use digital humanities methods with others in groups and across disciplines in the collaborative space of the NULab seminar. May be repeated up to three times.

INSH 9980. Experiential PhD Research Residency. 0 Hours.

Comprises a research residency experience in an organization whose mission and activities are aligned with the College of Social Sciences and Humanities PhD programs. The research residency is designed to help develop dissertation ideas or research papers or to obtain access to resources helpful to dissertation development or research. A faculty member serves as an advisor for the residency experience, but individuals within the organization in which the student is working are asked to serve as formal mentors for the student residency experience.

International Affairs (INTL)

Search INTL Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=INTL>)

INTL 1000. International Affairs at Northeastern. 1 Hour.

Introduces first-year international affairs students to the majors, the departments servicing IAF, and the university as a whole; familiarizes students with the skills needed for success as a university student.

INTL 1101. Globalization and International Affairs. 4 Hours.

Offers an interdisciplinary approach to analyzing global/international affairs. Examines the politics, economics, culture, and history of current international issues through lectures, guest lectures, film, case studies, and readings across the disciplines.

INTL 1150. The Mediterranean World: An Overview. 4 Hours.

Introduces problems currently facing the nations of the Mediterranean region, the sources of these problems, how they are affecting the rest of the world, and what the future of the region may be. The Mediterranean is a region of significant international geopolitical importance where three major religions and continents meet, very different demographic patterns interact, the challenge of adapting to global economic and social forces is being faced, and security and terrorism are major problems. Surveys the Mediterranean region, its characteristics and significance, the changes it has experienced, and the ways in which societies around the Mediterranean currently interact and influence each other.

INTL 1160. Middle East Studies. 4 Hours.

Concentrates on the twentieth and twenty-first centuries of the "Middle East" (Arab World, Israel, Turkey, and Iran), the links with southwest Asia (Pakistan, Afghanistan), and U.S. engagement with the Middle East. This course seeks to provide students with effective interdisciplinary analytical skills as well as historical, political, ethical, social, cultural, religious, and economic perspectives on the Middle East.

INTL 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

INTL 2011. The Arab Spring and Its Aftermath: Domestic, Regional, and International Challenges. 4 Hours.

Aims to explain and understand the divergent outcomes of the Arab uprisings by framing the uprisings within domestic, regional, and international developments. Critically and systematically analyzes the events that continue to affect governance across the Middle East and North Africa and neighboring Mediterranean states.

INTL 2100. Modern Israel. 4 Hours.

Introduces students to an Israel rarely seen in the news: Films, art, music, short stories, food, and spiritual movements show Israel from a different point of view and expose students to the questions Israelis ask themselves in order to define their own identity. Modern Israel is a fascinating, vibrant, talented, imperfect nation of people from 100 different countries. Thus, conflicts, tensions and contradictions lie at its heart: Ashkenazi Jews complain the country is too Levantine; Sephardi Jews complain about deprivation; Israeli Arabs complain about their position in the nation; Orthodox Jews say the state is not sufficiently religious; seculars consider it antiquated in nature. Immigrants from Russia and Ethiopia, foreign guest workers, water crises, and the Arab-Israeli conflict also figure in the story.

INTL 2200. America and the Middle East. 4 Hours.

Focuses on U.S. engagement with the Middle East, primarily with Muslim societies, and with the Christian and Jewish communities across the region. Emphasizes Egypt, Syria, Iran, Iraq, Turkey, Israel/Palestine, and Lebanon. From America's first proselytizing adventure to the Ottoman Empire in 1820 to the embrace of Saudi Arabia in the 1940s to the overthrow of the democratically elected prime minister in Iran in 1953 to the attacks of September 11, 2001, to the invasion and occupation of Iraq in 2003 to America's response to the "Arab Awakening" in 2011 and beyond, the course covers history, politics, oil, war, and peacemaking within the framework of U.S. involvement in the Middle East.

INTL 2240. Global Population and Development. 4 Hours.

Examines the reasons for global population growth and its economic, political, and social challenges. Topics include relation between population and development, environmental consequences, global imbalance in populations, influence of gender on population and development, attempts to control population growth in China and other countries, effects of aging population on economic growth and political life, population and labor force opportunities, population and migration, and the influence of population issues on international relations and global security. In 2012 the world's population reached 7 billion, with an additional billion being added every 20 years. Emphasizes how issues in national and international affairs are intimately linked with population, focusing on its effects on attempts to improve the quality of life across the globe.

INTL 2400. Politics of Islam and Gender. 4 Hours.

Rethinks critically the gender dynamics in Muslim societies. Readings pull together interdisciplinary debates surrounding gender politics in Islam. Emphasizes the pessimist (critiques), optimist (apologetics), as well as critical feminist works, to explore feminism's contested relationship to Islam. Presents multiple perspectives on contentious issues—including head scarf controversy, violence against women, and sexuality—to encourage critical thinking and constructive discussion.

INTL 2464. Natural Resources and Sustainable Development. 4 Hours.

Examines the social dimensions of resource extraction. Focusing mainly on developing nations, studies global issues, including developments in industrial nations, to assess their impact on resource extraction and living and working conditions in resource-rich regions. Uses case studies of key countries producing oil/gas, minerals, and forest/agricultural commodities to illustrate the past/current causes of resource mismanagement; their social consequences; and how public policies, legislation, and financial and human resource management with industrialization can be used to avert or reduce the adverse effects of resource extraction, especially in poor countries. Major theories examined include the resource curse and alternative approaches to problems faced by resource-bearing developing nations. AFRS 2464 and INTL 2464 are cross-listed.

INTL 2465. The Scope and Dynamics of Conflicts in Africa. 4 Hours.

Surveys the faces, character, and manifestations of violent and nonviolent conflicts across the landscape of continental Africa. Addresses the causes/sources of conflict, types of conflicts and their impact on society, and the conflict resolution mechanisms. The contemporary history of the continent of Africa is defined most markedly by conflict that has impacted heavily on the continent's diverse multicultural societies, politics, and economies. The structure of conflicts in the continent is complex and, indeed, exhibits diverse faces; conflicts differ in their roots, causes, and explanations and between the different regions and population groups in the south, east, central, west, and north. Focuses on Sub-Saharan Africa to critically analyze this broad range of aspects using country and case-based analyses and critical thinking. AFRS 2465 and INTL 2465 are cross-listed.

INTL 2480. Women and World Politics. 4 Hours.

Introduces a variety of issues facing women across the globe. Focuses on the gender dynamics of key issues in international affairs. These could include economic policy, conflict and war, human rights/women's rights, political power, and collective action. Draws on examples from various world regions since the twentieth century to analyze similarities and differences across cases around the globe. INTL 2480 and WMNS 2480 are cross-listed.

INTL 2718. Research Methods in International Affairs. 4 Hours.

Introduces a range of research methods employed in the study of international affairs. Offers students an opportunity to develop competency in the most commonly used quantitative and qualitative research tools in the social sciences and related humanities. Topics include empirical and normative research traditions, generalizability, historical analyses, hypothesis testing, literature reviews, qualitative and quantitative approaches, research ethics, survey research, units of analysis, and more.

INTL 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

INTL 3250. Democracy and Development in North Africa and the Mediterranean. 4 Hours.

Examines regional and national developments over the last several decades. Explores the persistence of authoritarian rule and the prospects for democratization, the role of Islamic movements in society and politics, the causes and consequences of neoliberal economic policies, the goals and strategies of North African women's movements, and the role the region plays in the international system.

INTL 3300. Covering Conflicts: Peace, War, and the Media. 4 Hours.

Examines the media's portrayal of conflicts and the peace process in the Middle East, Northern Ireland, Bosnia, Rwanda, and elsewhere. Evaluates the limits of fairness, balance, and accuracy in the coverage. Looks at the U.S. and international media—print, broadcast, and online—and some of the major stories in recent years and attempts to put these stories in historical, political, and social context. Analyzes the wide-ranging criticism of coverage from a variety of perspectives. INTL 3300 and JRNL 3300 are cross-listed.

INTL 3400. International Conflict and Negotiation. 4 Hours.

Offers an interdisciplinary approach to analyzing international conflict and negotiations: how conflicts evolve, are managed, and/or resolved. In dealing with different types of regional and international conflicts, students focus on historical, ethnic, religious, geographic, and political aspects of a variety of conflicts and the consequences these conflicts hold for regional and international actors.

INTL 3565. Morocco: History, Cultures, and Economic Development in the Mediterranean Basin. 4 Hours.

Offers students the opportunity to (1) better understand the origins and contemporary practice of Islam; (2) investigate the dynamics of Morocco as a multicultural society: Arab, Berber, African, and European; (3) explore the unique aspects of the major historical eras in Morocco: Islamic, French Imperialist, postcolonial; (4) consider the complex relationship between local economy and global economic trends; (5) identify the promises and problems involved in modernization in the postcolonial African/Islamic/Arab world(s); and (6) consider the dilemmas facing women as Morocco confronts the twenty-first century. Optional travel to Morocco by permission of instructor.

INTL 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

INTL 4350. Ethnography of Southeast Asia. 4 Hours.

Offers a seminar on the societies and cultures of Southeast Asia. Uses an interdisciplinary approach to this diverse and dynamic geopolitical region, with readings from anthropology, history, political science, and literature. Covers the major political and cultural changes that have shaped Southeast Asia in relation to the world—from the age of colonial expansion, to the rise of nation-states, to the present global era. Examines central questions in the ethnography of Southeast Asia, emphasizing the postcolonial legacies of Southeast Asia, states and violence, culture and mobility, and pressing contemporary issues in globalizing Southeast Asia. ANTH 4350 and INTL 4350 are cross-listed.

INTL 4500. Latin American Society and Development. 4 Hours.

Explores the processes of social, economic, and cultural change in Latin America. While concentrating on the present, traces class formation, agrarian structures, ethnic identity, ceremonial organization, gender roles, and political conflict since the colonial era in a range of countries. Emphasizes the relationship of communities and national political and economic systems. May emphasize Central America and Mexico or countries in South America through case studies. ANTH 4500 and INTL 4500 are cross-listed.

INTL 4510. Anthropology of Africa. 4 Hours.

Explores Africa's changing place in the world. Studies the history of Africa and explores the role of ethnography in the making of colonial Africa and the cultural transformations and continuities produced by the emergence of African cities during and after colonialism. Studies postcolonial Africa to critically and comparatively engage with contemporary issues facing African societies. Considers the efflorescence of new cultural forms of music, art, film, and literature, in conjunction with new sources of identity such as nationality, religion, ethnicity, consumption, and migration. ANTH 4510 and INTL 4510 are cross-listed.

INTL 4515. Culture and Politics in Modern India. 4 Hours.

Introduces the histories, cultures, and peoples of India. Seeks to convey a sense of how knowledge has been constructed about the region and how the subcontinent has been shaped by its engagements with the world through such processes as colonization, state building, and globalization. Uses readings, films, and class discussions to examine themes and topics that include Orientalism, postcolonialism, caste and community, gender and sexualities, conflict and violence, development and resistance, and transnational structures and processes. Critically evaluates some commonly held assumptions, including classical understandings of tradition and modernity, cohesion and conflict, and nation and identity. ANTH 4515 and INTL 4515 are cross-listed.

INTL 4700. Senior Capstone Seminar in International Affairs. 4 Hours.

Offers a senior research and writing seminar that integrates and assesses the knowledge and skills developed by students participating in the international affairs curriculum, including both experiential (co-op, Dialogue of Civilizations, study abroad, internship, or other approved international experience) and classroom-based components. Requires student self-reflection as well as new research, analysis, and writing, which culminate in a final paper and presentation. Topics include contemporary global issues and draw on relevant literature in the disciplines relating to international affairs.

INTL 4904. Special Topics. 4 Hours.

Covers selected topics in current events in global affairs and international studies. May be repeated without limit.

INTL 4938. Dialogue of Civilizations: Globalization and Social Sciences. 4 Hours.

Engages students with the culture, civilization, and people of the countries studied and visited. The course provides students with an in-depth and on-site experience, learning the politics, sociology, journalism, human services, law, public policy, and/or economics and business in the country of study. Students connect with their peers in each country/society and gain a "global experience" that enhances their academic studies on campus in Boston. The experience culminates in an independent research project conducted by the students before, during, and after their time in-country. May be repeated without limit.

INTL 4944. Dialogue of Civilizations: Regional Engagement. 4 Hours.

Engages students with the cultures, societies, and peoples of particular countries and localities in one primary geographic region. Offers students an in-depth and on-site experience and an opportunity to learn about various aspects of the region, which may include politics, sociology, law, history, philosophy, culture, music, arts, literature, theatre, economics, and/or business. Students may connect with their peers in each locality and across societies, therein to gain an international experience designed to enhance their academic studies on campus in Boston. Culminating projects may include a research paper, an artistic expression piece (i.e., film or photos), or other assignment as determined by the professor. May be repeated without limit.

INTL 4970. Junior/Senior Honors Project 1. 4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student's major field. Combined with Junior/Senior Project 2 or college-defined equivalent for 8-credit honors project. May be repeated without limit.

INTL 4971. Junior/Senior Honors Project 2. 4 Hours.

Focuses on second semester of in-depth project in which a student conducts research or produces a product related to the student's major field. May be repeated without limit.

INTL 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

INTL 4991. Research. 4 Hours.

Offers an opportunity to conduct research under faculty supervision.

INTL 4992. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

INTL 4993. Independent Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

INTL 4994. Internship. 4,8 Hours.

Offers students an opportunity for internship work. May be repeated without limit.

INTL 5100. Climate and Development. 4 Hours.

Serves as an introduction to climate change and development processes in developing countries. Exposes students to key debates in the fields of climate change and international development. Offers students an opportunity to learn about the approaches to climate adaptation, the relationship between adaptation and development, and concepts of resilience and transformation. Using a comparative case study approach, explores the importance of the local context; the intersections of politics, economics, and culture; ecology and human-environment relationships; and the role (and challenges) of finance and development assistance. Climate impacts threaten to reverse many of the development gains of the last century, and the most vulnerable are likely to be the most impacted by climate change. At the same time, opportunities exist to ensure climate-compatible development pathways.

INTL 5200. Political Economy: Interdisciplinary Perspectives. 4 Hours.

Examines how states, institutions, policy choices, and social forces shape—and are influenced by—the global economy and the world polity. Examines changes in relations among and between the countries of the Global North and the Global South. Draws on concepts, propositions, and theories from various disciplinary approaches to (international) political economy, as well as Marxian, world-systems, and feminist theories.

INTL 5400. Cities in a Global Context. 4 Hours.

Examines the roots of the urbanization process, major ways of thinking about it, and the development of world cities and megacities. The twenty-first century will be a century in which urbanism is a central problem and opportunity. Considers the economic, political, cultural, and environmental dimensions of urbanism across the globe. Includes specific case studies from around the world. Encourages students to develop a knowledge of particular cities in order to examine the key themes of the course. INTL 5400, ANTH 5400, and SOCL 5400 are cross-listed.

International Business (INTB)

Search INTB Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=INTB>)

INTB 1202. Becoming a Global Manager. 4 Hours.

Offers an introduction to global business. Functions as a foundational, “cornerstone” course that frames the BSIB course of study and maps the way forward. Covers frameworks for understanding the context of global business and the competencies required of global managers. Students work in teams to complete a global business project. Assessments are used to develop self-awareness and establish a baseline for subsequent development. Offers students an opportunity to develop a four-year professional development plan (PDP) to guide their study and development during their time at Northeastern and to develop the global mind-set necessary for becoming an effective global manager. The PDP is referenced in subsequent courses.

INTB 1203. International Business and Global Social Responsibility. 4 Hours.

Introduces the student to forces and issues confronted in our era of rapid globalization. Managers must understand forces from interconnected social, political, and economic national environments that affect their company's operations. At the same time they need to draw on their ethical foundations to address and act on social responsibility imperatives across national borders.

INTB 1204. Living, Learning, and Leading Globally. 1 Hour.

Functions as a foundational, cornerstone course that frames the Global Engagement Program and assists students in mapping their way forward. Covers cultural and ethical frameworks for understanding the context of global business as an integrated whole. Introduces global leadership competencies combined with multiple assessments to help foster greater self-awareness and establish a baseline for subsequent development. Offers students an opportunity to create a four-year professional development plan (PDP), a living document designed to guide students' study and development throughout the program and to cultivate the mindset necessary for effective and authentic global leadership.

INTB 1209. International Business and Global Social Responsibility. 4 Hours.

Does not count as credit for business majors. Counts as INTB 1203 for business minors only.

INTB 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

INTB 2202. Analyzing the Global Business Environment. 4 Hours.

Analyzes the global business environment—political, economic, sociocultural—and the use of various frameworks to aid in analysis and decision making. Introduces the global business environment in which firms have to compete. Specifically examines contemporary issues over the political, social, and economic consequences of the globalization of markets and industries. Also examines the responses of multinational enterprises to the challenges of globalization. Offers students an opportunity to review and revise their professional development plans (PDPs).

INTB 2501. Competing to Win in Emerging Markets. 4 Hours.

Presents an introduction to emerging markets, focusing on the BRIC countries of Brazil, Russia, India, and China. Takes the perspective of U.S. companies and what they must do to be successful in emerging markets. Discusses the differences between doing business in an emerging vs. a domestic market, the opportunities and potential of an emerging market, and the risks of operating in such a market. Then looks at the world from the perspective of emerging markets and discusses steps that their governments, companies, and entrepreneurs must take to succeed in the world economy. Analyzes what emerging markets must do to raise wages and incomes, accelerate wealth creation, and reduce poverty.

INTB 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

INTB 3202. Managing the International Assignment. 4 Hours.

Seeks to help students prepare for and succeed in an international assignment. Begins with classroom work during the semester before students leave for their expatriate year, continues throughout their year overseas, and concludes with debriefing sessions upon return. Requires monthly reports while overseas to document their academic and co-op learning. Exposes students to cultural diversity and the pervasive, but hidden, influence of culture on how people live, work, and manage. Offers students an opportunity to (1) develop abilities needed to function effectively in situations of cultural diversity; (2) develop an appreciation of the issues that they may confront; (3) create awareness of the personal impact of an international assignment while they are living and working abroad.

INTB 3310. Cultural Aspects of International Business. 4 Hours.

Helps develop awareness of the hidden influence of culture on behavior, particularly with respect to management and management practices. With the increasing globalization of business, many managers find themselves being managed by, or collaborating with, people of different nationalities and cultures. Develops the ability to recognize, understand, and work with the cultural diversity that affects business conducted across national and cultural boundaries.

INTB 3316. Economic, Social, and Political Dimensions of Doing Business in Brazil. 4 Hours.

Explores cultural, political, and social dimensions of doing business in Brazil. Investigates Brazil's role in the global economy as well as the role of multinationals in this rapidly developing economy. Discusses the challenges facing companies that operate in a developing country as the country balances economic growth with environmental and social concerns.

INTB 3318. Field Research in Emerging Markets in Brazil. 4 Hours.

Offers students an opportunity to learn how Brazilian companies contribute to Brazilian economic development while being profitable. Studies for-profit companies, exploring how they address issues of sustainability and corporate responsibility within the context of running a company in a rapidly growing economy. Also examines the role played by nonprofits, nongovernment organizations, and government agencies in reducing poverty and illiteracy and in protecting the environment.

INTB 3320. International Business Management and Environment. 4 Hours.

Examines contemporary issues that confront today's global managers. Explores the responses multinational enterprises have to the challenges of globalization. Seeks to build an understanding of the environment of international business while addressing the competencies required of global managers. Offers students an opportunity to develop a four-year professional development plan to guide their study and to help them develop the global mind-set necessary for becoming an effective global manager. Analyzes the political, economic, and sociocultural environment in which global businesses operate.

INTB 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

INTB 4202. Executing Global Strategy. 4 Hours.

Emphasizes global strategy and execution as well as the leadership requirements necessary to execute global strategy. Offers a capstone, "big picture" course that draws on and integrates all business fields and presents a global manager's perspective. Uses the knowledge acquired in core courses—such as finance, accounting, operations, marketing, and organizational behavior—along with their international dimensions, to study how global managers reach strategic management decisions for the firm and its role in society. Offers students an opportunity to review and revise their professional development plans (PDPs) following their return from the expatriate experience and begin to develop post-Northeastern PDPs.

INTB 4970. Junior/Senior Honors Project 1. 4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student's major field. Combined with Junior/Senior Project 2 or college-defined equivalent for 8 credit honors project. May be repeated without limit.

INTB 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

INTB 4993. Independent Study. 1-4 Hours.

Allows students who have received approval to undertake independent study in lieu of any course required in the various concentrations. Students present proposals to an Independent Studies Committee for evaluation and approval. Every proposal requires a detailed outline of the objectives and plan of study and must be accompanied by a supporting statement from the supervising faculty member under whose direction the study takes place. A copy of the final report prepared by the student is presented to the appropriate Independent Studies Committee. Further information about the Independent Studies Program can be obtained from concentration coordinators. May be repeated without limit.

INTB 4998. International Business Undergraduate Thesis Continuation. 0 Hours.

Offers thesis continuation for students in the BSIB program who are working on their thesis as part of the dual-degree requirements. May be repeated once.

INTB 5978. Independent Study. 1-4 Hours.

Allows students who have received approval to undertake independent study in lieu of any course required in the various concentrations. Students present proposals to an Independent Studies Committee for evaluation and approval. Every proposal requires a detailed outline of the objectives and plan of study and must be accompanied by a supporting statement from the supervising faculty member under whose direction the study takes place. A copy of the final report prepared by the student is presented to the appropriate Independent Studies Committee. Further information about the Independent Studies Program can be obtained from concentration coordinators. May be repeated without limit.

INTB 6200. Managing the Global Enterprise. 3 Hours.

Focuses on the international business environment, and examines the influence on global decision making of such areas as the international economy and trade issues, legal and political context differences, governmental actions, cultural and ethical system differences, exchange rates and international currency markets, international institutions like the World Trade Organization and the International Monetary Fund, and regional agreements like the European Union, NAFTA, and Mercosur. Also analyzes why firms internationalize their operations, how they can internationalize, and key areas such as international manufacturing, marketing, human resource management, and strategy.

INTB 6201. International Business Management. 3 Hours.

Explores the organizational and functional challenges a firm's manager must master to be effective across national borders in an era of increasing globalization. Such challenges affect the international manager's strategic decisions and operational actions and arise from international economy and trade conditions, legal and political context differences, as well as cultural and ethical system issues.

INTB 6208. Global Management. 3 Hours.

Focuses on managerial decision making in international business. Covers key international business topics from international strategy, management, and organizational behavior such as globalization, national business environment analysis, cultural and ethical differences across borders, politics and law in international business, regional economic integration, motivations for going international, foreign direct investment, mode of entry selection, international organizational structure, MNC strategy, principles of international marketing, managing international operations, and international human resource management. Students read selected international business works, analyze and discuss cases, conduct international feasibility projects, and discuss current developments in the field.

INTB 6212. Cultural Aspects of International Business. 3 Hours.

Focuses on issues that arise when a firm operates in multiple countries with cultures that are different from its home country. Principally addresses the perspectives of U.S. firms operating overseas, but also explores other national firms operating in the United States and in third-country environments. A central issue is how corporate cultures evolve in the context of national cultures.

INTB 6217. Creating Sustainable Competitive Advantage through Global Innovation. 3 Hours.

Offers students an opportunity to learn about how companies overcome the barriers to managing global new-product development. Studies how distance, along with differences in culture, capabilities, costs, and customers, make the task of managing global new-product development efforts incredibly difficult and delicate. Also studies how firms develop and execute global innovation strategies, build and leverage global networks, create R&D capabilities abroad, manage distributed projects and virtual teams, and how emerging market firms innovate globally.

INTB 6224. Competing to Win in Emerging Markets. 3 Hours.

Offers students an opportunity to develop an understanding of emerging markets. Studies how U.S. firms can and do compete with emerging markets, how emerging-market companies compete with developed companies, and how companies in emerging markets compete with each other. Explores the future of emerging markets and the steps they need to take to ensure their future viability and success, as well as the threats they face.

INTB 6226. Becoming a Global Leader. 3 Hours.

Seeks to help students build the cross-cultural skills necessary to comfortably and effectively work in different cultures and with people from different cultures. Discusses the alignment between the firm's business strategy and the leader's responses in a multicultural environment along with the methods for leadership effectiveness in multicultural teams and virtual environments. Using online, experiential, and discussion-based methods, offers students an opportunity to gain the self-awareness needed to generate a plan for their own global leadership development.

INTB 6230. International Field Study. 3 Hours.

Designed to give students intense exposure to the global business environment by immersing them in the business practices and culture of a country or region outside the United States. The course is taught primarily in the country or region of interest and involves a mix of classes, company site visits, and cultural activities. Fulfills the globalization requirement in the full-time MBA program. May be repeated without limit.

INTB 6232. Doing Business in Emerging Markets. 3 Hours.

Takes the perspective of managers who are considering the best ways to enter and succeed in emerging markets such as Brazil, Russia, India, China, South Africa, and others that offer varying institutional opportunities and challenges. Examines how their action choices compare to those appropriate for entering advanced markets like the United States, Western Europe, or Japan. Emphasizes how socioeconomic, ethical, political, regulatory, and technological complexities affect the strategy choices that multinational firms, from and in emerging markets, make to succeed at home and abroad.

INTB 6238. Global Project. 3 Hours.

Offers students an opportunity to work on faculty-led teams to address a current issue facing a global corporate partner organization. Students interact directly with organizational leaders and employees to scope the project and work as a consulting team, harnessing campus and corporate resources to solve a problem and/or make recommendations. Faculty travel with the students to an international site to continue research, interviews, etc., and report findings to local corporate representatives. Feedback on the project reports are incorporated, and the final project report takes place post-travel with the corporate/sponsoring organizations' representatives.

INTB 6260. Advanced Topics in Global Management and Strategy. 3 Hours.

Offers topics of current interest in the international business arena, emphasizing managing in emerging markets, analyzing global expansion, and developing analytical and quantitative modeling skills for the international business arena, often in the context of developing presentation and writing skills in a case competition format. Instructor interests will shape course format and meeting schedules. May be repeated without limit.

INTB 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

INTB 7976. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on chosen topics. May be repeated without limit.

Interpreting (INTP)

Search INTP Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=INTP>)

INTP 1000. American Sign Language at Northeastern. 1 Hour.

Intended for freshmen in the College of Social Sciences and Humanities. Introduces freshmen to the liberal arts in general; familiarizes them with their major; helps them develop the academic skills necessary to succeed (analytical ability and critical thinking); provides grounding in the culture and values of the University community, and helps them develop interpersonal skills—in short, familiarizes students with all skills needed to become a successful university student.

INTP 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

INTP 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit. .

INTP 3500. The Interpreting Profession. 2 Hours.

Presents an overview of the interpreting profession: responsibilities, ethics, and aptitudes of interpreters; professional associations; law and business of interpreting; the bilingual and bicultural context; basic translation and interpretation; environment and audience; special populations; freelance vs. in-house positions; and evaluation and certification.

INTP 3510. Interpreting Inquiry Texts. 4 Hours.

Presents theoretical models of interpretation, but the primary focus is the interpretation of inquiry texts (job interviews, case histories, and applications) and the development of strategic decision-making skills within the context of dedicated and embedded inquiry texts. Presents an overview of linguistic and sociolinguistic factors, facets, and aspects of inquiry texts, and then seeks to develop in students the cognitive processes and skills involved in translation, consecutive interpretation, and simultaneous interpretation. The goal is that students develop the cognitive processes and decision-making skills needed to apply these differing strategies for achieving cross-cultural mediation.

INTP 3515. Interpreting Narrative Texts. 4 Hours.

Focuses on the interpretation of narrative texts (personal narratives, storytelling) and the development of strategic decision-making skills within the context of dedicated and embedded narrative texts. Presents an overview of linguistic and sociolinguistic factors, facets, and aspects of narrative texts, and then seeks to develop in students the cognitive processes and skills involved in translation, consecutive interpretation, and simultaneous interpretation. The goal is that students develop the cognitive processes and decision-making skills needed to apply these differing strategies for achieving cross-cultural mediation.

INTP 3550. Performance Interpreting—Interpreting for the Theatre. 4 Hours.

Designed to take students through the process of interpreting a play from first read-through to final bow. Interpreting for theatrical performances is markedly different from other forms of interpreting. The availability of a script, the time to rehearse, and the possibility of getting feedback prior to the event makes this venue a hybrid, part interpreting and part performance. This course is offered in conjunction with or in advance of a Theatre Department production. Gives students the opportunity to learn how to analyze scripts for both content and interpreting issues; how to solve the production problems of logistics, placement, and lighting; and how to interpret a series of performances for members of the Deaf community. May be repeated without limit.

INTP 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit. .

INTP 4510. Interpreting Expository Texts. 4 Hours.

Focuses on the interpretation of expository texts (lectures, procedural texts) and the development of strategic decision-making skills within the context of dedicated and embedded expository texts. Presents an overview of linguistic and sociolinguistic factors, facets, and aspects of expository texts, and then seeks to develop in students the cognitive processes and skills involved in translation, consecutive interpretation, and simultaneous interpretation. The goal is that students develop the cognitive processes and decision-making skills needed to apply these differing strategies for achieving cross-cultural mediation.

INTP 4515. Interpreting Persuasive Texts. 4 Hours.

Focuses on the interpretation of persuasive texts (solicitation, political speeches) and the development of strategic decision-making skills within the context of dedicated and embedded persuasive texts. Presents an overview of linguistic and sociolinguistic factors, facets, and aspects of persuasive texts, and then seeks to develop in students the cognitive processes and skills involved in translation, consecutive interpretation, and simultaneous interpretation. The goal is that students develop the cognitive processes and decision-making skills needed to apply these differing strategies for achieving cross-cultural mediation.

INTP 4650. Ethical Decision Making. 4 Hours.

Explores ethical standards and dilemmas in American Sign Language–English interpreting and other professions through discussions, hypothetical situations, and role-playing. Topics include culturally objective standards, ethics and professional principles, power relations within groups, and the Registry of Interpreters for the Deaf (RID) code of ethics. Students examine various alternatives to a duty-based approach to the RID code and draw upon ethical fieldwork experience to analyze the principles that guide ethical decision making among professional interpreters.

INTP 4651. Ethical Fieldwork. 2 Hours.

Comprises the fieldwork component of INTP 4650. Students are placed in practical interpreting experiences in educational settings, agencies serving Deaf people, and with freelance interpreters. Focuses on ethical questions and dilemmas and decision making in a biweekly seminar format. Students are required to maintain a log and participate in online discussions. Fulfills the experiential education requirement for ASL majors.

INTP 4940. Interpreting Research Capstone. 4 Hours.

Requires students to undertake a research project focused on some aspect of American Sign Language–English interpretation. Students work in research teams (with approval) and may begin their research project once enrolled in INTP 3510. In consultation with a faculty adviser, students select a research question, design and implement the data-collection component of the project, analyze results, and write up their research findings. In addition to a written report, students also present their research results to ASL majors at an annual “in-house” ASL research symposium.

INTP 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit. .

INTP 4995. Interpreting Practicum. 4 Hours.

Places students in practical interpreting experiences in educational settings, agencies serving Deaf people, and with freelance interpreters. Students are required to record a set number of hours interpreting with supervision and analyzing their work with the supervising interpreter. Students maintain a log and participate in online discussions. Students present case studies drawn from their supervised work experience in seminars. Fulfills the experiential education requirement for ASL majors.

Italian (ITLN)

Search ITLN Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=ITLN>)

ITLN 1101. Elementary Italian 1. 4 Hours.

Designed for students with very little or no prior knowledge of Italian. Provides a lively introduction to basic oral expression, listening comprehension, and elementary reading and writing. Each lesson incorporates helpful information about daily life in Italy and the varied cultures within the world of Italian speakers. Laboratory practice complements class work, enables students to work aloud at their own speed, reinforces their acquisition of essential structures, and acquaints them with a vast library of audio-visual resources.

ITLN 1102. Elementary Italian 2. 4 Hours.

Continues ITLN 1101. Reviews and continues the study of grammar and basic language skills. Offers progressively more intensive practice in oral and written communication. Laboratory practice complements class work, enables students to work aloud at their own speed, reinforces their acquisition of essential structures, and acquaints them with a vast library of audio-visual resources.

ITLN 1302. Elementary Italian Immersion 2. 4 Hours.

Designed for students who are in an Italian-speaking country, this is an off-campus immersion course. Offers students an opportunity to continue to develop grammatical and conversational competence. Focuses on oral and aural skills that are enhanced by the immersion environment.

ITLN 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ITLN 2101. Intermediate Italian 1. 4 Hours.

Emphasizes further vocabulary building and mastery of fine points of grammar through written composition, prepared oral reports, and reading and discussion from current Italian periodicals.

ITLN 2102. Intermediate Italian 2. 4 Hours.

Continues ITLN 2101. Emphasizes further vocabulary building and mastery of fine points of grammar through written composition, prepared oral reports, and reading and discussion from current Italian periodicals.

ITLN 2301. Intermediate Italian Immersion 1. 4 Hours.

Designed for students who are in an Italian-speaking country, this is an off-campus immersion course. Offers students an opportunity to continue to develop grammatical and conversational competence. Focuses on oral and aural skills that are enhanced by the immersion environment.

ITLN 2302. Intermediate Italian Immersion 2. 4 Hours.

Designed for students who are in an Italian-speaking country, this is an off-campus immersion course. Offers students an opportunity to continue to develop grammatical and conversational competence. Focuses on oral and aural skills that are enhanced by the immersion environment.

ITLN 2900. Specialized Instruction in Italian. 1-4 Hours.

Designed for individuals whose language skills are at the intermediate level and who seek specially focused language instruction. Such instruction might be the use of the language in specific settings, or it might be focused on specific conversational nuances of the language. Students must have at least an elementary level of competence in the language. May be repeated without limit.

ITLN 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ITLN 3101. Advanced Italian 1. 4 Hours.

Stresses the fundamentals of Italian to promote effective self-expression through speaking and writing and to explore the idiomatic aspects of the language. Through progressive class discussions and oral and written commentaries, students analyze a contemporary Italian novel or a Italian cultural reader, screenplay, or collection of short stories. The course strives, first, to help students read and comprehend modern Italian writing with confidence and to be able to talk and write about it in good Italian; and second, to provide preparation for advanced courses.

ITLN 3301. Advanced Italian Immersion 1. 4 Hours.

Designed for students who are in an Italian-speaking country, this is an off-campus immersion course. Offers students an opportunity to continue to develop grammatical and conversational competence.

ITLN 3302. Advanced Italian Immersion 2. 4 Hours.

Designed for students who are in an Italian-speaking country, this is an off-campus immersion course. Focuses on standard Italian as well as the local dialect. Offers students an opportunity to continue to develop grammatical and conversational competence.

ITLN 3900. Specialized Instruction in Italian. 1-4 Hours.

Designed for individuals whose language skills are at an advanced level and who seek specially focused language instruction. Such instruction might be the use of the language in specific settings, or it might be focused on specific conversational nuances of the language. Requires at least an advanced level of competence in the language. May be repeated without limit.

ITLN 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ITLN 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ITLN 4991. Research. 4 Hours.

Offers an opportunity to conduct research under faculty supervision. May be repeated without limit.

ITLN 4992. Directed Study. 1-4 Hours.

Offers students a way of going beyond work given in the regular curriculum; may also enable students to complete major or minor requirements in certain situations. Priority is given to language majors and to juniors and seniors. May be repeated without limit.

Japanese (JPNS)

Search JPNS Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=JPNS>)

JPNS 1101. Elementary Japanese 1. 4 Hours.

Introduces basic grammar, sentence patterns, and vocabulary of Japanese with emphasis on spoken Japanese. Includes an introduction to the hiragana and katakana syllabaries in the written component. Designed for students with no previous knowledge of Japanese.

JPNS 1102. Elementary Japanese 2. 4 Hours.

Continues JPNS 1101. Emphasizes the development of oral skills; secondary emphasis is on reading. Offers students the opportunity to learn basic grammatical patterns, expand vocabulary, and improve communication skills in modern Japanese. Includes the introduction to kanji characters in the written component.

JPNS 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

JPNS 2101. Intermediate Japanese 1. 4 Hours.

Emphasizes further vocabulary building. Offers students an opportunity to master the fine points of grammar through written composition, prepared oral reports, and reading and discussion from contemporary Japanese materials.

JPNS 2102. Intermediate Japanese 2. 4 Hours.

Builds on JPNS 2101 and focuses on further development of vocabulary. Offers students an opportunity to continue to master grammar and conversation through written composition, prepared oral reports, and reading and discussion from contemporary Japanese materials.

JPNS 2301. Intermediate Japanese Immersion 1. 4 Hours.

Designed for students who are in a Japanese-speaking country, this is an off-campus immersion course. Offers students an opportunity to continue to develop grammatical and conversational competence. Focuses on oral and aural skills that are enhanced by the immersion environment.

JPNS 2302. Intermediate Japanese Immersion 2. 4 Hours.

Designed for students who are in a Japanese-speaking country, this is an off-campus immersion course. Offers students an opportunity to continue to develop grammatical and conversational competence. Focuses on oral and aural skills that are enhanced by the immersion environment.

JPNS 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

JPNS 3101. Advanced Japanese 1. 4 Hours.

Continues further development of vocabulary. Offers students an opportunity to continue to master grammar and conversation through advanced reading, composition, grammar review, and listening skills. Whenever possible, offers students an opportunity to engage in local community activities to enhance communication skills and cultural knowledge.

JPNS 3102. Advanced Japanese 2. 4 Hours.

Builds on JPNS 3101 and continues further development of vocabulary. Offers students an opportunity to continue to master grammar and conversation through advanced reading, composition, grammar review, and listening skills. Whenever possible, offers students an opportunity to engage in local community activities to enhance communication skills and cultural knowledge.

JPNS 3301. Advanced Japanese Immersion 1. 4 Hours.

Designed for students who are in a Japanese-speaking country, this is an off-campus immersion course. Offers students an opportunity to continue to develop grammatical and conversational competence.

JPNS 3900. Specialized Instruction in Japanese. 1-4 Hours.

Designed for individuals whose language skills are at an advanced level and who seek specially focused language instruction. Such instruction might be the use of the language in specific settings, or it might be focused on specific conversational nuances of the language. Requires at least an advanced level of competence in the language. May be repeated without limit.

JPNS 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

JPNS 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

JPNS 4992. Directed Study. 1-4 Hours.

Offers students a way of going beyond work given in the regular curriculum; may also enable students to complete major or minor requirements in certain situations. Priority is given to language majors and to juniors and seniors. May be repeated without limit.

JPNS 5976. Directed Study. 1 Hour.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

JWSS 1285. Jewish Religion and Culture. 4 Hours.

Explores the basic features of Judaism in the ancient, rabbinic, and modern periods. Employs an historical critical approach to the formative texts and their interpreters. Analyzes Jewish practices within specific historical contexts and discusses the ways in which practices relate to the texts and history of Judaism. Examines the rich varieties of Jewish cultural expressions. JWSS 1285 and PHIL 1285 are cross-listed.

JWSS 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

JWSS 2285. America and the Holocaust. 4 Hours.

Examines the American response to the Holocaust, in terms of both contemporaneous knowledge and actions and the lasting impact on policy and culture. Starts with early twentieth-century events, such as the Armenian genocide, that shaped later attitudes. Explores the prewar period, particularly U.S. immigration and isolationist policies. Assesses Americans' knowledge of European events as the extermination campaign unfolded and fights ensued over rescue possibilities. Examines changing depictions of the Holocaust that emerged in the postwar period as a result of critical events such as the Eichmann trial and popular television and film portrayals. Finally, considers how perceptions of the Holocaust have shaped subsequent U.S. responses to genocide. HIST 2285, JRNL 2285, and JWSS 2285 are cross-listed.

JWSS 2431. Immigration and Identity in the American Jewish Experience. 4 Hours.

Examines Jewish political, social, and cultural history from the arrival of the first group of Jews at New Amsterdam in 1654 to the present. Themes include immigration, adaptation, family life, religion, anti-Semitism, Zionism, the Holocaust, and American-Israeli relations. HIST 2431 and JWSS 2431 are cross-listed.

JWSS 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

JWSS 3678. Bedrooms and Battlefields: Hebrew Bible and the Origins of Sex, Gender, and Ethnicity. 4 Hours.

Considers stories from Hebrew Scripture in English translation, beginning with the Garden of Eden through the Book of Ruth, asking how these foundational narratives establish the categories that have come to define our humanity. Analyzes how the Bible's patterns of representation construct sexual and ethnic identities and naturalize ideas about such social institutions as "the family." ENGL 3678, JWSS 3678, and WMNS 3678 are cross-listed.

JWSS 3685. Modern and Contemporary Jewish Literature. 4 Hours.

Surveys Jewish literature from the late modern (1880–1948) and contemporary (1948–present) periods. Considers themes of immigration and cross-cultural influences and issues of religious, ethnic, and gender identity. Emphasizes American and European literatures to begin to define an international Jewish literary canon, including Yiddish poets and playwrights, Russian Jewish writers, and modern writers. ENGL 3685 and JWSS 3685 are cross-listed.

JWSS 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

JWSS 4660. Jewish Studies Module. 1 Hour.

Permits specialized Jewish studies topics to be studied as part of more general courses. Restricted to junior, senior, or graduate standing. May be repeated without limit.

Jewish Studies (JWSS)

Search JWSS Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=JWSS>)

JWSS 4992. Directed Study. 1-4 Hours.

Offers students an opportunity for special readings and research in Jewish studies. May be repeated for up to 8 total credits.

Jewish Studies - CPS (JLS)

Search JLS Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=JLS>)

JLS 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

Journalism (JRNL)

Search JRNL Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=JRNL>)

JRNL 1000. Journalism at Northeastern. 1 Hour.

Intended for first-year students in the College of Arts, Media and Design. Introduces students to liberal arts; familiarizes them with their major; develops the academic skills necessary to succeed (analytical ability and critical thinking); provides grounding in the culture and values of the University community; and helps to develop interpersonal skills—in short, familiarizes students with all skills needed to become a successful university student.

JRNL 1101. Journalism 1: Fundamentals of Reporting. 4 Hours.

Covers foundations of news writing for print media, including leads, story structure, objective tone, and attribution. Introduces fundamental reporting skills such as interviewing, researching, and observation. It then asks students, in their reporting, to step back and analyze the institutions they are writing about and the media itself in order to understand how societies and its institutions function and the validity of theories that explain these processes.

JRNL 1102. Journalist's Toolbox. 1 Hour.

Introduces the tools journalists use to tell stories that will be utilized in Journalism 1 and beyond. Covers introductory photo, audio, video, and data visualization skills. Exposes students to other journalistic tools including social media and blogging. Offers students an opportunity to become familiar with composition of photos, recording and editing audio and video on nonlinear software, and how data visualizations can enhance journalistic storytelling.

JRNL 1150. Understanding Today's News. 4 Hours.

Examines the media institutions that shape the news and how the challenges of economics, politics, diversity, and globalization change the function of the website, newspaper, news magazine, and news broadcasts. Examines stories and news decisions from different perspectives to evaluate national, political, local, foreign, sports, and science news in the U.S. media. Topics include responsibilities of the press and the changing ways news is gathered, processed, and disseminated. Explores how other societies in different parts of the world view the news; freedom of the press; and the role of reporters, producers, and editors.

JRNL 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

JRNL 2201. Journalism 2: Intermediate Reporting. 4 Hours.

Continues JRNL 1101. This is the second writing course for undergraduate journalism students with an emphasis on learning how to report news stories. Offers students the opportunity to find sources and interview them, do background research, and use public records. Developing story ideas using computer-assisted reporting will be covered. Examines how to develop a story idea and then focus and organize it. Covers basic principles of online journalism including writing, design, and integration of visuals and text for the Web. Introduces elements of design and layout.

JRNL 2250. Spotlight: The Story of Journalism and Democracy. 4 Hours.

Offers an overview of groundbreaking stories and the journalistic methods used to produce them. Seeks to facilitate broad understanding of why a free press matters in a democratic society. Offers a behind-the-scenes look at examples of great investigative journalism that changed American history and explores the media's capacity to hold the powerful accountable. From Watergate to WikiLeaks and beyond, students critically analyze important news stories that helped reshape society. Reviews major stories, films, and interactive media and studies the methods used to report and produce such stories, including methods used by the Boston Globe Spotlight team and seen in the Oscar-winning movie "Spotlight." Focuses on researching documents as well as interviewing techniques.

JRNL 2285. America and the Holocaust. 4 Hours.

Examines the American response to the Holocaust, in terms of both contemporaneous knowledge and actions and the lasting impact on policy and culture. Starts with early twentieth-century events, such as the Armenian genocide, that shaped later attitudes. Explores the prewar period, particularly U.S. immigration and isolationist policies. Assesses Americans' knowledge of European events as the extermination campaign unfolded and fights ensued over rescue possibilities. Examines changing depictions of the Holocaust that emerged in the postwar period as a result of critical events such as the Eichmann trial and popular television and film portrayals. Finally, considers how perceptions of the Holocaust have shaped subsequent U.S. responses to genocide. HIST 2285, JRNL 2285, and JWSS 2285 are cross-listed.

JRNL 2301. Visual Storytelling in Journalism. 4 Hours.

Continues JRNL 2201. Covers basic principles of journalistic storytelling with video, sound, and still images. Introduces students to the foundations of writing with audio and video, and explores the concept of "convergence," preparing stories for presentation in different formats. Fulfills the Advanced Writing in the Disciplines requirement for journalism majors.

JRNL 2350. The History of Journalism: How the News Became the News. 4 Hours.

Traces the development of American journalism from its European and English beginnings. Topics include the colonial press, the great personal journalists of the nineteenth century, and the impact of major technological changes in mass communications media in the twentieth century.

JRNL 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

JRNL 2991. Research in Journalism. 1-4 Hours.

Offers an opportunity to conduct introductory-level research or creative endeavors under faculty supervision.

JRNL 3300. Covering Conflicts: Peace, War, and the Media. 4 Hours.

Examines the media's portrayal of conflicts and the peace process in the Middle East, Northern Ireland, Bosnia, Rwanda, and elsewhere. Evaluates the limits of fairness, balance, and accuracy in the coverage. Looks at the U.S. and international media—print, broadcast, and online—and some of the major stories in recent years and attempts to put these stories in historical, political, and social context. Analyzes the wide-ranging criticism of coverage from a variety of perspectives. INTL 3300 and JRNL 3300 are cross-listed.

JRNL 3305. Special Topics. 4 Hours.

Offers specialized topics in journalism for the twenty-first century. Topic matter changes each semester. May be repeated up to four times.

JRNL 3370. Podcast and Radio Journalism. 4 Hours.

Covers the fundamentals of audio journalism in a hands-on environment. Offers students an opportunity to learn how to record and edit audio, write for the ear, interview for broadcast, and experiment with a wide range of radio and podcast formats and narrative techniques. Listening sessions and assignments explore the different requirements of spot news, radio features, reporter debriefs, host interviews, and longer-form audio storytelling, including documentary and serial-style podcasts. Emphasizes journalistic principles and ethical considerations.

JRNL 3425. Public Relations Principles. 4 Hours.

Presents the principles, history, and methods of public relations; processes of influencing public opinion; responsibilities of the public relations practitioner; and analyses of public relations programs. Through case studies and class discussions, offers students an opportunity to confront real-life ethical dilemmas and learn to apply ethical frameworks to evaluate and resolve them. COMM 3445 and JRNL 3425 are cross-listed.

JRNL 3455. Sports Writing. 4 Hours.

Provides practice in journalistic coverage of amateur and professional athletics. Focuses on the role of sports writing in the news media and examines such topics as game coverage, feature profiles, and opinion columns.

JRNL 3550. The First Amendment and the Media. 4 Hours.

Examines legal problems of libel, invasion of privacy, and access to government information; discusses the balance between private rights and the public's "need to know".

JRNL 3610. Digital Storytelling and Social Media. 4 Hours.

Offers students an opportunity to learn the fundamentals of digital journalism. Emphasizes hands-on instruction in multimedia skills. Topics may include blogging, photography, video and audio production, use of social media as a reporting tool, and mapping and data visualization. Guest speakers and a consideration of the future of news may also be part of the course. Requires students to produce a final project that consists of storytelling across a range of platforms—for example, a written article, a photo story, and a video.

JRNL 3625. Public Relations Practice. 4 Hours.

Demonstrates practices and techniques employed in the field including organization of events and functions. Studies campaign planning, research, and media relationships. COMM 3625 and JRNL 3625 are cross-listed.

JRNL 3630. Magazine Writing. 4 Hours.

Covers writing and freelancing magazine articles; analyzing magazines as markets; and selecting the best feature format—how-to-do-it, profile, personal experience, human interest, interpretive pieces, and others. Requires a firm grasp of journalistic concepts, including advanced reporting and writing skills; a prior journalistic co-op or internship or experience writing for a school, online, or professional publication is preferred.

JRNL 3650. Science Writing. 4 Hours.

Explores the role of journalism in delivering science news and information to a general audience through print and digital media. Through readings and analysis of a variety of news media, offers students an opportunity to learn how political debates intersect with and shape scientific developments and how scientific developments can be sensationalized or misunderstood. Students also have an opportunity to learn and apply best journalistic practices to communicate effectively in the media about science, health, environmental, and technology issues whether headed to a newsroom, corporate press office, or scientific institution.

JRNL 3680. Advanced Reporting. 4 Hours.

Offers students an opportunity to learn and apply advanced reporting techniques of the kind that editors and producers expect of their best reporters, especially those who cover demanding beats such as politics, government, healthcare, education, science, and business. Studies how to see and apply data and data visualization techniques, to develop and interview sources, to locate and decipher public records, to identify and conceptualize important stories, and to discuss and apply ethical theories to reporting to justify choices that may inflame or antagonize sources or readers. An assignment to do substantial enterprise stories for publication in major media outlets is part of the course.

JRNL 3945. Internship. 1-4 Hours.

Comprises academic credit for internship work in journalism. May be repeated without limit.

JRNL 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

JRNL 4650. Ethics and Issues in Journalism. 4 Hours.

Discusses the responsibilities of news media and ethical problems confronting decision makers in various journalistic fields and the principles found in codes of various professional societies. Requires students to write a paper on an ethical problem they faced while working in the media and place it in a framework of at least two ethical theories, for example, utilitarianism and deontology.

JRNL 4970. Junior/Senior Honors Project 1. 4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student's major field. Combined with Junior/Senior Project 2 or college-defined equivalent for 8-credit honors project. May be repeated without limit.

JRNL 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

JRNL 4991. Research. 4 Hours.

Offers an opportunity to conduct research under faculty supervision.

JRNL 4992. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

JRNL 4993. Independent Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

JRNL 5309. News Documentary Production. 4 Hours.

Offers students an opportunity to research, write, and produce a short news video documentary and acquaint themselves with a range of professional documentary styles through screenings and discussions. Emphasizes analyzing and addressing the ethical challenges facing documentary filmmakers and their interaction with subjects historically and in the new media age.

JRNL 5310. Photojournalism. 4 Hours.

Covers camera procedures along with cropping, assignment techniques, theory, and photo-caption methods. Engages students in the ethical choices photojournalists face in covering wars, disasters, and vulnerable people in societies—both historically and in the new media environment.

JRNL 5311. Design for Storytelling. 4 Hours.

Covers basic principles of print and digital design with lectures, skills training, and a maker's workshop. Introduces students to the foundations of typography, color, grids, and use of images for storytelling. Students design, prototype, and produce a print magazine and website.

JRNL 5314. Video News Reporting and Producing. 4 Hours.

Engages students in the ethical challenges facing journalists historically and in the new media age. Students experiment with techniques used by TV and electronic news producers, including reporting, writing, videotaping, and editing on nonlinear digital editing equipment. Offers students an opportunity to create and produce news stories and upload them to their websites with a variety of software programs for dissemination across video and several multimedia platforms, in line with journalistic and ethical standards.

JRNL 5316. The Newsroom. 4 Hours.

Immerses students in a real-life television newsroom experience. Exposes students to all aspects of TV news production: from news gathering, producing, and being in front of the camera to the behind-the-scenes work of operating multiple cameras, live switching, audio mixing, and studio lighting. Allows students to be an integral part of a newsroom team, working as reporters, anchors, videographers, and editors to gather content and work in the studio to produce a Northeastern newscast covering news on campus and beyond. Involves hands-on reporting and production where the stories are real and so are the deadlines.

JRNL 5360. Global Reporting. 4 Hours.

Discusses coverage of global issues and international public affairs and the function of the media in a global context. Topics include how news is gathered, processed, and disseminated by the various media abroad and how the media reflect culture, religion, and politics around the world. Focuses on practical, in-the-field experience with global governmental, business, and societal leaders. This course is part of the Dialogue of Civilizations program abroad. Graduate awards do not apply toward this program. International students wishing to register need to speak to the International Student and Scholar Institute prior to registration. May be repeated without limit.

JRNL 5400. Media and Advocacy in Theory and Practice. 4 Hours.

Examines time-tested and cutting-edge methods for shaping and presenting messages across multimedia platforms to effectively disseminate an organization's message, change a public conversation, or shift public opinion. Examines case studies in mainstream media, public advocacy, and strategic communications to explore the motivations and methods of the organizations as well as the tools and techniques used. Examines the practice of digital advocacy by exploring and applying pertinent findings from politics, advertising, and behavioral science that are increasingly employed by professionals looking to "micro-target" voters, "convert" customers, or "nudge" the public. One major component of the course is hands-on workshops through which students are offered an opportunity to learn how to leverage the latest digital tools for communicating across social media and online platforms.

JRNL 5460. POV: The Art and Craft of Opinion Journalism. 4 Hours.

Offers students an opportunity to learn how to write a variety of opinion articles in a journalistic context. Articles may include blog posts, op-ed columns, personal essays, reviews, and magazine-style stories that combine reporting with a strong point of view. Students are also offered an opportunity to learn about the ethics of opinion journalism, become familiar with the best practitioners in the field, and use social media to inform and promote their work.

JRNL 6100. Reporting and Writing Fundamentals. 1 Hour.

Introduces the basics of news reporting and writing. Runs for three weeks beginning in mid-August.

JRNL 6200. Enterprise Reporting 1. 4 Hours.

Defines and sharpens research, interviewing, and analytical skills necessary for good reporting. Focuses on learning to develop story ideas and conduct primary and secondary research for a major enterprise article. Skills are developed through an analysis of outstanding reportage, in-class discussion and exercises, and out-of-class assignments.

JRNL 6201. Enterprise Reporting 2. 4 Hours.

Builds on skills and concepts covered in JRNL 6200. Covers a variety of Web-based and traditional resources. Employs computer-assisted reporting methodologies to assist students in investigating areas such as government corruption, safety and environmental risks, criminal justice, education, healthcare, real estate, campaign financing, and business and financial transactions. Offers students an opportunity to learn how to access public databases, to reference materials, and to analyze the information.

JRNL 6202. Perspective on Journalism Ethics. 4 Hours.

Offers a seminar involving readings and discussions about philosophical and moral principles developed by Mill, Hume, and others, and their application to case studies and work experience in print and broadcast journalism. Issues include deception, conflict of interest, privacy, and corporate ownership. Students also evaluate the role of journalism reviews, codes of ethics, ombudsmen, and news councils.

JRNL 6305. Topics. 4 Hours.

Requires advanced work to develop media skills not covered in other classes. May be repeated without limit.

JRNL 6306. Media Innovation Studio 1. 4 Hours.

Constitutes the first of a two-course studio sequence designed to prepare experienced journalists to create new forms of journalism in the digital age. Offers students an opportunity to work with faculty members and peers via class exercises and peer-to-peer project collaboration to identify and develop the subject of a signature master's project. Incorporates lectures on emerging media practices, including parallax scrolling, and instruction on digital journalism tools, including DSLR cameras, as well as reviews and critiques of professional and studio work by faculty and guest speakers.

JRNL 6307. Media Innovation Studio 2. 4 Hours.

Offers students an opportunity to integrate knowledge and skills derived from foundation courses to develop a master's project. Creates a newsroom environment in which each student project is advanced through a journalistic collaborative process that features critiques from instructors and peers and integrates expertise from guest lecturers. Following the "teaching hospital" model, students work with the instructor, each other, and partnered media innovation visitors to develop their work.

JRNL 6340. Fundamentals of Digital Journalism. 4 Hours.

Offers students an opportunity to learn the fundamentals of digital journalism and to place those skills within the context of a changing media environment. Studies multimedia tools within an intellectual framework—i.e., offers students an opportunity to learn hands-on skills and also to study best practices and theory. May include guest speakers and a consideration of the future of news. Requires students to produce a final project that consists of storytelling across a range of digital platforms.

JRNL 6341. Telling Your Story with Data. 4 Hours.

Explores select topics in data journalism and support data-driven storytelling projects of various kinds. Offers students an opportunity to learn how to navigate the often-competing demands of rigorous analysis and accessible narrative and storytelling. Course units are designed to foster moderate technical learning of applications and software, incorporate theories from relevant fields in data visualization and data science, and emphasize storytelling for broad public audiences.

JRNL 6352. Nonfiction Writing. 4 Hours.

Concentrates on techniques that distinguish magazine writing from other types of journalism including first-person voice, strong point of view, observation-participation, and complex organizational structures. Also introduces students to the magazine market through an analysis of overall trends and a look at individual magazine's mission and modus operandi.

JRNL 6355. Seminar in Investigative Reporting. 4 Hours.

Introduces students to the world of investigative reporting as it is practiced at major metropolitan newspapers. Asks students to work as members of investigative reporting teams and introduces them to advanced reporting techniques and standards in the classroom. Provides an opportunity to learn how ideas for investigative reporting projects are developed; how to identify and interpret public records and online databases; and how to do interviews and write investigative stories. Working in small teams, the students are given an opportunity to develop and write investigative stories for publication.

JRNL 6400. News Internship. 4 Hours.

Provides students with the opportunity to report on public policy issues for newspapers, magazines, and legal affairs publications in Massachusetts and New England. Supplements live reporting with in-class discussion, including speakers in government, media, and the law. May be repeated without limit.

JRNL 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

JRNL 6964. Co-op Work Experience. 0 Hours.

Provides eligible students with an opportunity for work experience. May be repeated without limit.

JRNL 6966. Practicum. 1-4 Hours.

Provides eligible students with an opportunity for practical experience. May be repeated without limit.

JRNL 7976. Directed Study. 1-4 Hours.

Offers students work on individual projects under the supervision of an instructor. May be repeated without limit.

KMG 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

Landscape Architecture (LARC)

Search LARC Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=LARC>)

LARC 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

LARC 2130. Sustainable Urban Site Design. 6 Hours.

Focuses on site planning and design with an emphasis on parks and open-space systems in the adaptive reuse of urban sites. Projects focus on the creation and cultivation of public space, transformation of site conditions, and development of sustainable site materials. Emphasizes site analysis, development of an individual design process, and design communication strategies. This studio course introduces students to urban design precedents, site research, and remediation methods through case studies, lectures, site visits, and workshops.

LARC 2140. Designed Urban Ecologies. 6 Hours.

Continues LARC 2130. Focuses on sustainable community/campus/neighborhood design at the intersection of large-scale urban and environmental systems. Primary topics include mixed-use programming in relation to systems ranging from zoning and transit to the material flows of human and wildlife habitats. This studio course introduces basic geographical information systems (GIS) and application of landscape ecology principles. Projects examine the role of landscape systems and the formation and reformulation of land development scenarios.

LARC 2230. Introduction to Sustainable Site Planning and Design. 4 Hours.

Addresses fundamental techniques of sustainable site design in the built environment, including earthworks, water, and soils, using current-day storm events. Primary topics include topography, site grading, study models, universal accessibility, and storm water considerations in urban and other built environments. Introduces students to urban tree planting techniques, graphic communications, basic site materials, and construction details.

LARC 2240. Sustainable Site Construction and Detailing. 4 Hours.

Continues LARC 2230. Focuses on construction technologies, methods, and materials for sustainable site elements, including environmental performance infrastructures, circulation systems, and basic site structures. Introduces structural systems for site work via lecture and in-class exercises.

LARC 2330. Cities, Landscape, and Modern Culture. 4 Hours.

Presents the themes, core theories, and iconic works that gave shape to modernism in landscape architecture and urbanism. Focusing on the eighteenth-century through mid-twentieth-century projects and designers, lectures examine contextual factors and resulting formal, spatial, organizational, and material characteristics of built works. Offers students an opportunity to practice formulation of a critical design perspective via reading responses, project analysis, written work, and exams.

Knowledge Management - CPS (KMG)

Search KMG Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=KMG>)

LARC 2340. Cities, Landscape, and Contemporary Culture. 4 Hours.

Presents the themes, core theories, and iconic works that shape the field of contemporary landscape architecture and urbanism. Focusing on the late twentieth century through contemporary projects and designers, lectures examine contextual factors and resulting formal, spatial, organizational, and material characteristics of built works. Offers students an opportunity to practice formulation of a critical design perspective via reading responses, project analysis, written work, and exams.

LARC 2430. Plants, People, and Landscape Change. 4 Hours.

Uses the study of New England's plant communities and plant identification as a framework to consider the evolution of the New England landscape from European colonization to the present. Combines field study with lectures and class discussion. Human activity, land use, and settlement patterns all influence the development of landscape, and our cultural history is expressed in the species demographics, land forms, and ecosystem dynamics of our environment.

LARC 2440. Planting Design. 4 Hours.

Combines horticultural and ecological field study with studio design exercises to deliver introductory to advanced planting design techniques. Primary topics include how to design phytoremediation strategies for contaminated sites, seasonal planting considerations, strategic phasing, and maintenance techniques. This is a workshop-based course.

LARC 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at consortium institutions. May be repeated without limit.

LARC 3155. Studio Abroad. 6 Hours.

Offers students an opportunity to learn sustainable landscape and urban design techniques in an international setting. Key topics include cultural influences on urban revitalization and ecological restoration, innovative material and site technologies, regional best management practices (BMPs), and integration of diverse historical influences into the design process.

LARC 3170. Landscape Planning and Urbanism Studio. 6 Hours.

Introduces sustainable landscape planning techniques with an emphasis on adaptive urbanism. Key topics include the designed and managed relationship of cities to their regional ecologies, such as sub/urbanized watersheds and coastal zones, as well as the spatial, material, and programmatic roles of environmental infrastructures in the civic landscape. Particularly emphasizes the market-based integration of recreation, transit, food, housing, and industrial networks with living systems such as urban forests, riparian corridors, managed habitats, and constructed wetlands.

LARC 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at consortium institutions. May be repeated without limit.

LARC 5110. Advanced Design for Urban Environments Studio. 6 Hours.

Focuses on ecological, economic, and social resiliency of designed urban environments in response to globalization. Contemporary case studies of urban change provide the basis for design investigation into issues such as the impact of shifting industries on Detroit (deurbanization) or Shenzhen (rapid densification); shifting weather and water patterns in densely populated regions; societal shifts, from generational demographics to political upheavals and militarization/demilitarization of the urban landscape. Emphasizes the integration of interdisciplinary perspectives and advanced design analysis, conceptualization, and visualization skills into development of a global perspective on managing change in the built environment.

LARC 5120. Comprehensive Design Studio. 6 Hours.

Offers students an opportunity to design and develop a site or district including all of its requisite systems. Students draw on their landscape architectural education to produce a design both responsive to specific criteria and prototypical of ways to build sustainable and adaptable public landscapes—often described as “resilience.” Projects are expected to respond to and integrate their contexts (urban, environmental, climatic, and economic); meet spatial, performative, and programmatic requirements and technical demands (materials, implementation and management strategies); and dynamic processes at play within and around the project site.

LARC 5210. Landscape Ecology. 4 Hours.

Introduces fundamental-to-advanced concepts in the field of landscape and urban ecology. Focuses on the landscape-scale spatial structure, temporal patterns, and geographic ranges produced by the intersection of large-scale environmental and human processes. Emphasizes spatial taxonomies (patch, corridor, mosaic, granularity, edge, ecotone) produced across diverse landscape types influenced by human development and landscape dynamics in the built environment (disturbance, fragmentation, accumulation, and succession). Incorporates basic techniques in geographic-information-system software.

LARC 5220. Sustainable Landscape Practices. 4 Hours.

Offers a lecture/workshop/field-based course that builds upon landscape technology skills introduced in LARC 2230 and LARC 2240, with a focus on ecotechnologies operating in the built environment. Core topics include design and implementation metrics, material life-cycle management, funding models, and aesthetic and cultural aspects. Potential topics include green roofs, green walls, bioswales, pervious pavements, constructed wetlands, “complete street” elements, geosensor networks, alternative waste management, water detention and energy generation methods, and living infrastructures for coastal environments.

LARC 5310. Urban Landscape Seminar. 4 Hours.

Offers a discussion-based seminar focusing on case studies of influential works in contemporary landscape, urbanism, and sustainable environmental design. Encourages students to seek interdisciplinary perspectives toward development of critical-thinking skills in relation to forces shaping urban environments in contemporary global culture. A diverse range of material from published design criticism to open-source social media engagement provides basis for discussion and written and oral presentations.

LARC 5420. Professional Practice in Landscape Architecture. 4 Hours.

Offers a lecture- and case-study-based course focusing on strategic planning, business models, organizational structures, logistics, and regulatory paradigms associated with professional practice in landscape architecture. Core topics provide an overview of common technical and business procedures, including RFQs; RFPs; marketing, public relations, and client management; hiring and human resource management; review board/regulatory boards; permitting; and licensure.

Language - General (LANG)

Search LANG Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=LANG>)

LANG 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

LANG 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

LANG 4700. Capstone Seminar. 4 Hours.

Provides the graduating student the opportunity to integrate the intellectual aspects of the program with its experiential elements, especially the study-abroad portion of the students' program.

LANG 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

LANG 4992. Directed Study. 1-4 Hours.

Offers students a way of going beyond work given in the regular curriculum; may also enable students to complete major or minor requirements in certain situations. Priority is given to language majors and to juniors and seniors. May be repeated without limit.

Latin American and Caribbean Studies (LACS)

Search LACS Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=LACS>)

LACS 1220. Latino, Latin American, and Caribbean Studies. 4 Hours.

Offers an interdisciplinary introduction to Latinos and people of Latin American and Caribbean origin in the United States as well as to the regions of Latin America and the Caribbean. Dispels a series of powerful myths associated with U.S. Latinos and in Latin American and Caribbean society, such as racial inferiority, poverty, machismo, and violence. Introduces the construction of Latino, Latin American, and Caribbean identities as well as the politics, economics, history, and culture.

Law (for Non-Law School Students) (LW)

Search LW Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=LW>)

LW 1200. How Lawyers Think: An Introduction to American Legal Thought. 4 Hours.

Introduces students to legal analysis by exploring the history of American legal thought. Perhaps more than any other, American society is governed by lawyers. Explores how innovations in legal theory both emerged from and helped shape policy responses to some of America's biggest governance challenges, including economic concentration and corporate power, the New Deal and the rise of the welfare state, the replacement of Jim Crow with civil rights guarantees, and the emergence of identity politics. As is true for many academic fields—such as economics, political science, or literary studies—expertise in law is gained through mastery of the discipline's analytic techniques, which, in turn, shape how lawyers imagine possibilities, make policy, and engage in professional practice. Presumes no prior legal study.

LW 6120. Law and Strategy. 3 Hours.

Introduces students to the implications and impact of law on strategy, with attention to applying legal knowledge and resources to strategic planning and strategy implementation. Uses several examples of readily understood strategies to provide opportunities for students to identify the legal environment, consider the legal rights and requirements implicated by relevant law or regulation (e.g., intellectual property, contracts, administrative law) and their potential impact on management, incorporating law as a resource on the resource based view of the firm. Range of examples include considering law and strategy implementation in multiple contexts. Focuses on developing an appreciation of the legal environment and making effective use of legal resources and lawyers as advisors in strategic management aimed at attaining sustainable competitive advantage over rivals.

LW 6180. Health Law Survey. 3 Hours.

Examines legal regulations governing the provision of healthcare services. Topics include access to health insurance and healthcare, healthcare financing, the organization and responsibility of healthcare institutions (especially hospitals), healthcare cost containment policies, public and private insurance programs, and the formulation of health policy. Provides an introductory overview of the major statutes, regulations, and case law related to health law, including an introduction to the Patient Protection and Affordable Care Act, otherwise known as Obamacare.

LW 6211. Antidiscrimination Law. 3 Hours.

Provides an overview of antidiscrimination laws governing the workplace. Focuses on discrimination based on race and sex, but some attention will also be given to discrimination based on other characteristics, including age, sexual orientation, and disability. In addition to general issues of discrimination, also focuses on the specific topics of retaliation, harassment, and bullying in the workplace.

LW 6231. Identifying and Securing Intellectual Property Rights. 3 Hours.

Focuses on intellectual property issues in employment, collaborative environments, and business transactions. Covers common issues for founders and startups, employers, and contractors; including non-compete agreements, crowd-sourcing, and open innovation practices.

LW 6400. Law, Policy and Legal Argument. 4 Hours.

This course explores the legal levers that drive policy change. Advocates often intend to alter public policy in support of an organization or a cause. But influencing policy requires understanding who sets policy in the first instance. Is the issue governed by federal, state or local law? Are key decision makers elected or appointed? Who is it most important to persuade and what sorts of arguments are likely to convince the key audience? This course will introduce students to the mechanisms of government that drive key policy debates across a wide range of issues, which may include health care, market regulation, environmental policy, housing, education, the internet, privacy, and social policy. Emphasis will be placed on tailoring arguments to different constituencies.

LW 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

LW 7323. Corporations. 4 Hours.

This course relates to the formation, financial structure, and governance of business enterprises, especially incorporated businesses. Partnerships, limited partnerships, limited liability companies and limited liability partnerships are also explored, principally as they compare to the corporate form. The topics studied include: rights of creditors to hold principals of the enterprise liable; distribution of control within the corporation; fiduciary duties of directors and officers; key aspects of the federal securities laws (including the regulation of insider trading and proxies); organic changes (such as mergers); shifts in control (such as takeovers and freeze-outs); and legal implications of the roles of corporations in society. The course introduces some of the specialized concepts explored in detail in courses on Securities Regulation and Corporate Finance.

LW 7329. Environmental Law. 3 Hours.

This course focuses on federal and state environmental laws. Topics include pollution control, waste management, and cleanup of contaminated land and water. The course explores legislative policy and regulatory decisions as well as enforcement issues. We will give attention to questions of environmental justice and to the strategic use of legal tools in working to ensure safe and healthy surroundings for diverse groups of people.

LW 7333. Family Law. 3 Hours.

This is a basic course in family law and family policy. The first half of the course explores state regulation of intimate relationships, asking what purposes marriage serves, and looking at the law of incest, polygamy and same sex marriage. The second half of the course examines practical problems in family law: cohabitants' rights; common law marriage; and the many issues relating to divorce, with a particular focus on money and children.

LW 7335. Health Law. 3 Hours.

This course examines the legal regulation of the provision of healthcare services. Much of the focus is on the relationship between law and healthcare policy. Topics include access to health insurance and healthcare, healthcare financing, malpractice liability, the organization and responsibility of healthcare institutions, especially hospitals, the regulation of the quality of care and the formulation of health policy. This course is highly recommended for all students enrolled in the JD/MPH dual degree program, but is open to others as well.

LW 7338. International Law. 3 Hours.

This course introduces students to fundamental concepts and unresolved problems in international law. We discuss historical and contemporary theoretical debates about the roles and utility of international law. Students are introduced to the sources of international law and to methods of international dispute resolution in domestic and international fora. This course explores the part that international law has played (or failed to play) in the prevention or conduct of war, the promotion of human rights and international economic development.

LW 7358. Social Welfare Law. 3 Hours.

This course examines American public assistance as a legal institution. After reviewing the historical, sociological and juridical roots of the welfare system, students examine the laws governing major assistance programs, especially eligibility requirements, rules governing grant determination, work and family rules, and procedural rights. Primary emphasis is on statutory and regulatory construction. The course explores methods by which lawyers can deal with the system: advocacy in the administrative process, litigation, legislative reform and representation of recipient organizations.

LW 7369. Intellectual Property. 3 Hours.

In our modern day information economy, the law of intellectual property has taken on enormous importance to both creators and users of intellectual creations. Introduces students to the classic principles of copyright, patent, trademark, and trade secret law and explores the ways in which those principles are shifting and adapting in response to new technology. .

LW 7394. Land Use. 3 Hours.

A survey of legal doctrines, techniques and institutions relating to regulation of the use of real property. Topics covered include constitutional questions of takings by public agencies, the scope of the police power as it affects land use and the basic techniques of zoning and subdivision control. Students study, among other issues, recent cases on exclusion of low income housing, current techniques to encourage housing development (inclusionary or "linkage" regulations) and First Amendment questions arising from land use controls.

LW 7428. State and Local Government. 3 Hours.

This course offers an introduction to the workings of state and local governments, and to the roles of law and of lawyers in shaping and controlling their operation. Topics to be covered include: the sources and scope of state and of local lawmaking authority, intergovernmental relationships, modes of citizen participation in and control over the governing process, and state and municipal fiscal structure and operations. In exploring these topics, the course will focus both on the practical roles played by attorneys (employed inside or outside of government) in the governmental processes and on the place of decentralized governmental units within the vision of a democratic polity.

LW 7463. Nonprofit Organizations. 3 Hours.

Examines federal regulation of nonprofit organizations. Why does the government exempt certain organizations from tax? What are the rules that non-profit organizations must follow in order to retain their tax-exempt status? What activities by non-profit organizations are prohibited by federal law? Discusses these and other questions about non-profit organizations. Focuses on relevant Federal tax law, but there is no prerequisite for the course. Although the course is about the Internal Revenue Code, the concepts of income taxation (what is income? when is it income? etc.) are irrelevant because nonprofit organizations are exempt from tax.

LW 7488. Sexuality, Gender and the Law. 3 Hours.

This course uses case law and theory to address doctrinal problems and justice concerns associated with gender and sexuality. The syllabus is organized around notions such as privacy, identity and consent, all of which are conceptual pillars upon which arguments in the domain of sexuality and gender typically rely. Doctrinal topics include same-sex marriage, sodomy, sexual harassment, discrimination, among others, but the course is not a doctrinal survey; it is a critical inquiry into key concepts that cut across doctrinal areas. Students should expect to write a paper and share some of what they have learned with the class.

LW 7491. International Human Rights and the Global Economy. 3 Hours.

Can recognizing "the right to housing" make the demands of homeless persons for adequate housing more effective? Does the right to maintain cultural or religious traditions conflict with the right to be free from gender discrimination? This course highlights the growing influence of the international economic, social, and cultural rights framework as well as the implications of globalization for all international human rights. We will begin by examining the history and theoretical origins of socioeconomic and cultural rights such as rights to food, housing, health, education, and cultural expression. We then engage the legal framework under major international and regional human rights treaties and leading interpretations of them by international, regional, and domestic courts and other actors. Finally, we grapple with the tensions among collective rights, cultural imperatives, and traditional human rights. There is no prerequisite for this course.

LW 7501. Patent Law. 3 Hours.

This course will provide an in-depth review of patent law and practice. The course will cover the administrative process for obtaining patents, including the requirements for patentability. The course will also cover enforcement of patent rights and the defense of patent infringement suits. The course will be presented in a simple, non-technical manner so that students of all disciplines can learn and understand the concepts.

LW 7512. Problems in Public Health Law. 3 Hours.

Explores the rationales for using law to protect and preserve the public's health, the legal tools that may be used to achieve that end, and the conflicts and problems that may result from legal interventions. Topics discussed include the use of law to reduce the spread of HIV and other infectious diseases, control of tobacco and other hazardous products, bioterrorism, and the threats to civil liberties and minority groups engendered by all such legal efforts. Students who do not meet course prerequisites may seek permission of instructor.

LW 7525. Law and Economic Development. 3 Hours.

Examines the prevailing economic theories of and strategies for economic development since World War II and the legal and institutional frameworks devised to implement these strategies. Questions we will explore will include: What kinds of legal and institutional arrangements best facilitate economic growth? How does law structure and shape markets? What is development; and how can it best be measured? Can legal instruments be used effectively to address underdevelopment in a structural way? While the focus is on development in the so-called "developing world"; we will also explore some strategies for addressing development in a local community context. Course concludes by applying what we have learned to address several development case studies posing particular problems in particular regions and contexts.

LW 7582. Elder Law. 3 Hours.

Examines legal and policy questions related to aging individuals. Older Americans face an increasing number of legal questions involving entitlement to public benefits, protection of property, utilization of medical resources, healthcare decision-making, and interaction with legal and financial institutions. Topics include Medicaid benefits, Medicare benefits, Veterans Benefits for elderly veterans and their spouses, age discrimination, nursing home institutionalization, income maintenance (social security benefits, pensions etc.), elder abuse, consumer fraud targeted at older consumers, guardianships, conservatorships, competency and capacity, alternatives to guardianships and conservatorships, end of life issues, tax issues in elder law and estate planning for elders. Also discusses ethical issues that arise when representing the elderly. .

LW 7588. Reproductive Rights and Health. 3 Hours.

Examines how sexual and reproductive health laws impede or increase access to sexual and reproductive healthcare and shape how we understand what constitutes sexual and reproductive health. Attention is paid to understanding legal doctrine, public health research, and critically assessing issues arising from sexual and reproductive health law. Draws on various tools of analysis including critical race theory, critical legal theory, human rights, and a range of public health methods. Topics covered include, amongst others, sexual and reproductive health law as it pertains to abortion, sexuality, pregnancy, marriage, healthcare in prisons, immigrants, HIV/AIDS, and sex education.

LW 7597. Civil Rights and Restorative Justice Clinic. 1-6 Hours.

The CRRJ (Civil Rights and Restorative Justice) Clinic engages students in legal research, litigation and legislative initiatives relating to anti-civil rights violence in the United States. CRRJ clinic students assist law enforcement agencies considering criminal investigation and pursue civil litigation against government entities. One of CRRJ's projects, Reconstructing Cases of Racial Violence, involves researching cases where criminal prosecution may not be an option. Students reconstruct legal proceedings and conduct factual investigations. The project focuses on practical legal research skills and helps students integrate the law of torts, civil procedure, federal courts, criminal law, and constitutional law. Faculty will provide individual supervision of each student.

LW 7600. Current Issues in Health Law and Policy. 3 Hours.

Examines recent debates in health law and policy through discussion of current events, proposed legislation, and scholarly articles in the legal, medical, and public policy literatures. Weekly topics depend in part on student interest, but likely include federal healthcare reform, malpractice liability reform, obesity, health disparities, regulation of pharmaceutical promotion, and other issues related to healthcare access, quality, and financing. Requirements include weekly readings, weekly attendance and participation, a brief presentation of one health law-related current event, a research paper of at least 20 pages on any approved health law-related topic, and an oral presentation of the research paper. Previous health-related coursework or work experience is recommended but not required.

LW 7635. Lab Seminar in Applied Design and Legal Empowerment. 3 Hours.

Explores the use of design principles in the development of new models for delivering legal information and services. Problem-solving methodologies derived from the fields of product and systems design are being successfully applied in many disciplines, including the law. These methods will be critically examined and applied by students within the context of NuLawLab community projects. Students join multidisciplinary teams working with communities to collaboratively design responsive solutions to unmet legal needs, using the technological advances currently transforming the legal profession and our larger society. The seminar emphasizes hands-on student engagement with community clients, field observations, and teamwork in partnership with a diversity of other disciplines. Students will be assessed based on contributions to project work, including class discussions. .

LW 7648. Access to Justice by Design. 2 Hours.

One of the biggest challenges facing the legal system is how many people are trying to navigate it without a lawyer; particularly for problems like divorce, child custody, personal debt, housing, and small claims. This class proposes that a user-centered design approach, mixed with an agile development approach, can increase the amount of procedural justice for self-represented litigants in the courts. Students will be exposed to how to practice agile user-centered design by creating new interventions for courts to help people without a lawyer to understand their legal options, create a strategy, and pursue a legal process. The class will involve fieldwork at the courts; identifying key fail points and frustrations of stakeholders by observing and conducting interviews, and brainstorming and testing new solutions.

LW 7651. Human Rights in the United States. 3 Hours.

Explores the role of international human rights frameworks and strategies in social justice lawyering in the United States. On a range of issues, lawyers are bringing human rights home. They are using human rights mechanisms of the United Nations and Inter-American Human Rights system, drawing on international human rights and comparative foreign law in litigation before U.S. courts, and engaging in other human rights-based advocacy such as documentation, organizing, and human rights education. Advocates find that a human rights approach provides important strategic leverage and highlights the interdependence of economic, social, cultural, civil, and political rights. Uses skills exercises, assignments and real-world problems to develop practical skills to address policies on local, state and national levels, and to support social movements.

LW 7654. Race, Justice, and Reform. 3 Hours.

This seminar will focus on: how the criminal justice system impacts community members; how laws, policies and practices disparately impact communities of color and perpetuate structural economic inequality; and how Massachusetts and other states struggle to reform our criminal justice systems. Class sessions will examine specific topics and discuss class readings on those topics. Each student will choose one topic to investigate and explore. Students will write papers identifying and analyzing the issues germane to their topic. In addition, they will investigate and develop narratives describing the community impact of particular criminal laws and policies. Finally, they will create podcasts and op-eds to educate the public about this particular topic and what reforms are needed to address the problems illuminated by their research and narratives.

LW 7655. Advancing Economic and Social Equity through Municipal Policy and Law. 2 Hours.

Strong-market cities fuel the American Economy. They are experiencing employment and population growth, private sector investment and new, wealthier demographics attracted to urban living. But the benefits of urban prosperity are not shared equitably across races or incomes. Federal disinvestment and state/federal roadblocks have spurred municipal innovation to address income inequality and to defend or advance inclusion for communities like immigrants and LGBT individuals. This course will examine trends in equitable city policy through case studies on civil rights, wages, worker protections, safety net funding like affordable housing and more. It will also explore legal-policy intersections like home rule, pre-emption, the limits of federal coercion and constitutional considerations. Taught by a municipal elected official, policy discussions will be grounded within real-world civic and political contexts.

LW 7667. Law and Ethics of Advocacy. 3 Hours.

What limits are there on actions aimed at influencing public officials or public opinion? What limits should there be? Clearly, it is unlawful to offer a bribe to a public official to produce a desirable outcome. But what constitutes a bribe? Can a lobbyist send a wedding gift to a favorite legislator? Are the rules different when advocacy efforts reach beyond United States borders? Are there limits on what an advocate can say to promote a product or service? Where is the line between conduct that is legally permissible and conduct that is not? To what extent are legal boundaries and ethical boundaries aligned? This course will explore the ethical and legal issues that arise in connection with advocacy.

Law (LAW)

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LAW 6100. Civil Procedure. 5 Hours.

This course introduces students to the procedural rules that courts in the United States use to handle non-criminal disputes. The purpose of this course is to provide a working knowledge of the Federal Rules of Civil Procedure and typical state rules, along with an introduction to federalism, statutory analysis, advocacy and methods of dispute resolution. The course also examines procedure within its historical context. May be repeated once.

LAW 6101. Constitutional Law. 4 Hours.

This course studies the techniques of constitutional interpretation and some of the principal themes of constitutional law: federalism, separation of powers, public vs. private spheres, equality theory and rights analysis. The first part of the course is about the powers of government. The second part is an in-depth analysis of the 14th Amendment.

LAW 6102. Contracts. 5 Hours.

This course examines the legal concepts governing consensual and promissory relationships, with emphasis on the historical development and institutional implementation of contract theory, its relationship and continuing adaptation to the needs and practice of commerce, and its serviceability in a variety of non-commercial contexts. Topics covered include contract formation, the doctrine of consideration, remedies for breach of contracts, modification of contract rights resulting from such factors as fraud, mistake and unforeseen circumstances, and the modern adaptation of contract law to consumer problems. This course also introduces students to the analysis of a complex statute: the Uniform Commercial Code. May be repeated once.

LAW 6103. Criminal Justice. 4 Hours.

In this course, students are introduced to the fundamental principles that guide the development, interpretation and analysis of the law of crimes. They are also exposed to the statutory texts—primarily the Model Penal Code, but also state statutes. In addition, students are introduced to the rules and principles used to apportion blame and responsibility in the criminal justice system. Finally, students examine the limits and potential of law as an instrument of social control. May be repeated once.

LAW 6105. Property. 4 Hours.

This course covers the major doctrines in American property law, including trespass, servitudes, estates in land and future interests, landlord-tenant relationships, nuisance, and takings. Students are introduced to rules, policies, and current controversies. .

LAW 6106. Torts. 4 Hours.

This course introduces students to theories of liability and the primary doctrines limiting liability, which are studied both doctrinally and in historical and social context. The course includes a brief consideration of civil remedies for intentional harms, but mainly focuses on the problem of accidental injury to persons and property. It also provides an introductory look at alternative systems for controlling risk and allocating the cost of accidents in advanced industrial societies.

LAW 6160. Legal Skills in Social Context. 2 Hours.

The LSSC Social Justice component immediately applies students' legal research and writing skills in using law as a tool for social change. LSSC links students' pre-law school thinking with the new legal culture in which they find themselves. In the first semester, they begin by forging their own team lawyering dynamic in discussing assigned readings and in preparing, and presenting, several advocacy exercises and written assignments. In the second semester, students apply and consolidate their new legal research and writing skills in addressing an intensive real-life social justice project for a selected client organization. LSSC student teams develop their legal and cooperative problem-solving skills and knowledge while producing real client work of a quality that far exceeds the ordinary expectations of first-year law students. May be repeated once.

LAW 6165. LSSC: Legal Research and Writing Component. 2 Hours.

Competent and effective legal research and writing skills are the foundation for students' success in law school and in their legal careers. In LSSC's Legal Analysis, Research and Writing component, students learn about the organization of the American legal system, the sources and construction of laws, and how the application of laws may vary with the specific factual situation. Students learn how to research the law to find applicable legal rules, how to analyze and apply those rules to a factual situation, and how to communicate their legal analysis clearly and concisely to different audiences.

LAW 6301. Intensive Introduction to American Law and Legal Institutions. 3 Hours.

This course is a general introduction to the American legal system for graduates of law programs outside the United States. The focus will be on the distinctive features of the American system, including how the U.S. common-law system differs from the civil-law system in place in most other countries. The three branches of government, federalism, the federal-state relationship, the constitutional protection of individual rights, civil and criminal procedure, and statutory and regulatory law will all be discussed. LLM students only.

LAW 6302. Intensive Introduction to Legal Research and Writing for LLM Students. 3 Hours.

This course introduces graduates of law programs outside the United States to the principles of U.S. legal discourse and to the basics of manual and electronic U.S. legal research. Students will have an opportunity to practice researching complex questions of U.S. law and writing memoranda based on their research. LLM students only.

LAW 6313. Introduction to the Law of Contracts. 3 Hours.

This course is designed to provide international LLM students with an introduction to U.S. contract law, with a special focus upon contracts for the sale of goods. Topics may include formation of contracts, contract interpretation, performance, and breach, remedies, and Articles 1 and 2 of the Uniform Commercial Code. This course is especially recommended for LLM students who wish to take a U.S. bar exam. This course is not open to JD students.

LAW 6314. Introduction to U.S. Constitutional Law. 4 Hours.

This course is designed to provide international LLM students with an introduction to U.S. constitutional law. The course is especially recommended for LLM students who wish to take a U.S. bar exam. Topics may include judicial review, separation of powers, federalism, equal protection, state action, due process and fundamental rights, and the First Amendment. J.D. students may take this course only with permission of the Associate Dean for Academic Affairs.

LAW 6315. Legal Research and Writing for LLM Students: Preparing for Co-op. 3 Hours.

This course introduces graduates of law programs outside the United States to the practical application of U.S. legal discourse and legal research in the workplace. Students will have an opportunity to apply what they have learned about U.S. legal writing and research to the sort of tasks that they will be called upon to complete during their Co-op internship work experience. LLM students only.

LAW 6316. Introduction to Civil Procedure. 3 Hours.

This course is designed to provide international LLM students with an overall introduction to U.S. civil procedure. Topics will include personal and subject-matter jurisdiction, pleadings, discovery, choice of law (the Erie Doctrine), finality and preclusion, and class actions. The course is designed to emphasize the practical application of civil procedure law, and is especially recommended for LLM students who wish to take a U.S. bar exam. Not open to JD students.

LAW 6330. Global Legal Practice. 1-8 Hours.

In this course, LLM students receive practical training by working with real-world clients on real-world cases obtained from Boston-area legal services organizations, under the legal supervision of licensed attorneys working in the LLM program at the Law School. LLM students only. May be repeated up to seven times for up to 8 total credits.

LAW 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

LAW 7300. Administrative Law. 3 Hours.

This course provides an introduction to the legal doctrines designed to empower and constrain government agencies and officials in their daily practice of governance. Topics include the constitutional status of administrative agencies, due process, the Administrative Procedure Act and the availability and standards of judicial review of agency actions. The course emphasizes the historical evolution of the modern administrative state and the regulatory agency's peculiar role in our system of governance.

LAW 7301. Advanced Criminal Procedure: Adjudication. 3 Hours.

This course closely examines some of the constitutional complexities in the prosecution and defense of criminal cases in state and federal courts. Students investigate how the law fashions the adjudicatory process and how the law evaluates what is "fair" and what is "legitimate" in formally deciding on whom to impose punishment. The course covers, among other things, pretrial detention, right to counsel, plea bargaining, discovery, trial processes, and sentencing.

LAW 7303. Antitrust. 3 Hours.

The federal antitrust laws, first created to break apart the powerful business "trusts" of the late 1800s, have since been applied to markets as diverse as utilities, ski areas, sports leagues, copy machine repair services and computer hardware and software. This course will explore the core principles of antitrust law, with an emphasis on three substantive areas: monopolization, horizontal merger analysis, and agreements among competitors. Because antitrust cases and scholarship rely heavily upon economics, the course begins with an introduction to firm and market economics, and economic analysis plays a significant role in our discussions.

LAW 7306. Civil Trial Practice. 2 Hours.

An introduction to the tactical and strategic problems commonly encountered in the trial of cases is the main objective of this course. Although the focus of class discussion is directed toward civil litigation, the techniques and problems are common to criminal cases. Attention is given to the forensic aspects of trial practice, techniques of direct and cross-examination, and opening and closing summations.

LAW 7313. Secured Transactions. 3 Hours.

A survey of commercial lending transactions, with particular emphasis on Article 9 of the Uniform Commercial Code, consumer legislation, relationship to real estate mortgage transactions, relationship to bankruptcy problems, fraudulent conveyances, federal tax liens, etc.

LAW 7315. Consumer Bankruptcy. 3 Hours.

This course explores basic principles of consumer bankruptcy. We examine how the bankruptcy process works, the underlying policies that purport to justify the way the law is written and construed, and the mechanics of applying key sections of the federal Bankruptcy Code. To convey the liveliness and volatility of bankruptcy practice, and to provide an introduction to strategic thinking in bankruptcy, the course relies primarily on problem solving and discussion.

LAW 7320. Constitutional Litigation. 3 Hours.

In the first phase of the course, the class considers strategic and tactical decision-making in constitutional litigation. In the second phase, students report on the process of litigating cases involving constitutional issues. Relying on briefs, court records and interviews with counsel, students report to the class and prepare a research paper setting out their findings. The paper is a major commitment of time and energy; only students with a significant interest in litigation of constitutional questions should apply. Papers are eligible to satisfy the writing requirement.

LAW 7323. Corporations. 4 Hours.

This course relates to the formation, financial structure, and governance of business enterprises, especially incorporated businesses. Partnerships, limited partnerships, limited liability companies and limited liability partnerships are also explored, principally as they compare to the corporate form. The topics studied include: rights of creditors to hold principals of the enterprise liable; distribution of control within the corporation; fiduciary duties of directors and officers; key aspects of the federal securities laws (including the regulation of insider trading and proxies); organic changes (such as mergers); shifts in control (such as takeovers and freeze-outs); and legal implications of the roles of corporations in society. The course introduces some of the specialized concepts explored in detail in courses on Securities Regulation and Corporate Finance.

LAW 7324. Securities Regulation. 3 Hours.

Federal regulation of securities transactions originated in the New Deal investor protection legislation of the early 1930s and must now adapt to the changes and challenges of the 21st century. This course surveys major issues in the registration of initial public offerings ("IPOs") under the Securities Act of 1933 and relevant provisions of the Securities Exchange Act of 1934, civil liability provisions, and the major exemptions from registration. Students will engage in detailed statutory analysis, as well as analysis of judicial and administrative decisions. The material covered in the course also raises important public policy issues such as "market democracy" and the role of regulation, disclosure policy with regard to corporate accountability and social responsibility, and the implications of internet disclosure.

LAW 7326. Criminal Trial Practice. 2 Hours.

Lectures on cases tried in state and federal courts, from arrest to appeal, are used to highlight criminal trial practice. One case is used throughout in which students are assigned roles including defense attorney, prosecutor, judge, witness (expert and lay), juror, clerk and defendant. Materials are based on actual cases. Emphasis is on federal criminal trials.

LAW 7329. Environmental Law. 3 Hours.

This course focuses on federal and state environmental laws. Topics include pollution control, waste management, and cleanup of contaminated land and water. The course explores legislative policy and regulatory decisions as well as enforcement issues. We will give attention to questions of environmental justice and to the strategic use of legal tools in working to ensure safe and healthy surroundings for diverse groups of people.

LAW 7331. Estate Planning. 3 Hours.

This basic upper-level course weaves together three strands that make up the discipline of estate planning. Strand 1 is an introduction to key elements of relevant law: property; creditor/debtor; wills, estates, and trusts; estate and gift tax; trust income taxation; and a touch of public benefits. Strand 2 introduces the tools and key components of an estate plan, such as Wills, Trusts, asset titling, and death beneficiary designations. Strand 3 weaves these together with and applies them to real-world frequently encountered situations using classroom hypotheticals to teach sound practice management, ethical considerations, blended family issues, and a mindset that plans for the knowable unknowns (e.g., not all potential beneficiaries may in the future be healthy, financially secure, still living, or even born yet).

LAW 7332. Evidence. 4 Hours.

This course examines how courtroom lawyers use the evidence rules to present their cases—notably, rules regarding relevance, hearsay, impeachment, character, and experts. The approach to the study of evidence will be primarily through the "problem" method—that is, applying the provisions of the Federal Rules of Evidence to concrete courtroom situations. Theoretical issues will be explored as a way to deepen the student's appreciation of how the evidence rules can and ought to be used in litigation.

LAW 7333. Family Law. 3 Hours.

This is a basic course in family law and family policy. The first half of the course explores state regulation of intimate relationships, asking what purposes marriage serves, and looking at the law of incest, polygamy and same sex marriage. The second half of the course examines practical problems in family law: cohabitants' rights; common law marriage; and the many issues relating to divorce, with a particular focus on money and children.

LAW 7335. Health Law. 3 Hours.

This course examines the legal regulation of the provision of healthcare services. Much of the focus is on the relationship between law and healthcare policy. Topics include access to health insurance and healthcare, healthcare financing, malpractice liability, the organization and responsibility of healthcare institutions, especially hospitals, the regulation of the quality of care and the formulation of health policy. This course is highly recommended for all students enrolled in the JD/MPH dual degree program, but is open to others as well.

LAW 7336. Immigration Law. 3 Hours.

This course is designed to give the student an overview of U.S. immigration law. The focus is on the day-to-day practice of immigration law, including an examination of the substantive and procedural aspects of this practice, and a historical analysis of the changes in our immigration laws and policies. Topics covered include non-immigrant and immigrant classifications, the preference system for immigrants, grounds of inadmissibility and deportability, relief from removal, asylum, citizenship, administrative and judicial review, and the immigration consequences of crimes.

LAW 7338. International Law. 3 Hours.

This course introduces students to fundamental concepts and unresolved problems in international law. We discuss historical and contemporary theoretical debates about the roles and utility of international law. Students are introduced to the sources of international law and to methods of international dispute resolution in domestic and international fora. This course explores the part that international law has played (or failed to play) in the prevention or conduct of war, the promotion of human rights and international economic development.

LAW 7344. Accounting/Finance for Lawyers. 3 Hours.

Accounting is described as the language of business. This course may be of interest to students seeking to understand accounting, finance, auditing, financial reporting, taxation, or exempt organization management commonly encountered by attorneys. The course introduces objectives and mechanics of financial reporting and accounting. In addition to traditional textual and case materials, we examine financial statements of a local public company including the balance sheet, income statement, statement of shareholders' equity, statement of cash flows, footnotes and management disclosure and analysis. We perform fundamental comparative financial analysis from an investor's viewpoint to determine each company's financial strengths and weaknesses. The course addresses the relationship between lawyer and auditor and reviews and analyzes recent financial reporting and financial scandals and audit failures.

LAW 7350. Negotiation. 3 Hours.

Negotiation is a course where students engage in simulated disputes and transactions, which are then debriefed in class. Through frequent in-class mini-negotiations and major simulations, the course focuses on: (1) negotiation planning, (2) case preparation and evaluation, (3) client counseling and informed client consent, (4) analysis of the bargaining range and principled concession patterns, (5) competitive, cooperative and problem-solving strategies, (6) information bargaining, (7) ethics and (8) critiques of negotiation patterns and institutions. Students are required to turn in preparation materials and to keep weekly journals, reviewed by the instructor, addressing their experiences in, and thoughts about, negotiations. Students are encouraged to internalize habits of analysis, prediction, preparation, and flexibility and to become more self-evaluative for their future negotiating experiences.

LAW 7351. Prisoners' Rights Clinic. 6 Hours.

This clinical course is offered during both the fall and winter quarters. It provides upper-level students with an opportunity to develop and refine valuable advocacy skills under the close supervision of two experienced practitioners. Typically, each student gets to handle, from beginning to end, either an adversarial hearing (final parole revocation), or a non-adversarial parole release hearing for an inmate serving a life sentence. Through this experience, students learn how to properly conduct client/witness interviews and thorough factual investigations, to examine and cross-examine witnesses effectively and to make persuasive opening and closing statements. Students also learn how to write winning administrative appeals. The skills students learn in this course are easily transferable to any civil or criminal practice after law school. The course also presents a survey of the constitutional law relating to the sentencing process and the rights of prisoners while incarcerated and while on parole.

LAW 7358. Social Welfare Law. 3 Hours.

This course examines American public assistance as a legal institution. After reviewing the historical, sociological and juridical roots of the welfare system, students examine the laws governing major assistance programs, especially eligibility requirements, rules governing grant determination, work and family rules, and procedural rights. Primary emphasis is on statutory and regulatory construction. The course explores methods by which lawyers can deal with the system: advocacy in the administrative process, litigation, legislative reform and representation of recipient organizations.

LAW 7362. Poverty Law and Practice Clinic. 6 Hours.

The twenty hours a week spent in the clinic provides an opportunity for students to provide direct representation to clients confronting legal challenges as they try to balance family and work responsibilities. Students have complete responsibility for a range of clients under the supervision of a faculty member. Students interview, research, plan, investigate, counsel, negotiate, and advocate for their clients. The clinic encourages students to maintain a client-centered focus and looks to extend the experience beyond the problem of the individual to the benefit for the community. The clinic also provides an opportunity to work in collaboration with a community organization in order to experience collaborative efforts for systemic change for low income clients.

LAW 7369. Intellectual Property. 3 Hours.

In our modern day 'information economy,' the law of intellectual property has taken on enormous importance to both creators and users of intellectual creations. This course introduces students to the classic principles of copyright, patent, trademark, and trade secret law and explores the ways in which those principles are shifting and adapting in response to new technology.

LAW 7377. Trusts and Estates. 4 Hours.

This basic course covers all aspects of inheritance, including intestacy, wills, common modern will substitutes, trusts, and future interests, with attention to rights of spouses and children, charitable interests, fiduciary duty, and other issues. The focus is practical, and students are required to write numerous short exercises—including analysis, planning advice, and formal drafting—to address realistic problems.

LAW 7394. Land Use. 3 Hours.

A survey of legal doctrines, techniques and institutions relating to regulation of the use of real property. Topics covered include constitutional questions of takings by public agencies, the scope of the police power as it affects land use and the basic techniques of zoning and subdivision control. Students study, among other issues, recent cases on exclusion of low income housing, current techniques to encourage housing development (inclusionary or "linkage" regulations) and First Amendment questions arising from land use controls.

LAW 7398. Federal Courts and the Federal System. 4 Hours.

The subject of this course is the distribution of power between the states and the federal government, and between the federal courts and other branches of the federal government as manifested in jurisdictional rules of the federal courts. The topics covered include the nature of the federal judicial function, the review of state court decisions by the United States Supreme Court, and the jurisdiction of federal district courts, with special emphasis on actions claiming constitutional protection against state official actions.

LAW 7400. Corporate Taxation. 4 Hours.

An introduction to Subchapter C of the Internal Revenue Code and an exercise in reading a short but difficult statute. Among topics covered are taxation of dividends, stock redemptions, liquidations, distributions, and taxable and tax-free sales of corporate stock and assets.

LAW 7410. Domestic Violence Clinic. 6 Hours.

The School of Law's Domestic Violence Institute offers an upper-level clinic focused on violence prevention and criminal intervention at Dorchester District Court. In this clinic, students develop traditional lawyering skills—including interviewing and counseling clients, and preparing and presenting cases in court—in the context of a busy community court that handles thousands of domestic abuse cases each year. The clinic also trains students to participate in a broader community-based response to domestic violence and to work collaboratively in interdisciplinary teams with battered women survivors, advocacy groups and police and law enforcement personnel.

LAW 7417. Entertainment Law. 3 Hours.

Entertainment Law involves the study of legal principles and business practices of the entertainment industry, with a focus on such matters as they exist in the film, television, and music industries, as well as publishing, video games, emerging media, and the Internet. The course is divided generally into four segments: Intellectual Property (including idea submissions, copyright, trademark, and privacy and publicity rights); Representation of Entertainers (including the roles of agents, managers, lawyers, and unions); Contracts, Credits, and Compensation; and Restrictions on Entertainment Content (including defamation, discrimination, obscenity and indecency, and violence). The focus is on the practical application of the legal principles, including an awareness of issues that arise in negotiations, contracts, and litigation involving entertainment companies and creative talent.

LAW 7423. State Local Taxation. 3 Hours.

This course surveys the variety of regimes deployed by various states to fund state and municipal government, with primary attention to state income taxation of individuals and businesses, property taxation and sales taxes. Among the topics to be covered are federal and state constitutional constraints on state and local tax structures, alternative methods of state business taxation, and issues relating to the taxation of interstate activity. The course will approach these topics from the viewpoints both of state tax policy-making and of taxpayer planning and representation.

LAW 7424. Labor Law 1. 4 Hours.

A general introduction to the law of labor relations through an examination of the National Labor Relations Act and leading cases, in conjunction with historical, social and economic materials. Topics include organization, union recognition, unfair labor practices and collective bargaining.

LAW 7428. State Local Government. 3 Hours.

This course offers an introduction to the workings of state and local governments, and to the roles of law and of lawyers in shaping and controlling their operation. Topics to be covered include: the sources and scope of state and of local lawmaking authority, intergovernmental relationships, modes of citizen participation in and control over the governing process, and state and municipal fiscal structure and operations. In exploring these topics, the course will focus both on the practical roles played by attorneys (employed inside or outside of government) in the governmental processes and on the place of decentralized governmental units within the vision of a democratic polity.

LAW 7429. Labor Law 2. 3 Hours.

An advanced labor law course focusing on the law of the collective bargaining agreement. The course compares collective bargaining rights to other workplace rights systems, such as individual statutory entitlement and public employee constitutional rights.

LAW 7434. Secured Transactions. 4 Hours.

This course has as its principal focus the way that most credit in America is extended. The transactions covered range from the purchase by consumers of automobiles or large household goods on credit to mega-loans by banks to large corporations. The primary law studied is Article 9 of the Uniform Commercial Code as well as certain sections of the federal Bankruptcy Code. The course also seeks to introduce students to commercial law generally and to further their facility with issues of statutory construction.

LAW 7443. Professional Responsibility. 3 Hours.

This course focuses on the legal, ethical and professional dilemmas encountered by lawyers. Emphasis is on justice as a product of the quality of life that society provides to people rather than merely the process that the legal system provides once a crime or breach of duty has occurred. The course also provides students with a working knowledge of the American Bar Association's Model Rules of Professional Conduct and the Code of Professional Responsibility as well as an understanding of the underlying issues and a perspective within which to evaluate them. In addition, the course examines the distribution of legal services to poor and non-poor clients.

LAW 7447. Quantitative Methods. 3 Hours.

Quantitative Methods is an interdisciplinary skills-building course intended to enhance students' ability to critique, analyze, and generate empirical information. The course explores a variety of contexts in which legal and policy professionals may be called upon to evaluate and interpret data. Possible topics may include calculating the present value of cash flows in settlements (divorce, personal injury); preparing and analyzing financial statements (corporate); critiquing empirical methods and sources of bias in scientific literature (mass torts, medical malpractice); evaluating geographical information (environmental management, zoning); and formulating social science and polling research (public policy and politics). Taking an experiential approach, students are expected to apply concepts and methodologies introduced in class to straight forward problem sets, independent research assignments, and interactive discussions of current events.

LAW 7448. Employment Discrimination. 3 Hours.

The Employment Discrimination course focuses on Title VII of the 1964 Civil Rights Act. It surveys the Supreme Court's decisions in this ever-changing area of law—including the recent decisions in *Nassar* and *Vance*, which reflect the efforts of the current Court to reduce the number of cases filed in this area.

LAW 7449. Alternative Dispute Resolution. 3 Hours.

This course is designed to introduce the theory and practice of various dispute resolution mechanisms that are alternatives to the traditional litigation model for resolving disputes. Insofar as negotiation is the foundation of most ADR processes, the course begins there. We will analyze negotiation theory and strategy before adding mediation and collaborative law to the mix. We will look at how to represent clients in negotiation, mediation and collaborative law, how to prepare for these processes and how to develop effective strategies. The final weeks of the course will focus on understanding the essential attributes of arbitration.

LAW 7454. Advanced Legal Research. 2 Hours.

The course is designed to prepare law students for research in practice, clerkships, and legal scholarship. Students will evaluate legal research sources and use them effectively, expand skills in primary and secondary U.S. legal sources, become aware of non-legal information resources that could be useful to legal practice, and get an overview of public international law and foreign legal research. Since learning legal research requires a hands-on approach, students are required to complete assignments and in-class exercises. This course will emphasize cost-effective research, including print and Internet sources. The topics covered in this survey course will vary from year to year and may include immigration law, tax law, business law, environmental law and cultural property law among others.

LAW 7463. Non-Profit Organizations. 3 Hours.

This course is about federal regulation of nonprofit organizations. Why does the government exempt certain organizations from tax? What are the rules that non-profit organizations must follow in order to retain their tax-exempt status? What activities by non-profit organizations are prohibited by federal law? These and other questions about non-profit organizations will be discussed. The course will focus on relevant Federal tax law, but there is no prerequisite for the course. Although the course is about the Internal Revenue Code, the concepts of income taxation (what is income? when is it income? etc.) are irrelevant because nonprofit organizations are exempt from tax.

LAW 7469. Disability Law. 3 Hours.

This course explores how the law treats individuals with disabilities. We will analyze what is meant by the term “disability” and consider constitutional review of state actions discriminating against individuals with disabilities. Particular attention will be given to the rights and obligations created by the Rehabilitation Act, the Americans with Disabilities Act and the Individuals with Disabilities Education Act. The rights of individuals with disabilities to be educated, work, receive healthcare, and enjoy public accommodations will be considered in depth. This course is designed for students wishing to represent individuals with disabilities as well as students who may represent employers and public accommodations.

LAW 7475. First Amendment. 3 Hours.

This course examines several rights protected by the First Amendment to the Constitution. The focus is on the principles and processes developed by the judiciary to protect various forms of speech, expression and association. The course does NOT deal with the free exercise of religion or the establishment clause. The course also focuses on integrating doctrine with the core values of the First Amendment as well as emphasizing the need for students to develop their own preferred approach to protecting free expression. The course does not, except tangentially, deal with other parts of the Bill of Rights.

LAW 7479. Basic Income Taxation. 4 Hours.

This introductory tax course covers the fundamental concepts and operations in income taxation. Tax issues are raised in the context of typical lawyer-client situations: the employment contract (fringe benefits, employee business expenses), buying and selling a house and other property, personal injury expenses and recoveries, and running a small business. An important aspect in understanding the details covered will be comprehension of the economic policy objectives, and unintended results, of specific tax provisions such as capital gains taxation. The course is focused on the statute, cases and administrative law that define the income tax base. Tax rates are also examined and tax unit issues are covered for individual wage-earners, married couples, children living in the home, pensioners and small businesses organized as sole proprietorships.

LAW 7487. Critical Race Theory. 3 Hours.

This course traces the historical, political, and intellectual origins of Critical Race Theory (CRT) by examining the key writings that formed its foundational pillars. Through this endeavor, we will have an opportunity to grapple with some of CRT’s theoretical contributions as well as the associated methodologies for advancing these claims. Our exploration will also encompass a review of new developments in the field and an application of CRT to current social injustices. Enrollment is limited and evaluation will be based on class participation, a presentation, and a paper project.

LAW 7488. Sexuality, Gender, and the Law. 3 Hours.

This course uses case law and theory to address doctrinal problems and justice concerns associated with gender and sexuality. The syllabus is organized around notions such as privacy, identity and consent, all of which are conceptual pillars upon which arguments in the domain of sexuality and gender typically rely. Doctrinal topics include same-sex marriage, sodomy, sexual harassment, discrimination, among others, but the course is not a doctrinal survey; it is a critical inquiry into key concepts that cut across doctrinal areas. Students should expect to write a paper and share some of what they have learned with the class.

LAW 7491. International Human Rights and the Global Economy. 3 Hours.

This course surveys the international human rights legal system. It includes the promotion and protection of economic, social, and cultural rights (such as rights to health, food, water, and education) and civil and political rights (such as equality and non-discrimination, the right to human security, the prohibition on torture, and rights to religious and cultural expression). We begin by examining the history and theoretical origins of human rights law. We then engage the legal framework under international and regional human rights treaties and interpretations of them by international, regional and domestic courts and other actors. We examine international, regional and domestic mechanisms for monitoring compliance. Finally, we grapple with tensions among cultural and religious imperatives and traditional human rights.

LAW 7494. Bioethics and the Law. 3 Hours.

This course will focus on the intersection of law and bioethics and will consider how different ethical theories may guide legal decisions. Topics will include physician-assisted suicide, testing for HIV, reproductive technology, and rationing of healthcare. Students will be expected to write a research paper and share some of what they have learned with the class.

LAW 7495. Advanced Criminal Procedure: Investigation. 3 Hours.

During this course, students will examine the law of criminal investigation. The primary focus of the course will be to present and discuss leading Supreme Court decisions in the field of constitutional criminal procedure. Students will study decisions which apply the Fourth, Fifth and Sixth Amendments and the Due Process Clause to the criminal justice process and the procedures through which criminal laws are enforced.

LAW 7496. Appellate Practice. 2 Hours.

This course covers various aspects of appellate practice, focusing on appellate jurisdiction, brief writing and oral advocacy. As a component of the course, students will write an appellate brief, working from a record from a lower court, and argue the case. The course includes observation of appellate arguments, conversations with appellate judges and with lawyers who focus on appellate practice, and review of recent cases that were briefed and argued in the Massachusetts appellate courts and the First Circuit.

LAW 7501. Patent Law. 3 Hours.

This course will provide an in-depth review of patent law and practice. The course will cover the administrative process for obtaining patents, including the requirements for patentability. The course will also cover enforcement of patent rights and the defense of patent infringement suits. The course will be presented in a simple, non-technical manner so that students of all disciplines can learn and understand the concepts.

LAW 7503. Business Bankruptcy. 3 Hours.

This course deals with business reorganization under Chapter 11 of the Bankruptcy Code. The objective of Chapter 11 bankruptcy is to allow the debtor to modify and restructure its debt so that it can continue to operate its business. The course will cover matters that typically arise in a Chapter 11 case, such as the automatic stay, modification of debt, rejecting contracts, post-bankruptcy financing, creditors’ claims, management of the debtor, and the plan of reorganization. The course will also address topical issues such as employee rights, retiree benefits, and mass tort claims, including asbestos and environmental claims.

LAW 7509. Professional Responsibility Seminar. 3 Hours.

This small section of Professional Responsibility is taught as a seminar-style course. The course incorporates basic analytical and legal reasoning techniques, as well as offers opportunities for students to improve their legal writing through analysis and critique. Writing is done in the context of Professional Responsibility doctrine with a focus on legal, ethical and professional dilemmas encountered by lawyers. This course fulfills the 3 credit Professional Responsibility course requirement while, at the same time, refines students' basic analytical and writing skills.

LAW 7511. Labor Arbitration Workshop. 3 Hours.

In this workshop, students will explore the important role of alternative dispute resolution in the workplace. Using court and arbitration decisions as well as supplementary materials, students will discuss the relationship between arbitration and the judicial system, a union's duty of fair representation, issues of arbitrability, evidence and procedure, as well as a variety of substantive contractual issues normally addressed in arbitration, such as seniority, fringe benefits, wages and hours, subcontracting and union security. In particular, the course will focus on "just cause" discharge and discipline cases. Although there are no prerequisites or co-requisites, Labor Law I is recommended. During the course of the quarter, students will draft an arbitration brief based on a transcript of a hearing and participate in an arbitration simulation using witnesses and documentary evidence.

LAW 7512. Problems in Public Health Law. 3 Hours.

This course will explore the rationales for using law to protect and preserve the public's health, the legal tools that may be used to achieve that end, and the conflicts and problems that may result from legal interventions. Topics discussed will include the use of law to reduce the spread of HIV and other infectious diseases, control of tobacco and other hazardous products, bioterrorism, and the threats TO CIVIL LIBERTIES AND MINORITY GROUPS engendered by all such legal efforts. This course is highly recommended for all students enrolled in the J.D./M.P.H. dual degree program, but is open to other students as well.

LAW 7514. Natural Resources Law. 3 Hours.

This course addresses legal requirements and institutions dealing with animal and plant species, biological resources, habitats, and ecosystems. Major themes include biological diversity, endangered and threatened species, public and private rights in migratory resources, public trust doctrine, the allocation of power among federal, state, and local governments, and the roles of administrative agencies in ecosystem management. The course provides opportunities to explore specific topics of interest such as environmental ethics, wetlands protection, fisheries law, Native American hunting rights and fishing rights, and management of national parks, forests, and grazing lands.

LAW 7515. Sports Law. 3 Hours.

This course explores the legal, economic and social aspects of national and international professional and amateur sports. The course will focus on judicial, administrative, legislative and private decisions that have created a cohesive body of principles for the resolution of disputes involving athletes, clubs, leagues, spectators, and fans. These decisions address issues of antitrust, labor, tort, agency, and constitutional law. We will pay particular attention to the governance of sports, player reservation systems and player contracts, collective bargaining and salary arbitration, franchise free agency, violence in sports, NCAA rules and regulations, gender and handicapped discrimination, and sports agents. Students will draft a research paper on a topic approved by the instructor.

LAW 7516. Legal Writing Workshop. 3 Hours.

This course is for students who wish to strengthen their writing and analytic skills. The first part of the course will focus on objective writing. Students will work on an office memorandum analyzing a statute and case law. The classes will focus on large scale organization, small scale organization, case analysis, and revising your own work. The second part of the course will focus on persuasive writing and research. Students will research and draft an appellate brief based on a constitutional issue, paying particular attention to persuasive writing techniques. The appellate brief will fulfill the upper level writing requirement. The entire course will focus on writing concisely, using citations accurately, and other skills essential to effective legal writing.

LAW 7521. Branding Law and Practice. 3 Hours.

As preparation for advising clients on brands and brand-related activities, this course looks at a variety of laws (such as trademark, copyright, unfair competition, trade dress, design patent and advertising) and the business practices associated with branding products and services. The focus is on the practical application of legal principles with respect to selection, acquisition, promotion, use and protection of brand indicia (marks, logos, slogans, designs, labels and packaging) and related lawyering competencies, including conducting due diligence, applying relevant law, working collaboratively, giving useful advice and communicating effectively.

LAW 7525. Law and Economic Development. 3 Hours.

This course will examine the prevailing economic theories of and strategies for economic development since World War II and the legal and institutional frameworks devised to implement these strategies. Questions we will explore will include: What kinds of legal and institutional arrangements best facilitate economic growth? How does law structure and shape markets? What is "development" and how can it best be measured? Can legal instruments be used effectively to address underdevelopment in a structural way? While the focus will be on development in the so-called "developing world," we will also explore some strategies for addressing development in a local community context. We will conclude the course by applying what we have learned to address several development case studies posing particular problems in particular regions and contexts.

LAW 7526. Juvenile Courts: Delinquency, Abuse, Neglect. 3 Hours.

This course covers the broad topic of children in custody for delinquency, abuse or neglect and for status offenses. Through an examination of fundamental case law, statutory law and theory of juvenile law, participants will be exposed to both substantive and procedural principles of the juvenile court system. The course examines how children come into court jurisdiction and the educational and mental health services they require while in foster care or in detention. The course looks at foster care, termination of parental rights and adoption as well as the juvenile death penalty issue. Court attendance is a requirement.

LAW 7527. Public Health Legal Clinic. 4 Hours.

This clinic supports the work of the Public Health Advocacy Institute, a Northeastern-based think tank. It provides students with an opportunity to gain experience in public interest law, health law, and the use of litigation to effect changes in public health policy. The clinic's primary focus will be on tobacco control and on the emerging issue of obesity-related litigation and policy, but students may explore other public health-related topics as well. This clinic also provides a unique opportunity for students to develop their academic legal writing skills; the final project in this course is the equivalent of a law review article. In addition to weekly class readings and discussions, each student will work on a major research project throughout the quarter, meet regularly with the instructor to discuss the project, give an oral presentation to the class, and write a substantial paper discussing his/her research.

LAW 7528. Balancing Liberty and Security Seminar. 3 Hours.

This course will examine the challenges, obstacles and issues presented in the struggle to create a balance between securing our homeland and respecting the rights of all of those who call this land home. We will examine recent Supreme Court decisions (Handi, Rasul, and Padilla) as well as international perspectives on counterterrorism strategies. The course will include a discussion of the privacy and human rights issues that have arisen since September 11th and the ethical responsibility of lawyers adjudicating those issues. Students will take a take-home exam at the end of the quarter.

LAW 7530. Education Law. 3 Hours.

A survey of current issues in U.S. education law including high stakes testing, "No Child Left Behind," the charter school movement, vouchers, church/state issues, home schooling, and school funding.

LAW 7535. Legal Interviewing Counselng. 3 Hours.

Students in this course will study the principles of interviewing and counseling, learning how to interview clients to identify their legal problems and to gather information on which solutions to those problems can be based. Students will also practice interviewing witnesses and students will be taught how to counsel clients—a process by which, having determined what the client's legal problems are, the lawyer helps clients make decisions by identifying potential strategies and solutions and their likely positive and negative consequences. Students will practice specific interviewing and counseling techniques and have the opportunity to receive feedback from classmates and the instructor.

LAW 7536. Employment Law Safety Health. 3 Hours.

This course will focus on the legal issues relating to the primary and secondary prevention of injuries and illnesses at work. The course will include a review of the Occupational Safety and Health Act, as well as discussions of other relevant aspects of employment, labor, compensation and tort law.

LAW 7538. International Environmental Law. 3 Hours.

This course addresses the evolution of key concepts and principles of international environmental law. It discusses legal responses to transboundary and global environmental problems such as marine and freshwater pollution, habitat destruction, and climate change. It explores the connections between resource exploitation, ecological degradation, poverty, and violations of human rights. It discusses the regulation of international trade to achieve environmental goals. The course includes consideration of framework agreements, binding obligations, financing and compliance mechanisms, and articulation of international principles through domestic law. It gives attention to the expanding roles of local and non-state actors in pursuing solutions to international environmental controversies.

LAW 7539. Employment Law—Job Security and Rights. 3 Hours.

This course surveys legal and policy issues concerning job security, focusing primarily on law governing the termination of private sector employment. Students develop an understanding of the history and scope of the underlying employment-at-will doctrine and the primary ways in which the at-will doctrine has been modified through common law and statute.

LAW 7540. Employment Law—Compensation, Benefits, and Retirement. 3 Hours.

This course surveys legal, economic, and social policy issues concerning wages and working time, leave, unemployment insurance, and retirement income. The course provides detailed coverage of the Fair Labor Standards Act (FLSA), the Family Medical Leave Act (FMLA), and the Unemployment Insurance program, and also provides introductions to retirement and survivor income under the Social Security Act and to pension regulation under the Employee Retirement Income Security Act (ERISA). The problems of low-wage workers and women workers receive special emphasis, as well as tensions between the design of the older, statutory schemes and contemporary trends in business and work organization.

LAW 7541. Global AIDS Policy Seminar. 3 Hours.

The global HIV/AIDS pandemic, the preeminent public health and human rights challenge of our time, is structured by biological, economic, social, and cultural forces ranging from the arcane structures of the international intellectual property regime to the cultural norms that prefigure sexual intimacy. This seminar will explore selected policy options for reversing and responding to the tide of infection. Pharmaceutical research, development, and access, neo-liberal economic and trade policies, gender relations and prevention policies, global health initiatives and primary health systems, healthcare policy and health worker migration – these and many other topics will be the subject of classroom discussion and student research papers.

LAW 7546. Law of Financial Institutions. 3 Hours.

This course will survey the complex regulatory regime governing the operations of commercial banking organizations in the United States. The primary focus will be on federal regulation of banks and bank holding companies. Nevertheless there will also, of necessity, be coverage of federal regulation of other types of depository institutions and holding companies – such as credit unions, savings associations, and savings and loan holding companies – as well as of state regulation of depository institutions and their holding companies. Current issues relating to bank mergers, diversification of banking organizations into other forms of financial and commercial activities (including securities and insurance), regulatory responses to specific problems (such as capital adequacy, deposit insurance, limitations on lending authority, anti-money laundering and anti-terrorism initiatives) will be considered.

LAW 7549. Comparative Law: Law, Markets and Democracy in East Asia. 3 Hours.

Today, we see a variety of market developments and rule of law programs around the world promulgated by such international institutions as the World Bank, the International Monetary Fund, and the Asian Development Bank. Markets are viewed as the panacea to the ills associated with economic development, and "rule of law" is synonymous with democracy, equality, and universal rights. This course examines the truth of the above assumptions by a study of legal systems in East Asian countries, selected for their varying stages of economic development. The course will examine three areas: cultural forces behind legal systems; forces of economic development and political, social and legal institutions established to promote this national goal; and finally, the intended and unintended consequences of these legal institutions.

LAW 7550. Refugee and Asylum Law. 3 Hours.

This course will explore the law of asylum and refugees. The primary focus will be on U.S. law as it has evolved since passage of the Refugee Act of 1980. This will include legislation and case law—both administrative and federal court cases. It will also look at relevant international law and standards utilized in other countries by way of comparison with U.S. Law. We will also examine the process of asylum adjudications to analyze issues of due process, credibility, cross cultural communication and integrity of the various legal procedures. We will explore new and emerging theories of asylum eligibility and policy developments which impact asylum seekers in the United States.

LAW 7554. International Investment Arbitration and Litigation Practice. 3 Hours.

This course will blend the study of Investor-State International Arbitration with mock arbitration exercises. The subject of Investor-State disputes and their resolution lies at the cutting edge of international law. Topics that will be covered in this course are (1) the substantive law of investment arbitration; and (2) elements of procedure that characterize investor-state arbitration including tribunal composition, jurisdiction, evidence, and annulment. At the same time, students will put their knowledge into practice by participating in a series of mock arbitration hearings brought by a foreign investor against a State before the International Centre for the Settlement of Investment Disputes (ICSID). Active participation in oral advocacy exercises is required. The course grade will be a function of those exercises and class participation.

LAW 7556. Corporate Finance. 3 Hours.

Corporate Finance considers sources of funding and capital structure of corporations, as well as decisions managers make to increase the value of a firm. This class is aimed at equipping lawyers with an ability to understand decision-making of business clients. The course introduces tools and methods used to evaluate projects and to allocate limited financial resources, as well as considerations regarding capital structure. We will cover valuation concepts, including present and future value computations, discount rates, net present value, the Efficient Capital Markets Hypothesis, relationship between risk and return, capital asset pricing model, as well as issues of leverage and capital structure. We will also examine the characteristics of financial instruments used by firms to raise capital, including common stock, preferred stock and debt instruments.

LAW 7559. International Trade. 3 Hours.

This course provides a comprehensive introduction to the legal framework for U.S. and international regulation of international trade. The course will include a brief introduction to the economics of trade and trade restriction measures. It will then focus on the World Trade Organization agreements regulating international trade in goods, services and intellectual property; it will provide an overview of the North American Free Trade Agreement; and it will examine U.S. trade laws particularly relief from “unfairly” traded imports, boycotts and trade sanctions.

LAW 7561. Private Litigation in the Public Interest. 3 Hours.

How can lawyers working in the “private” arena influence public policy? This course looks at tort-based litigation that impacts tobacco control, climate change, and other policy arenas. It considers the financial consequences of “mass torts”, class actions and punitive damages on plaintiffs’ attorneys as well as on defendants, and examines doctrinal, ethical and practical issues raised by the effort to use civil remedies to achieve social change.

LAW 7565. Intellectual Property Transactions Practice. 3 Hours.

This course provides students with training for transactions, with focus on the purpose, terms and conditions of transactions related to creation, ownership, license, sale, use and exploitation of intellectual property assets. The course includes analyzing cases, problems and agreements related to transactions affecting private and public interests. Initial exercises focus on the purpose, effect and drafting of various types of transactions and clauses. The class then focuses on cases leading to transactions between business and/or NGOs or other public interest parties, for which students are expected to analyze parties’ interests, propose transactional resolutions and draft or revise transaction documents. As a final exercise, students prepare on behalf of one party a version of a transaction document and draft and final versions of an advisory memorandum.

LAW 7569. International and Foreign Legal Research. 2 Hours.

This course is designed to teach students how to research international and foreign legal materials. The course uses a combination of lectures, hands-on research exercises, and homework assignments. Students will have opportunities: to increase the quality of research by attaining substantive knowledge on international legal topics and the legal system in which their issue arises; to attain practical skills to brainstorm search terms, formulate issues, and evaluate legal research resources by reiterative process; and to increase flexibility and confidence in researching international and foreign law topics. Topics include: U.S. and Non-U.S. treaties, international custom, jurisprudence, and documents of the United Nations, the European Union, and NGOs. The class also explores research in topical areas such as human rights, immigration and refugee laws, and foreign laws.

LAW 7572. Transactional Drafting Seminar. 3 Hours.

This seminar will help students improve their writing in the context of transactional legal documents. The seminar will help students: adopt tools to achieve clear and concise writing; understand the purpose of each element of a contract and adopt the language that most clearly accomplishes that purpose; draft the operative provisions of a contract to express the agreement of the parties; and create an “architecture” for a contract to make individual provisions work together in a cohesive document. The seminar will address concepts applicable to a wide range of transactional legal documents, with emphasis on drafting in the context of corporate transactions, including employment issues, shareholders’ rights, and mergers and acquisitions.

LAW 7573. Civil Procedure. 2-5 Hours.

This course introduces students to the procedural rules that courts in the United States use to handle non-criminal disputes. The purpose of this course is to provide a working knowledge of the Federal Rules of Civil Procedure and typical state rules, along with an introduction to federalism, statutory analysis, advocacy and methods of dispute resolution. The course also examines procedure within its historical context. May be repeated for up to 7 total credits.

LAW 7574. Property. 2-6 Hours.

This course covers personal property, estates in land, landlord-tenant relationships, mortgages, real estate financing and the doctrine of future interests. The course concludes with the study of private restrictions on land use and a detailed examination of zoning law. May be repeated for up to 6 total credits.

LAW 7576. Criminal Justice. 2-4 Hours.

In this course, students are introduced to the fundamental principles that guide the development, interpretation and analysis of the law of crimes. They are also exposed to the statutory texts—primarily the Model Penal Code, but also state statutes. In addition, students are introduced to the rules and principles used to apportion blame and responsibility in the criminal justice system. Finally, students examine the limits and potential of law as an instrument of social control. May be repeated for up to 6 total credits.

LAW 7580. Community Economic Development. 3 Hours.

Community economic development has been the subject of intense work and innovative approaches to poverty alleviation in the last several decades. But CED efforts have thus far lagged behind in producing sustainable forms of income generation for poor people. This seminar will examine current efforts to develop sustainable forms of income generation in Boston and nationwide. The students will then undertake the process of developing a new model for sustainable income development. In doing so, we will ask how the law can support such a model. Students will write research reports describing and critiquing current income generation programs in Boston.

LAW 7581. Rights of Noncitizens. 3 Hours.

This seminar explores the rights of noncitizens in the United States. Areas of focus will include workplace rights, language rights, child custody rights, and state and local anti-immigrant initiatives. Students will be asked to choose and research a relevant topic, incorporating both domestic and international law into their analysis. Students will present their research to other members of the seminar for discussion and feedback from other students and the instructor before submitting the final paper at the end of the quarter. Final papers can be used to satisfy the law school's "rigorous writing" requirement. Readings will include case law, statutes, policy reports, and academic articles from a variety of disciplines.

LAW 7582. Elder Law. 3 Hours.

In this course we will look at legal and policy questions related to aging individuals. Older Americans face an increasing number of legal questions involving entitlement to public benefits, protection of property, utilization of medical resources, healthcare decision-making, and interaction with legal and financial institutions. Topics that will be covered will include Medicaid benefits, Medicare benefits, Veterans Benefits for elderly veterans and their spouses, age discrimination, nursing home institutionalization, income maintenance (social security benefits, pensions etc.), elder abuse, consumer fraud targeted at older consumers, guardianships, conservatorships, competency and capacity, alternatives to guardianships and conservatorships, end of life issues, tax issues in elder law and estate planning for elders. Ethical issues that arise when representing the elderly will also be discussed.

LAW 7588. Reproductive and Sexual Rights and Health. 3 Hours.

This course will examine how sexual and reproductive health laws impede or increase access to sexual and reproductive healthcare and shape how we understand what constitutes sexual and reproductive health. Attention will be paid to understanding legal doctrine, public health research, and critically assessing issues arising from sexual and reproductive health law. The course will draw on various tools of analysis including critical race theory, critical legal theory, human rights, and a range of public health methods. Topics covered will include, amongst others, sexual and reproductive health law as it pertains to abortion, sexuality, pregnancy, marriage, healthcare in prisons, immigrants, HIV/AIDS, and sex education.

LAW 7590. Copyright Law. 3 Hours.

This course examines the law of copyright in the United States, with some reference to international aspects. We will discuss the scope of copyright protection, the formalities of securing copyright, the nature of the rights afforded by copyright law, the fair use doctrine, and copyright enforcement. The course will place copyright in historical perspective, and consider tensions created by emerging industries. The course is open to upper level students, without prerequisite.

LAW 7592. Spanish for Lawyers. 2 Hours.

This course offers the opportunity to enhance oral and written Spanish abilities. The course focuses on communication skills in different legal contexts. The course will stress listening comprehension, speaking skills and verb conjugation practice. The first half will focus on basic conversation: personal introductions, family, and country of origin. The second half will focus on procedural legal vocabulary and how to discuss legal problems with clients. The goals are for students to be able to have conversations with clients, fill out client intake forms in Spanish, give directions to law offices and court buildings in Spanish, and discuss legal and court fees. A focus will be placed on procedural legal vocabulary in Spanish. The instructor may wish to verify basic Spanish proficiency prior to admission.

LAW 7597. Civil Rights and Restorative Justice Clinic. 6 Hours.

The CRRJ (Civil Rights and Restorative Justice) Clinic engages students in legal research, litigation and legislative initiatives relating to anti-civil rights violence in the United States. CRRJ clinic students assist law enforcement agencies considering criminal investigation and pursue civil litigation against government entities. One of CRRJ's projects, Reconstructing Cases of Racial Violence, involves researching cases where criminal prosecution may not be an option. Students reconstruct legal proceedings and conduct factual investigations. The project focuses on practical legal research skills and helps students integrate the law of torts, civil procedure, federal courts, criminal law, and constitutional law. Faculty will provide individual supervision of each student.

LAW 7599. Pretrial Civil Practice and Advocacy. 2 Hours.

This course provides the foundation to manage the pretrial phase of a civil action. Each class will consist of a lecture concerning an aspect of pretrial practice, followed by student conducted pretrial advocacy. Using model civil cases, the students will engage in most types of pretrial practice, including an initial client interview and basic legal analysis to evaluate and assert potential legal claims and defenses, witness selection and preparation, deposition and written discovery practice, dispositive motions, pretrial memoranda and settlement positions.

LAW 7600. Current Issues in Health Law and Policy. 3 Hours.

This seminar will examine recent debates in health law and policy through discussion of current events, proposed legislation, and scholarly articles in the legal, medical, and public policy literatures. Weekly topics will depend in part on student interest, but will likely include federal healthcare reform, malpractice liability reform, obesity, health disparities, regulation of pharmaceutical promotion, and other issues related to healthcare access, quality, and financing. Requirements include weekly readings, weekly attendance and participation, a brief presentation of one health law-related current event, a research paper of at least 20 pages on any approved health law-related topic, and an oral presentation of the research paper. Previous health-related coursework or work experience is recommended but not required.

LAW 7602. Bioproperty. 3 Hours.

This seminar will examine how the law has enabled property in living organisms, including plants, animals, and people. Drawing upon case law, property theory, and multi-disciplinary commodification scholarship, participants will explore topics such as bioprospecting, frozen human embryos, patents in genetically engineered plants and animals, and markets in human organs.

LAW 7603. International Business Transactions. 3 Hours.

This course deals with transnational commercial law. It addresses the legal framework for international sales transactions, including the commercial terms of the sales agreement, shipping contracts, insurance, financing arrangements, and customs documentation. It also examines foreign direct investment transactions, international franchise and distribution agreements, and contracts for the transfer of technology. Bribery of foreign officials and liability under US and international rules are also included. Dispute resolution will be considered briefly with emphasis on choice of law and forum, arbitration, and enforcement of arbitral awards and foreign judgments.

LAW 7606. Drug Law and Policy. 3 Hours.

The field of Drug Law is vast, spanning the discovery, manufacture, distribution, and consumption of chemical agents designed to alter the human condition. This course focuses on three domains of the broader subject: the evolution and current state of the Federal Food, Drug, and Cosmetic Act; the architecture of the drug regulation system in the U.S., including the distinct space occupied by the Food and Drug Administration, the Department of Agriculture, and the Drug Enforcement Agency; and the role of regulation and tort litigation in harmonizing drug policy with science. Designed around legal and policy case studies, this course is intended for students expecting to become involved in clinical practice involving pharmaceuticals as well those generally interested in the interplay of law and public health.

LAW 7607. Consumer Law. 3 Hours.

This course examines consumer transactions in formation, substance, and remedies. While the course will focus most on consumer credit, we will also examine consumer leasing, advertising; fraud; warranties; and product standards and safety.

LAW 7608. American Legal Thought: Traditional and Critical. 3 Hours.

This course contrasts critical-theoretic approaches to law (e.g., legal realism, critical legal studies, identity-based jurisprudence, socio-legal studies, transformative jurisprudence) with mainstream legal thinking. In part the course is an intellectual history of American law, and in part it addresses contemporary jurisprudence and legal theory. Drawing on students' personal experience, the course also examines American legal education and the professional socialization of law students. A "big" question underlying the course is whether legal work is a medium in which one can pursue projects oriented toward political and social change. There is no prerequisite for this course, and no prior background in legal theory, history, or jurisprudence is needed. All students are expected to read the assigned texts very closely and participate in discussing them in class.

LAW 7610. Community Business Law Clinic. 6 Hours.

The clinic requires students to devote twenty hours per week to providing legal services to low-income and underserved entrepreneurs under the supervision of clinical faculty and staff. The services provided will range from entity formation to financing and include attention to intellectual and real property issues and government regulation. Preference will be given to students with relevant academic learning, including Corporations and the Community Economic Development Seminar, or relevant practical experience.

LAW 7612. Wrongful Convictions and Post-Conviction Remedies. 3 Hours.

The emergence of DNA testing has not only assisted law enforcement in solving crimes, but it has also helped to expose a problem that many observers of the criminal justice system have long suspected: that a number of actually innocent prisoners have been convicted in the United States. Given that biological evidence suitable for post-conviction DNA testing is available in only a smattering of cases, the exonerations generated by DNA represent only the tip of the innocence iceberg, so to speak. This class will explore (1) the primary factors that contribute to the phenomenon of wrongful convictions, (2) the state and federal procedures through which post-conviction claims are litigated and (3) potential reforms to protect against the conviction of the innocent.

LAW 7614. Law Practice Management: Access to Justice. 3 Hours.

This course challenges conventional law practice management by exploring means of methods of filling the market gap in the provision of legal services to middle class clients. Students will investigate and document ways to use improved marketing techniques, staffing patterns, technological innovations and a variety of other tools to provide legal services to underserved portions of the market in a sustainable and economically viable fashion. Students will conduct independent research to develop a law firm business plan; exploring a practice area of particular interest to them. This course is not solely geared toward the entrepreneurial attorney, but rather will assist anyone in the development of skills to bridge-the-gap between their theoretical education and its practical application to the practice of law.

LAW 7617. Economic Perspectives on Health Policy. 4 Hours.

Uses basic economic concepts to illuminate the many factors that shape health, healthcare, and the healthcare system in the United States. Examines the role of these concepts in explaining the challenges faced in achieving three core goals of the healthcare system: increasing access, limiting cost, and improving quality. Explores how policy makers, market participants, and others can remedy access, cost, and quality deficiencies. Illustrates how economic concepts can be applied to the study of health and health behaviors.

LAW 7619. Healthcare Fraud and Abuse Law. 3 Hours.

This course provides an overview of the law relating to healthcare fraud. It will provide an overview of the healthcare fraud and abuse laws, emphasizing the role of whistleblowers, qui tam actions, criminal investigative techniques, trial issues inherent in white collar criminal prosecutions, innovative resolutions of corporate fraud including compliance programs, and sentencing. Topics will include an overview of the healthcare payment system, the frauds visited on that system, and the interplay of criminal prosecutions with the FDA regulation. This course is highly recommended for students in the JD/MPH program, LLM students specializing in health policy and law, and students interested in criminal law, but is open to others as well. Health Law is recommended but not required.

LAW 7622. Whistleblower Law. 2 Hours.

This course provides an introduction to the legal issues related to whistleblowing, a dynamic new area in employment, corporate compliance, and anti-fraud law. It focuses on tort-like remedies and monetary rewards available to whistleblowers under the Dodd-Frank, Sarbanes-Oxley, Foreign Corrupt Practices and False Claims Acts, along with protections under tax law, the First Amendment, and common law. There will be a final exam and a short paper (approximately 2 pages in length).

LAW 7624. Advanced Legal and Interdisciplinary Research. 2 Hours.

This course teaches students how to research specialized legal topics, highlighting both legal and nonlegal sources that reflect modern practice. The course will use a combination of lectures, interactive hands-on sessions, real life examples, and an in-depth final research and writing project. Students may explore state, federal and international primary laws and regulations, as well as relevant nonlegal sources and how they interact with the law. Both print and electronic sources will be researched. The course will highlight different specialized topics such as health law, environmental law, etc.

LAW 7629. Inside Counsel. 2 Hours.

The legal departments of corporations represent a significant practice opportunity for lawyers interested in corporate and regulatory law. These corporate departments operate on a different model than law firms and regulatory agencies and offer careers that combine legal disciplines with business management skills. This course will examine the roles of corporate counsel inside U.S.-based corporations and not-for-profits, specifically: the value proposition of corporate counsel, common responsibilities, unique ethical issues, the implications of the Sarbanes-Oxley and Dodd-Frank acts, corporate governance, risk management and litigation. Students will be graded on their responses to mid-term and final essay questions and the demonstration of their comprehension of the subject matter in the classroom. Prior study of Corporate Law is preferred but not required.

LAW 7633. IP CO-LAB Clinic. 6 Hours.

The clinic requires students to devote at least twenty hours per week to providing IP-related legal services to students, ventures and other participants in the university's entrepreneurship and innovation ecosystem under the supervision of clinical faculty and staff. The clinic includes opportunities to address issues related to IP rights, risks and transactions for individuals and ventures in the university community, to collaborate with faculty and others on IP learning modules, policies, presentations or workshops for this community, to develop practice skills, and to participate in organization and operation of a legal services office. Intellectual Property LAW 7369 is a prerequisite. Enrollment is limited to 6; preference given to students with other relevant courses or practical experience.

LAW 7634. Energy Law and Policy. 3 Hours.

Climate change and carbon emissions are the most important issues shaping energy law and policy in the United States today. This course will provide an introduction to U.S. energy law and policy in that context and will be organized around the regulated electricity sector which alone produces about 40% of all U.S. greenhouse gas emissions. We will explore the dynamics of natural monopoly markets, public utilities and their regulation, and the interplay of state and federal power in the energy space. We examine coal, natural gas, nuclear power, hydropower, renewables, storage, and efficiency for their impacts and potential as electrical energy sources in a carbon-constrained world. We conclude by investigating the legal potential to proactively foster and sustain a transition to a carbon-sustainable energy economy.

LAW 7635. Laboratory Seminar in Applied Design and Legal Empowerment. 3 Hours.

This limited enrollment seminar explores the use of design principles in the development of new models for delivering legal information and services. Problem-solving methodologies derived from the fields of product and systems design are being successfully applied in many disciplines, including the law. These methods will be critically examined and applied by students within the context of NuLawLab community projects. Students will join multidisciplinary teams working with communities to collaboratively design responsive solutions to unmet legal needs, using the technological advances currently transforming the legal profession and our larger society. The seminar emphasizes hands-on student engagement with community clients, field observations, and teamwork in partnership with a diversity of other disciplines. Students will be assessed based on contributions to project work, including class discussions.

LAW 7638. Trademark Law. 3 Hours.

This course is about the intellectual property right known as a "trademark," a word or symbol that distinguishes source of goods or services from each other. Trademark law is part of unfair competition law, which protects against a variety of "deceptive" or "inequitable" business practices. The regulation of trademarks is considered a way to maintain a fair and efficient marketplace for businesses and consumers. This course will cover common and statutory law of trademark as well as deepening your legal analysis of intellectual property rights. The course will offer insight into how trademarks live and develop in culture so you can draw both on the black letter law and its nuances as well as on your experience as a consumer in order to advise clients.

LAW 7639. Internet Law. 3 Hours.

This course examines how courts, legislatures, and regulators have confronted the legal issues presented by technology innovation and the commercialization of the Internet. The material in the course ranges from the foundational texts of historical "cyberlaw" of the 1990s to current leading-edge internet law and policy documents around duties of information security and privacy, protection of free speech, and recourse for harms caused(?) by technology. We will discuss the legal implications of social networks, user-generated content, location-based services, cloud computing, and the Internet of Things, and various other topics that are ripped from the headlines. No pre-existing technical knowledge is required.

LAW 7640. Information Security Law. 3 Hours.

This seminar will conduct a bleeding edge discussion of the state of the legal art in information security law – what is known in DC policy circles as "cybersecurity." While this field of law started in the 2000's by focusing on data breach notification, today the stakes are much higher. Consumer products that rely on computer code can now kill us, and one appropriately targeted zero day exploit could potentially devastate our economy. We will discuss why data breaches continue to run rampant, what duties of data care and code safety are owed to consumers, and how various government agencies are tackling the consumer protection and national security issues implicated by vulnerable computer code. You will never look at your gadgets the same way again.

LAW 7641. Amicus Curiae Project. 3 Hours.

Today more than ever, amici curiae (“friends of the court”) appear in high-stakes litigation over everything from the right to bear arms to same-sex marriage. An amicus curiae is someone who, though not a party to a lawsuit, adds their voice because they have an interest in the outcome. Amicus briefs can influence judges by providing legal or policy analysis, or factual information, not supplied by the litigants. In this course, students research and draft amicus briefs for the Massachusetts Supreme Judicial Court, with guidance from experienced appellate counsel. Exceptional research and writing skills are required. Useful prerequisites are Legal Writing Workshop, Advanced Legal Research, or Appellate Practice. Students can apply by submitting a resumé and unofficial transcript to the instructor.

LAW 7642. Law Practice Technology and the Legal Profession. 3 Hours.

Expanding use of technology is transforming the nature of the legal profession and how lawyers practice law. Using both conceptual and practical approaches, students will learn about changes in the profession, and about practice technologies, including practice management, document management, e-discovery, information security, electronic communication and social networking, information literacy, and presentation technologies. Ethical considerations related to use of technology and data management will be covered. Examples of subject-specific practice software will be included. The focus will be on practice in a small firm or organization, while understanding “Biglaw” approaches. Students’ own practice and subject interests can partially shape course coverage. There will be a final project and class presentation in place of a final exam.

LAW 7643. Creative and Innovative Economies: IP, Commercial Development, and Sustainable Business Practice. 3 Hours.

This seminar based on IP policy and law reform focuses on the binary of access and ownership in the development of IP-rich communities focused on creative and innovative practices. Students read intensely for 4–5 weeks and write response papers and discuss the material, then pick projects to develop (a particular creative or innovative community to study), while continuing our reading and discussion. The deliverable is a portfolio that includes: (1) interviews with professionals in the field, transcriptions of interviews and executive summaries (simulating client intake and fact gathering); (2) a 10–15 page memo identifying and analyzing particular IP issues the community faces and needs resolved; (3) a presentation that resembles a problem-identifying and problem-solving model of client counseling, with open issues identified for further study.

LAW 7644. Advanced Legal Research—Online Version. 2 Hours.

This two credit course which will be taught online in a long distance format through Blackboard, will focus on advanced legal research methodologies. It will include coverage of secondary sources, statutes, cases and citators, administrative law, electronic databases, practice materials, and strategies for making sure that your research is thorough. The course is designed to prepare law students for research in practice, clerkships, and legal scholarship. Students will be taught how to evaluate legal research sources and use them effectively, expanding skills in primary and secondary U.S. legal sources.

LAW 7647. Trial Practice. 2 Hours.

An introduction to the tactical and strategic problems commonly encountered in the trial of civil and criminal cases is the main objective of this course. Attention is given to the forensic aspects of trial practice, techniques of direct and cross-examination, and opening and closing summations. Prior course work in Evidence is a prerequisite.

LAW 7649. Law and Social Movements. 3 Hours.

This course will cover the theory, policy, and practice underlying key legalized social movements, focusing on the last three decades. The course will cover some or all of the following movements: environmental justice; LGBT rights; disability rights; death penalty abolition; racial justice; restorative justice; the innocence movement; and “rollback” movements that seek to narrow reproductive rights, voting rights, and LGBT rights.

LAW 7650. Dynamic Lawyering for Systemic Change. 3 Hours.

This innovative project incubator prepares students for future leadership by fusing theory into practice and practice into teaching. Students learn innovative client-centered lawyering by helping selected organizations that serve underserved communities to transform challenging problems into concrete, workable legal and advocacy projects suitable for engagement between the organizations and NUSL students. Students will: (1) plan and phase short- and long-term project proposals; and (2) develop multidisciplinary project strategies for participation with diverse institutional and community stakeholders. Students will also (3) deepen their research, writing, strategic advising and team managements skills; and (4) learn to give and receive constructive peer, expert and client critique. Limited enrollment course open to all upper-level students.

LAW 7651. Human Rights in the United States. 3 Hours.

This seminar explores the role of international human rights frameworks and strategies in social justice lawyering in the United States. On a range of issues, lawyers are bringing human rights home. They are using human rights mechanisms of the United Nations and Inter-American Human Rights system, drawing on international human rights and comparative foreign law in litigation before U.S. courts, and engaging in other human rights-based advocacy such as documentation, organizing, and human rights education. Advocates find that a human rights approach provides important strategic leverage and highlights the interdependence of economic, social, cultural, civil, and political rights. We will use skills exercises, assignments and real-world problems to develop practical skills to address policies on local, state and national levels, and to support social movements.

LAW 7652. Strategies for Bar Success. 3 Hours.

This course eases students into bar exam preparation by focusing on contextualized substantive review of the most heavily tested topics on the bar. It overlays skill instruction on reading comprehension, issue identification, rule mastery, critical thinking, legal analysis and recognition of distractor skills. Students gain a strong conceptual understanding and in-depth knowledge of highly tested doctrines across two MBE subjects and will be taught how to develop, use and apply a flexible but strong analytical framework to solve bar exam problems. Limited to third-year law students.

LAW 7653. Law and Strategy. 3 Hours.

This course will introduce students to the interplay of law and strategy, with attention to applying legal knowledge and resources to strategic management and strategy implementation. The course will use several examples/cases of business school oriented strategy scholarship and integrate understandings of contract law, administrative law, for profit and nonprofit corporation law, ethics, and the role of lawyers as in-house and outside counsel. We will emphasize the resource based view of the firm in examining and developing approaches to incorporating understanding of law in strategic management. We will work with the concepts of legal astuteness and transformation in the integration of law and strategy.

LAW 7654. Race, Justice, and Reform. 6 Hours.

This seminar will focus on: how the criminal justice system impacts community members; how laws, policies and practices disparately impact communities of color and perpetuate structural economic inequality; and how Massachusetts and other states struggle to reform our criminal justice systems. Class sessions will examine specific topics and discuss class readings on those topics. Each student will choose one topic to investigate and explore. Students will write papers identifying and analyzing the issues germane to their topic. In addition, they will investigate and develop narratives describing the community impact of particular criminal laws and policies. Finally, they will create podcasts and op-eds to educate the public about this particular topic and what reforms are needed to address the problems illuminated by their research and narratives.

LAW 7656. Legal Research and Writing 2. 3 Hours.

Building on the basic skills developed in the required Legal Research and Writing course, this course offers the opportunity to solidify and expand on the skills learned in the foundation course and develop additional advanced research and writing techniques to more fully prepare for current real world work experiences. Requires permission of instructor.

LAW 7657. Immigrant Justice Clinic. 6 Hours.

Law students, under the supervision of clinical faculty and staff, will devote 20 hours per week to providing legal services to non-citizen clients. Students are expected to interview, research, plan, investigate, write, counsel, negotiate, and advocate for their clients. Students will be exposed to cross-cultural legal practice and working with interpreters. The types of cases handled may include applications for Asylum, U-visas, T-visas, and other forms of relief. The skills students are expected to learn in this course are transferable to any civil or criminal practice after law school. Enrollment is limited, and preference will be given to students with relevant course or practical experience and fluency in Spanish. Students must take Immigration Law or Refugee and Asylum Law prior to taking the clinic.

LAW 7658. Legal Blogging: Health Law. 2 Hours.

In this course, students will have an opportunity to develop and expand their existing research and writing skills beyond traditional legal genres. The course emphasizes how to best utilize blogs and other short form mediums to discuss legal issues related to health policy and law, including issues such as health care reform, the opioid crisis, and occupational safety. Assignments include researching and drafting several blog and short form pieces for possible publication on a blog overseen by the Center for Health Policy and Law and possibly additional sites. Weekly class meetings will feature both substantive discussions as well as writing workshops with the instructors and classmates. Strong foundational writing skills are necessary. Prior health-related coursework or work experience is recommended.

LAW 7659. Comparative Family Law. 3 Hours.

Globally, families are regulated by overlapping legal regimes (religious, domestic, international), each influencing family formation, kinship, and care. This seminar focuses on how globalization dynamics, from the rise of human rights and international economic regimes to the increase of immigration flows, and technological advances are shaping rules and policies concerning families. The class focuses on the comparative study of family laws as well as on the regulation of cross-border family relationships. We will analyze the recognition of new family structures (same-sex marriage, transnational surrogacy regulation agreements and new forms of parenthood), and developments in family law and immigration (immigrant families and religious family norms in secular societies) and economic aspects of family regulation (protection of working parents, and international economic development and the productive family).

LAW 7660. Disrupt the Cradle-to-Prison Pipeline—Restorative Justice. 3 Hours.

This course examines how we construct the cradle/school to prison pipeline while focusing on several pivotal points that channel largely poor Black and Brown students into it. With an eye toward practical application, students will learn about, critique, problem solve and create pipeline disrupting solutions looking to restorative justice as a time-honored justice paradigm alternative to our western constructions.

LAW 7662. Master Class in Legal Design. 3 Hours.

This three-credit upper level course pairs law students with students from a design discipline such as architecture, service design, user experience design, or game design to reimagine aspects of our legal system for the age of self-representation. Law students join interdisciplinary student teams to apply advanced discipline-specific design methodologies and frameworks in response to a specific system design challenge.

LAW 7663. Cost Effective Legal Research. 2 Hours.

This advanced legal research survey course will focus on cost-effective research strategies and techniques using print and electronic resources. We will examine the benefits and drawbacks of free Internet sources and low cost subscription databases, discuss how to use the major legal research platforms (Lexis and Westlaw) most efficiently, and explore various avenues for accessing research tools and research help (such as public law libraries, state libraries, and bar associations). As both employers and clients become increasingly cost-conscious, this course is equally appropriate for students planning a law firm career as it is for students intending to work in public interest, government or in solo practice.

LAW 7664. Law and Inequality. 3 Hours.

In this course we will explore inequality from a range of disciplinary perspectives and the difference that difference can make in a variety of legal, social and economic contexts. More specifically, we will examine and elaborate methodologies for mapping some of the ways diverse legal regimes and concepts contribute to the production, recognition, reinforcement and maintenance of hierarchies of privilege and disadvantage between individuals, groups, localities, regions and nations. As we identify key legal drivers in the production of adverse inequities, we will also explore ways that changes in these legal drivers might shift bargaining power, redistribute resources or otherwise ameliorate the inequities or their adverse consequences. Students will each research a circumstance of inequality and develop a legal map to engage it.

LAW 7665. Housing Matters: Overview of Fair Housing Laws and the Social Impact of Homelessness. 3 Hours.

This class will present students with an expansive overview of Fair Housing in the United States. Students will be exposed to basics of landlord-tenant law, rental assistance programs, housing discrimination, health codes enforcement and their impact on homelessness, gentrification, and the social cost of not following a housing first model. The class will focus on the laws of the United States but will also offer a comparative law view of housing in the European Union and Singapore. The class will have a practical component aimed at getting students ready for practice.

LAW 7666. Human Rights, the Environment, Development and Community Resilience. 3 Hours.

This course explores the interlinkages between human rights and the environment within the context of how unsustainable development, especially by businesses, is driving environmental degradation and global human rights violations. We will appraise how communities are responding with innovative lawyering utilizing emerging jurisprudence in comparative law and judicial, quasi-judicial, and non-judicial grievance mechanisms, with special attention to African examples. The course will emphasize practical approaches to environmental protection using human rights instruments. The power of corporations and financial institutions, the ways in which corporate activities often connect to abuses of human rights and the environment, and legal advances in the regulation of transnational corporate activity will be explored while also discussing corporate accountability, the global justice movement, and strategies being used to address these trends.

LAW 7667. Law and Ethics of Advocacy. 3 Hours.

What limits are there on actions aimed at influencing public officials or public opinion? What limits should there be? Clearly, it is unlawful to offer a bribe to a public official to produce a desirable outcome. But what constitutes a bribe? Can a lobbyist send a wedding gift to a favorite legislator? Are the rules different when advocacy efforts reach beyond United States borders? Are there limits on what an advocate can say to promote a product or service? Where is the line between conduct that is legally permissible and conduct that is not? To what extent are legal boundaries and ethical boundaries aligned? This course will explore the ethical and legal issues that arise in connection with advocacy.

LAW 7668. Community Economic Development Practicum. 1-3 Hours.

This practicum is an extension of the Community Economic Development (CED) course, which examines contemporary American approaches to local economic development. CED has served as a consensus strategy for alleviating urban poverty and spurring neighborhood-level economic development. This practicum provides students an opportunity to critically examine the role of CED law and lawyers by providing opportunities to represent CED clients.

LAW 7669. Law and Technology. 3 Hours.

This course examines law and technology as both processes and artifacts endemic to human groups, who have been toolmakers and lawmakers since human history has been recorded. Yet, in recent times, development of technological things has outpaced development in the law, bringing about what we might describe as new “design challenges” within the law. This course will consider several disputes around ownership and property, and safety and risk, and will provide students with a conceptual framework from the social study of science and technology by which to understand technology and the law. The seminar will have a particular focus on the regulation of “digital labor” and algorithmically-convened labor markets, such as Uber.

LAW 7670. Legislation and Regulation. 3 Hours.

In contemporary times, more often than not, a situation giving rise to a case or controversy will be governed by statutes and regulations. This course in legislation and regulation supplements first-year courses focused on the common law and upper-level courses focused on specific legal areas by illuminating how laws are made. It examines the political and technical processes by which statutes are drafted and enacted by legislatures, as well as how regulations are adopted by administrative agencies exercising statutory authority. Students will practice drafting a law and putting together testimony for a legislative committee. They will also engage in hands-on exercises involving legislative and regulatory work of the sort that is done not only within government, but also by firms and advocacy groups.

LAW 7671. Racial Minority Representation, the US Constitution, the Voting Rights Act of 1965. 2 Hours.

The goal of this course is to introduce students to key provisions of the U.S. Constitution and Voting Rights Act that have been most effective at protecting and advancing the voting rights of people of color, as well as to examine what remains of the VRA’s protections following the Supreme Court’s 2013 *Shelby County, Alabama v. Holder* ruling. Students will scrutinize the old and new forms of racial discrimination in voting that continue to deny and abridge voting rights, including felony disenfranchisement, restrictions on voter registration and early voting, voter purges, polling places changes, strict voter photo identification laws, and manipulative redistricting, among many other election laws, policies, and practices that limit the ability of voters of color to freely exercise their right to vote.

LAW 7672. Data Regulation and Compliance. 3 Hours.

Institutions increasingly face a host of regulatory compliance issues. This course will cover the challenges facing organizations in building programs that ensure adherence with legal obligations, especially regarding data. We will explore statutes covering a broad range of areas, especially when it involves data protection and privacy.

LAW 7673. Immigrant Justice Practicum. 4 Hours.

Students in the Immigrant Justice Clinic (IJC) Practicum will work under the guidance of immigration attorneys to assist in remote representation of detained immigrants in a variety of matters. Given the current immigration crisis, especially at the border, the work might include preparing asylum seekers for credible fear interviews, drafting written submissions, telephonically appearing at credible fear and reasonable fear interviews, and general legal research and writing. The practicum also includes a classroom component that combines practical training and reflection.

LAW 7674. Defense, Offense, and Dreaming: Lawyering for Social Movements. 2 Hours.

From millions facing deportation, the Muslim Ban, continued impunity for police killings of Black men and women, threats to reproductive justice, and climate disasters, marginalized communities are facing a scale of crisis that we have not seen before. At the same time, the Movement for Black Lives, Standing Rock, and #MeToo, demonstrate that marginalized communities are resisting, organizing and building movements with radically hopeful visions of the future. Lawyers can play an important role in defending and emboldening social movements. Yet “movement lawyering” is infrequently taught in law schools. This course will explore the theory and practice of movement lawyering. Together we will deepen our understanding of social change and critically examine how law is a tool of defense, offense and dreaming for social movements.

LAW 7675. Information Privacy Law. 3 Hours.

Information privacy law concerns the collection, use, and disclosure of personal information. This course will address the interrelated web of torts, statutes, crimes, contracts, property rules, administrative regulations, procedural rules, and constitutional provisions that implicate information privacy. Topics covered in this course include: the difficulty in conceptualizing privacy, justifications for protecting privacy, privacy and the press, conflicts between privacy and free speech, wiretapping and government surveillance, national and international data protection frameworks, privacy and social media, anonymity, and the rules for cross-border data flows.

LAW 7676. Global Energy Justice. 3 Hours.

This course explores the social justice dimensions of the renewable energy transition, with a focus on the Global South. The first half of the course includes an exploration of the theoretical and legal backdrop of renewable energy development, including law and development theory, climate change governance, energy justice theory, and indigenous rights. The second half of the course explores structural approaches to renewable energy development in the Global South, including energy market liberalization, development finance, and community energy development. The course highlights selected case studies in Latin America and Africa and, through project work, students develop country-specific energy development expertise.

LAW 7677. Contemporary Issues in Family Law. 2 Hours.

This seminar provides students the opportunity to explore current issues related to families and the capacity of the legal system to address some of these issues. Weekly topics will vary and may include but are not limited to: consequences of legal recognition of adult domestic relationships; rights of children/juveniles in the court system; the child-parent relationship; the court system's ability to address substance abuse occurring within the family. Requirements include weekly readings, regular attendance and participation in an oral presentation, which may be co-presented, of one family law-related current event, a research paper of 20 pages on any approved family law-related topic and an oral presentation of the research paper. Previous family law-related coursework or work experience is recommended but not required.

LAW 7678. Legal Research Workshop. 1 Hour.

This course assists students in developing and executing research plans for writing projects. Students must identify an appropriate project early in the course; the project may be one that the student creates specifically for the course, or it could be one undertaken for a seminar or independent study in which the student is concurrently enrolled. The workshop will include readings, lectures, demonstrations, and in-class and homework exercises, as well as peer and instructor feedback focused on research strategies. Students will periodically present their research strategies and results for their writing projects.

LAW 7679. Race and the Law. 3 Hours.

This course examines the role of the law in perpetuating and alleviating racial inequality in the United States. We will interrogate historical and contemporary debates about the law and racial inequality. We will bear down on a question that is often asked by critical race scholars: why does inequality persist despite massive legal transformation especially following the civil rights movement? We will approach this question by examining how the law and legal institutions shape racial identity and how ideas about race shape legal institutions. The course will also consider tensions and debates within critical race theory and among race scholars. We will excavate the stakes of these debates and the consequences (intended and unintended) of various legal reform projects designed to address racial inequality.

LAW 7680. Advanced Immigrant Justice Clinic. 2 Hours.

In the Advanced Immigrant Justice Clinic (IJC), law students, working under the supervision of clinical faculty, will continue and advance their representation of noncitizen clients from their previous time in the IJC. Students will also engage in more regular intakes at immigration detention centers and delve into know-your-rights presentations in the Boston community. For the immigration cases, students will continue managing all aspects of their cases, including interviewing, fact development, legal research, drafting, and oral advocacy.

LAW 7681. Law and Biotechnology. 3 Hours.

Developments in biotechnology and the life sciences have thrown into question existing legal approaches and instruments dealing with such critical issues as genetic discrimination, intellectual property rights in biotechnology, regulating new reproductive technologies, drug development, informed consent, responsible conduct of research, forensic uses of DNA, and privacy. These developments are reconstituting concepts of legal rights and obligations of people in relation to their governing institutions. Focusing in particular on human genetics, this course seeks to identify and explore important ethical, legal, and policy issues associated with these new challenges.

LAW 7927. Applied Learning Experience for JD/MPH. 3 Hours.

Work completed for this individualized instruction course fulfills the capstone requirement for the Master of Public Health (MPH) portion of the Dual JD/MPH Program with Tufts University. The requirement is known as the Applied Learning Experience and it earns 3 Northeastern University Law school credits. Students fulfilling this required course spend a minimum of 160 hours in a public health agency completing a project related to public health and law. It is both an academic and practice experience where students use their legal and public health knowledge and skills to undertake a discrete project in a public health agency. A final paper and presentation are required.

LAW 7929. Moot Courts and Legal Competitions. 1-4 Hours.

This individualized instruction program allows students to participate in a variety of professional competitions: moot court, mock trial, mediation, client counseling and writing competitions. Under the supervision of a faculty member, participants in these competitions devote substantial time and effort to researching, writing, and preparing for oral arguments or advocacy. In recognition of the effort required to participate in these competitions, participants are awarded up to three (3) credits for the experience, provided they satisfactorily (i) complete the required written submission, (ii) participate in a number of rounds of practice argument, and (iii) attend and participate in the competition. May be repeated up to five times for up to 6 total credits.

LAW 7930. Law Review, Legal Writing, and Scholarly Publication. 1-3 Hours.

This individualized instruction program allows students to participate in a variety of professional writing, scholarship, and publication experiences: law review, legal journals, online publications, and legal symposia and debates. Under the supervision of a faculty member, participants devote substantial time and effort to researching, writing, editing, and producing theoretical and applied legal scholarship and publications. In recognition of the effort required to participate, participants are awarded up to three (3) credits for the experience, provided they satisfactorily (i) complete required written submissions and other writing assignments, (ii) fulfill their assigned editing, publication, scholarly, and other responsibilities, and (iii) attend and participate in required events. May be repeated up to five times for up to 6 total credits.

LAW 7931. LSSC Lawyering Fellow. 4 Hours.

Lawyering Fellows in the Legal Skills in Social Context (LSSC) program assist LSSC faculty in all aspects of the first-year LSSC course. Working closely with a supervising faculty member, Lawyering Fellows provide critique and feedback on first-year students' written and oral work, create legal research plans, identify areas for field research, liaise with representatives from the partner organizations, and help to foster strong team dynamics and development. Lawyering Fellows also receive instruction in facilitating discussions around social justice issues, as well as in cultural competency, teamwork, strategic planning, and project management. Lawyering Fellows receive four credits for their work in the LSSC program.

LAW 7932. Public Service Externship Seminar. 2-4 Hours.

This seminar is for students who will be completing a part time field placement with a not for profit organization or in a governmental legal setting. The seminar requires structured reflection of the student's individual experiences, organization, the social context of our changing profession, acquisition of proficiency in oral communication such as oral presentations and the utilization of interdisciplinary insights into legal problem solving. The number of credits allowed will be determined based on the student's additional course load, organizational expectations of the participating agency, and the number of non-classroom credits available to the student.

LAW 7933. Law Review - Note Development. 1 Hour.

The Northeastern University Law Review publishes legal scholarship in its flagship print journal and on-line platforms. In addition to performing standard staff duties, a staff member may elect to develop a Student Note. Notes shall meet Rigorous Writing Requirement Rule standards and be of publishable academic quality analyzing an original legal issue or problem. Note writers work under supervision of the Faculty Advisor and senior staff over two quarters, earning one credit for satisfactory work in each quarter. In the first quarter, the student selects and researches a topic, does preemption checks, and develops an article outline. In the second quarter, the student writes and edits a finished Note. Top student Notes may be selected for publication.

LAW 7934. Law Review - Senior Staff. 0.5 Hours.

The Northeastern University Law Review publishes legal scholarship in its flagship print journal and on-line platforms. In addition to performing standard senior staff duties, a senior staffer may elect to register to mentor NULR staff who are developing Student Notes for credit and potential publication. These senior staff work as teaching assistants under the supervision of the Faculty Advisor to guide staff note-writers' research and writing, topic development, and preemption checks. These senior staff earn one credit at the end of their second registered quarter of performing satisfactory academic work.

LAW 7935. Law Review - Editorial Board Member. 1,2 Hour.

The Northeastern University Law Review publishes legal scholarship in its flagship print journal and on-line platforms. Operations are managed by an Editorial Board. In addition to the three Executive Editors who lead the E-Board, members include Articles Editors, Extra Legal Editor, Forum Editor, Publications Editor, and Symposium Editor. E-Board members work under supervision of the Faculty Advisor and Executive Editors, earning a total of three credits for two quarters. They may choose in which quarter of the two to earn the one or two credit hours. Editors develop articles and content, facilitate events and the publication process, and work with senior staff and staff. Individual position descriptions define additional specific responsibilities for each position.

LAW 7936. Law Review - Executive Editor. 2,3 Hours.

The Northeastern University Law Review publishes legal scholarship in its flagship print journal and on-line platforms. Operations are managed by an Editorial Board, led by three Executive Editors per rotation: Editor-in-Chief, Managing Editor, and Executive Articles Editor. Executive Editors work under supervision of the Faculty Advisor over two quarters, earning two credits for satisfactory work in each quarter. In the broadest sense, they manage operations, production, and staff, make editorial choices, and ensure ethical operation that meets legal and financial obligations. Though their specific roles require different specific actions, as defined in their position descriptions, Executive Editors often share work and are ultimately responsible for doing what is necessary to ensure a successful Law Review.

LAW 7937. Teaching Assistant. 1-3 Hours.

Working under the direct supervision of a full-time faculty member, an upper level student in good academic standing may serve as a teaching assistant for first year or upper level courses. Teaching assistants may be required to attend classes and complete all reading assignments. Other responsibilities may include, but are not limited to, conducting review sessions, classroom exercises or other forms of direct instruction; holding office hours or meetings with individual students taking the course; and assisting in the development of course materials and assessments. In addition, teaching assistants are expected to meet regularly with the professor.

LAW 7938. Research Assistant. 1-3 Hours.

An upper level student in good standing may serve as a faculty Research Assistant. The student will work with a full-time faculty member on a supervised project relating to the faculty member's teaching or scholarly activities. The project will provide the student with supervised research and/or writing experience as well as an opportunity to engage in analytical discourse with the faculty member.

LAW 7944. Co-op Work Experience—Part Time. 0 Hours.

Provides eligible students with an opportunity for part-time work experience.

LAW 7962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

LAW 7964. Co-op Work Experience. 0 Hours.

Provides eligible students with an opportunity for work experience. May be repeated without limit.

LAW 7965. Co-op Work Experience Abroad. 0 Hours.

Offers eligible students an opportunity for work experience abroad. May be repeated without limit.

LAW 7966. Public Interest and Government Co-op Work Experience. 0 Hours.

Offers eligible students an opportunity for work experience in a public interest or government setting. May be repeated without limit.

LAW 7967. Public Interest and Government Co-op Work Experience Abroad. 0 Hours.

Offers eligible students an opportunity for work experience in a public interest or government setting abroad. May be repeated without limit.

LAW 7978. Independent Study. 1-5 Hours.

Any upper level student in good standing may engage in one or more independent study projects, totaling not more than three credits during an academic quarter and six credits during the two upper level years. A student wishing to conduct an independent study must secure the approval of a faculty member who agrees to supervise the project. Many students use independent studies to continue to examine a topic begun during co-op, or to extend the syllabus of a course. Students may also design projects which are not based in either course work or co-op, but in all cases a faculty sponsor must agree to the project. May be repeated for up to 6 total credits.

Law and Policy - CPS (LWP)

Search LWP Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=LWP>)

LWP 6118. Historical Foundations of American Law. 3 Hours.

Explores American law and legal institutions in a historical context, examining the founding ideals and the era that shaped them. Includes an introduction to U.S. political thought and examines signature documents of the American republic, key works related to the founding of the United States, and places those topics within the current political landscape. Topics include the role of slavery, federalism, immigration, and foreign affairs in building the nation; the emergence of law as a distinct profession; and the rise of the political, administrative, and court systems. Analyzes the relationship between law and society and the importance of history in understanding modern legal developments.

LWP 6119. Current Law and Policy Debates: Our Nation's Capital and Beyond. 3 Hours.

Explores important law and policy issues that are currently capturing the attention of our national policymakers, think tanks, and journalists. Topics may include, but are not limited to, civil rights and civil liberties; the right to privacy; policy issues such as healthcare, gun control, immigration, and education reform; and global issues including foreign policy, among others. Includes a residency in Washington, D.C.

LWP 6120. Law and Legal Reasoning 1. 2 Hours.

Introduces modes of legal reasoning used by lawmakers, focusing on the courts and their principal actors, attorneys, and judges. Offers students an opportunity to obtain the skills necessary to use legal resources and reasoning in academic and policy work. Expects successful students to understand basic legal concepts and terminology, the organization of the federal and state court systems, and how litigation moves through the courts; to understand the types of legal reasoning used in cases involving both common law and enacted/statutory law; and to be able to read and understand key legal documents, especially judicial opinions and litigation documents such as complaints and briefs. Offers students an opportunity to add to the literature review for their thesis by developing the ability to conduct legal research on their topic, including reviewing and briefing cases. .

LWP 6121. Law and Legal Reasoning 2. 3 Hours.

Introduces modes of legal reasoning used by lawmakers and policymakers, focusing on legislature and current administrative state. Examines the way Congress and administrative agencies develop and adopt statutes and regulations and how interpreting institutions analyze and apply these laws. At the course conclusion, students are expected to understand the organization of legislatures at multiple levels; how bills are developed and move through legislatures; the impact of various stakeholders and politics upon the legislative process; the different types of legal reasoning used in lawmaking; and to be able to read and understand statutes and regulations. Offers students an opportunity to add to their literature review by developing the ability to conduct legal research on their topic and understanding the role of relevant agencies to their topic. .

LWP 6122. Law and Legal Reasoning 3. 3 Hours.

Introduces the modes of legal reasoning used by lawmakers, focusing on the role of the executive branch in policymaking. Offers students an opportunity to obtain the skills necessary to use legal resources and reasoning in academic and policy work. Expects successful students to understand basic legal concepts and terminology; how the executive branch interacts with other branches and stakeholders; the role of the U.S. president on the policymaking process; and how presidents across different eras have advanced and driven policy agendas as part of the U.S. political system. Offers students an opportunity to add to the literature review for their thesis by developing the ability to conduct legal research on their topic and by reading about U.S. presidential administrations over time.

LWP 6123. Law and Legal Reasoning 4. 2 Hours.

Offers a theoretical and practical overview of modes of legal reasoning, jurisprudence, and the application of such reasoning in contemporary legal cases. Topics include, but are not limited to, legal formalism and textualism, legal realism and pragmatism, critical legal studies, the living constitution, originalism, popular constitutionalism, and constitutional debates. Offers students an opportunity to apply these theories to historic and current cases and may offer opportunities for students to make comparisons across varied forms of government.

LWP 6401. Law and Policy Concepts 1: The Policymaking Process. 3 Hours.

Introduces students to the basic structure of the political branches of government, as well as foundational theories of the policy cycle and policy theorists, types of public policy, and the dimensions of conflict in the creation and modification of public policy. Topics may include, but are not limited to, problem definition, policy heuristics, and policy decisions including street-level bureaucracy. Students engage in practical application of policy theory through course assignments e.g., to their own proposed thesis research area or case examples.

LWP 6402. Law and Policy Concepts 2: Strategizing for Public Policy. 3 Hours.

Offers an overview of policymaking in the 21st century. Topics may include agenda setting, historical institutionalism, and interbranch perspectives of law and policy, as well as the interaction between state- and federal-level policy.

LWP 6403. Law and Policy Concepts 3: Policy Case Studies. 2 Hours.

Reviews how modern policy scholarship is applied to public policy challenges. Topics may include, but are not limited to, healthcare, criminal justice, environmental policy, labor policy, economic development, housing, or social welfare. Offers comparisons allowing students a broader perspective of issues that surround law and policy domestically in the United States and globally in other sovereign states.

LWP 6404. Evaluation Research. 3 Hours.

Introduces commonly used policy evaluation methods and tools. Offers students an opportunity to become familiar with the concepts, techniques, and practices of evaluation research; to learn how to read evaluation research critically; and to develop an appropriate evaluation plan for an ongoing program. Topics include outcome and impact evaluation, as well as cost-benefit analysis. May include opportunities to engage in the further development of the literature review for the doctoral thesis project, conducting a short policy analysis, and critical review of a policy evaluation.

LWP 6410. Economics for Policy Analysis. 3 Hours.

Offers an overview of the use of various economic theories in policy analysis and the tools of public finance. Topics may include the theory of public choice; market failure; economic concepts of public and private goods; externalities; and theories of social welfare, political economy, behavioral economics, sources of revenue and expenditure, tax structures, and other contemporary efforts to incentivize private investment to support social goals. Offers students an opportunity to understand these theories and concepts and apply them to a range of public policy and legal issues.

LWP 6420. Quantitative Methods. 2 Hours.

Introduces students to quantitative research methodology, including techniques needed to explore the student's doctoral thesis questions from a quantitative perspective. Offers students an opportunity to learn how to move from designing a quantitative study to data collection through analysis and interpretation of quantitative data. Topics include the basic logic of statistical inference, the manipulation and description of data, survey techniques, and secondary data analysis. Covers a variety of statistical techniques used within policy research to calculate descriptive statistics and techniques to evaluate the relationship between variables, such as crosstabs, t-tests, correlation, and regression analysis. Students apply these techniques through assignments and performing quantitative data analysis. .

LWP 6423. Qualitative Methods. 3 Hours.

Introduces students to qualitative research, including techniques needed to explore the student's doctoral thesis questions from a qualitative perspective. Offers students an opportunity to learn how to move from design to data collection through analysis of qualitative data, as well as how one interprets and draws conclusions from qualitative data. Topics include qualitative data collection techniques, including in-depth group interviews, archival research, observation, and focus groups; coding qualitative data; and proper presentation of qualitative analyses and conclusions in formal academic writing such as the doctoral thesis. Students apply these techniques through assignments and performing qualitative data analysis.

LWP 6424. Research Methods. 3 Hours.

Introduces students to systematic methods of inquiry in law and policy doctoral study. Covers qualitative, quantitative, and mixed-methods approaches to research. Seeks to immediately assist students in thinking through their doctoral thesis research question and the development of the research methodologies suited to answer their research question. Topics may include research design; logic of inquiry; data collection; data management, data quality, communication and dissemination of results, evaluation of evidence; qualitative, quantitative, and mixed-methods approaches for law and policy research and analysis. Offers a general introduction to research ethics and Institutional Review Board processes and policies.

LWP 6431. Political and Moral Ethics and Dilemmas. 2 Hours.

Examines the political and moral responsibilities of public policymakers in government by asking what governments should do—considering principles that guide good, just, legitimate public policy—and what political actors should do—considering the many and often competing obligations that guide them in contesting what is good, just, and legitimate public policy. Assignments focus on applications of theoretical concepts from scholarly readings in philosophy and political theory to practical issues of public policy. Expects students to research distinct political and moral scholars, make presentations of their research, and complete a term paper addressing these ideas and scholars as applied to their doctoral project.

LWP 6450. Public Policy Theory and Practice 1. 2 Hours.

Offers a practical and theoretical overview of how legislation and public policy are initially developed at the federal, state, and local levels, using a range of research and policy tools. After developing the technical aspects of a public policy proposal, those working for policy change face an array of strategic and tactical decisions about where and how to intervene in the complicated system of actors and institutions that establishes and implements public policies. Examines a wide range of policy topics to understand and evaluate how different policy strategies evolve in the interplay between branches and levels of government.

LWP 6451. Public Policy Theory and Practice 2. 3 Hours.

Focuses on crafting effective strategies for advancing and passing concrete public policy changes at the federal, state, and local levels. Potential topics include, but are not limited to, health policy, education policy, jobs and economic policy, national security policy, immigration policy, and housing policy. Expects students to analyze policy change options and evaluate which strategies are most likely to produce desired changes. Offers students an opportunity to develop a theory-based and pragmatic framework for developing effective strategies to achieve desired policy change across a broad spectrum of issues and at all levels of government.

LWP 6452. Public Policy Theory and Practice 3. 2 Hours.

Focuses on the passage and implementation of public policy changes at the federal, state, and local levels. Guest experts lecture and initiate class discussions. Expects students to analyze policy change options and propose strategies to produce desired policy changes. Selected students are asked to lead and moderate class debates. Offers students an opportunity to develop a theory-based and pragmatic framework for developing effective strategies to achieve and implement desired policy change across a broad spectrum of issues and at all levels of government. Students may also be asked to examine ideas and proposals related to their doctoral theses.

LWP 6500. Doctoral Research Design 1. 2 Hours.

Builds upon prior courses in the methods sequence. Offers students an opportunity to further develop their knowledge and skills in research methodology and design. Students refine and add to the literature review and law and policy review conducted in prior course work and utilize their updated literature review to refine their design for their thesis research project for their selected topic area and to define the research methodology. By the end of the course, successful students are expected to have a doctoral thesis project proposal in their topic of interest, be ready to defend the proposal, and have prepared their IRB application for review in alignment with university requirements.

LWP 6501. Doctoral Research Design 2. 3 Hours.

Offers students an opportunity to continue to develop the doctoral thesis project; to refine the doctoral thesis proposal and IRB application completed in Doctoral Research Design 1; to defend the doctoral thesis proposal with the thesis committee; and submit the IRB application. In addition, offers students an opportunity to deepen the narrative around data analysis, ethical considerations and theoretical frameworks, and begin to build the doctoral thesis. Explores in-depth relationships with data collection, management, and analysis in alignment with standards of rigor.

LWP 6502. Doctoral Research Design 3. 2 Hours.

Offers students an opportunity to continue to develop the thesis project in the data collection, analysis, and reporting phase of the research. Continues in-depth exploration of data: collection, management, analysis, and handling of ethical concerns and standards of rigor. Offers students an opportunity to explore the conclusions that are possible from the results of their data collection and analysis. Introduces concepts of display of qualitative or quantitative data for the purpose of communicating data findings in the thesis and best practices in academic writing and presentation of data.

LWP 6503. Doctoral Research Design 4. 2-6 Hours.

Offers students an opportunity to continue to develop the thesis project, including finalizing data analysis and reporting of results and conclusions from research. Expects students to work toward a complete five-chapter dissertation (or accepted alternative) that will be edited and submitted for publication in the university dissertation repository. Students prepare for the culminating activity of the thesis defense and disseminating findings through scholarly channels.

LWP 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

LWP 6995. Project. 1-4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student's major field. May be repeated without limit.

LWP 7962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions.

LWP 7994. Thesis Continuation—Part Time. 0 Hours.

Offers continued thesis supervision by members of the program. May be repeated up to three times.

Law and Public Policy (LPSC)

Search LPSC Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=LPSC>)

LPSC 1101. Introduction to Law. 4 Hours.

Examines the role of law and society from a regulatory, constitutional, and judicial perspective, noting the role each of these has played in shaping the current legal framework in the United States. Introduces students to the relationship between law, societal organizations (both nongovernmental organizations and not-for-profit organizations), the private sector, and the separate branches of government (the judiciary, congressional, and executive branches). Provides students with the opportunity to learn to legally analyze judicial opinions, prepare legal memoranda, and present an oral argument before a "judge."

LPSC 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

LPSC 2301. Introduction to Law, Policy, and Society. 4 Hours.

Examines the relationship of society to its laws: how society creates changes in law or policy via societal pressure and social movements (such as the environmental, women's rights, and corporate accountability movements); how law and policy affect individual rights and behavior; whether a society needs laws in order to function; the relationship between some branches of our government in effectuating social change; and some of the fundamental differences between societies governed by seemingly similar but pragmatically different laws, such as the right to a jury trial. Requires a GPA of 3.000 or better.

LPSC 2302. Global Human Rights: A Social and Economic Perspective. 4 Hours.

Explores the implications of globalization on international human rights law. Analyzes numerous sources of international law, such as the universal declaration of human rights and the international covenant on economic, social, and cultural rights. Examines free trade and its impact on civil, political, economic, social, and cultural rights. Also explores the international mechanisms to resolve disputes and the impact of globalization on the rights of particular groups (e.g., women, children, and indigenous peoples).

LPSC 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

LPSC 3303. Topics in Law and Public Policy. 4 Hours.

Covers special topics in law, policy, and society to fulfill students' interests. May be repeated without limit.

LPSC 3307. Understanding the Modern Supreme Court. 4 Hours.

Offers a historical overview of the Supreme Court's role in American life, focusing on the 20th century. As a legal, political, and policymaking institution, the Supreme Court plays a central role in U.S. legal, political, and policy disputes. The justices possess a wide range of social, cultural, political, and economic views.

LPSC 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

LPSC 4304. Advanced Debates in Law and Public Policy. 4 Hours.

Explores the evolving roles of the courts, the legislative process, and social movements through case studies of current controversies in law and policy. Topics may include sentencing disparities in drug crimes, the changing laws of Internet use, funding of stem cell research, and safety on university campuses. Each case study includes a class debate or interactive simulation. Specific topics vary each semester.

LPSC 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

LPSC 4992. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

LPSC 5201. Law and the City. 4 Hours.

Examines key legal structures, court decisions, and social research to consider the ability of cities to make and implement public policies that directly affect the everyday lives of millions of people. American cities and their residents are frequently faced with similar legal and political questions. Topics include federalism, land-use planning and development, business regulation, gun control, school choice, public health, and climate adaptation initiatives.

LPSC 6313. Economic Analysis for Law, Policy, and Planning. 4 Hours.

Designed to familiarize master's degree students with the essential ideas and methods of microeconomics and their application to a wide range of domestic public policy issues at the national, state, and local level. Emphasizes the role of program and management incentives in influencing behavior and policy outcomes. Focuses on understanding the ideas of microeconomic theory and applying them to a range of alternative public policy issues. Offers students an opportunity to develop a clear understanding of essential economic ideas and how the economic perspective can be applied to a wide range of public policy issues. Restricted to master's degree students only.

LPSC 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

LPSC 7215. Advanced Quantitative Techniques. 4 Hours.

Covers multivariate statistical models and their applications to social science data. The ordinary least squares (OLS) regression model and the assumptions underlying it are covered in detail, as are techniques for analyzing data when OLS assumptions do not apply, such as simultaneous equation models, time series models, and maximum likelihood techniques for limited and discrete dependent variables. This is an advanced course in quantitative techniques for graduate students in the social sciences.

LPSC 7305. Research and Statistical Methods. 4 Hours.

Examines the methods and assumptions of research conducted in policy and legal studies. Explores how to identify researchable questions; how to formulate a set of hypotheses; and how to design, develop, and carry out research projects, including a study of quantitative and qualitative techniques for analyzing data. Focuses written assignments on critiques of published articles in reference journals addressing comparative strengths and weaknesses inherent in any research approach.

LPSC 7311. Strategizing Public Policy. 4 Hours.

Provides a practical overview to crafting effective strategies for advancing public policy changes at the federal, state, and local level using a range of legislative, litigation, and other policy tools. Uses a series of case studies on a wide range of policy topics to understand and evaluate how different policy strategies evolve in the interplay between branches and levels of government. Takes an interbranch perspective on how policy is made and places particular emphasis on the role litigation and the courts play in policy making, an aspect of public policy formulation that is often downplayed or overlooked.

LPSC 7312. Cities, Sustainability, and Climate Change. 4 Hours.

Provides an overview of the various aspects of urban sustainability planning. Examines sustainability as an urban planning approach with both ecological and social justice goals. Covers sustainable planning and offers students an opportunity to understand it within the context of smart growth and the new urbanism. Focuses on the two areas in which cities can reduce energy consumption and greenhouse gas emissions—the built environment and transportation. From there, the course examines planning efforts to reduce demand on water and sewer systems and to create employment in renewable energy and other “clean-tech” occupations. The course ends by placing urban initiatives in the context of state and national policy.

LPSC 7962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

LPSC 7976. Directed Study. 1-4 Hours.

Offers a supervised reading and research activity with faculty supervision approved by a committee of the Law, Policy, and Society faculty. May be repeated without limit.

LPSC 9000. PhD Candidacy Achieved. 0 Hours.

Indicates successful completion of the doctoral comprehensive exam.

LPSC 9990. Dissertation. 0 Hours.

Offers dissertation supervision by members of the department. May be repeated once.

LPSC 9996. Dissertation Continuation. 0 Hours.

Offers continued dissertation supervision by members of the department. May be repeated without limit.

LDR 1200. Assessing Your Leadership Capacity. 3 Hours.

Introduces the methodologies and processes that are essential aspects of leadership: conceptualizing motivation, identifying traits, creating a vision, understanding influence, overcoming obstacles, developing character, and establishing a professional brand. Offers students an opportunity to focus on self-awareness, reflection, individual effectiveness, and self-assessment to learn how to recognize and utilize the differences between themselves and others. Students receive ongoing feedback from their peers and a chance to develop their own philosophy of leadership. The successful student should be able to answer the question, “What does it take to be a 21st-century leader?”.

LDR 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

LDR 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

LDR 3200. Leading and Managing Change. 3 Hours.

Offers students an opportunity to develop the knowledge base necessary to lead and manage organizational change in all sectors with an emphasis on a 360-degree approach to understanding the many facets of change. Uses case studies that address various aspects of implementing change, such as: addressing the human psychology of change through innovative technology, social media, theoretical frameworks, understanding change agents, and operations. Encourages students to develop their views from both a management and nonmanagement perspective. The successful student should be able to gain knowledge and practical skills in how to connect change with strategy, anticipate resistance, assess readiness, and measure sustainability.

LDR 3250. Leading Teams Locally and Virtually. 3 Hours.

Covers the skills needed to manage teams in one office, in multisite locations, internationally or virtually. Topics include effective communication strategies, how to structure teams within an intergenerational environment, and how to leverage individual strengths to lead high-performance teams. Offers students an opportunity to identify barriers, study strategic methods for overcoming obstacles, leverage technology to build virtual spaces for people and ideas, and work to develop a strategy to optimize team effectiveness through a shared process and peer coaching by participating on a cohort team. The successful student should be able to understand their role as a catalyst, visionary, and leader in the formation and success of any team.

LDR 3300. Innovative Leadership. 3 Hours.

Offers students an opportunity to leverage a carefully curated mix of leadership literature, experiential exercises, and self-reflection, as well as specific feedback from the instructor and mentor, to optimize their leadership effectiveness in the real world. Provides students with continuous coaching and real-time feedback on their innovative leadership activities from their fellow peers, instructor, and assigned mentor.

Leadership Studies - CPS (LDR)

Search LDR Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=LDR>)

LDR 3400. Evidence-Based Leadership and Decision Making. 3 Hours.

Examines the components of evidence-based leadership that have been tested in various settings, shown to be effective, operational, and able to be used in solving real-world dilemmas. Emphasizes using decision-making models to analyze behaviors, align organizational goals, determine consequences, and make recommendations for actions leaders can make to solve problems. Studies the relationship(s) between scientific data, academic theory, technological advances, and changes in society toward the goal of understanding ethical problems. The successful student should be able to demonstrate increased information literacy, identify strategies for decision making, and know where to seek evidence needed in order to make high-quality decisions on a wide range of issues.

LDR 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

LDR 4850. Strategic Decision Making (Capstone). 3 Hours.

Offers students an opportunity to examine and test leadership theory in practice. Students demonstrate their leadership knowledge gained during their undergraduate studies by completing an experiential action-oriented project. Under faculty guidance and approval, each student must present a body of work that addresses a critical leadership topic that will enhance their professional development as a 21st-century leader. Experiences can be undertaken within any industry sector or at the workplace with supervisor approval. Past projects have included research studies, case studies, new products, leadership development plans, publications, journals, magazines, media/films, training programs, etc. Requires students to deliver a presentation on their project and share a culmination of learned outcomes.

LDR 4955. Project. 1-4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student's major field. May be repeated without limit.

LDR 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

LDR 4995. Practicum. 1-4 Hours.

Integrates theory and practice through a structured consulting experience working with organizations or conducting an applications-oriented research study. Introduces the problem-solving consulting model. From problem identification through recommendations, offers student teams an opportunity to work with decision makers to solve organizational leadership issues or conduct practical research studies.

LDR 5978. Independent Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic.

LDR 6100. Developing Your Leadership Capability. 3 Hours.

Begins with the premise everyone is capable of exercising leadership. Establishes this premise by exposing students to a series of alternative perspectives of leadership, including some contemporary collaborative models. Offers students an opportunity to demonstrate a holistic perspective of leadership by gaining an appreciation for the self and how it relates to the greater world around them. Students take a series of professional and leadership assessments/instruments designed to increase their self-awareness. This information allows students to think critically about their own leadership abilities and determine where they fit within the leadership continuum. Offers students an opportunity to build a personal model of leadership that can be put to immediate use in their workplace.

LDR 6101. Professional Leadership Lab/Core LDR Experience. 1 Hour.

Offers each student an opportunity to participate in an intensive, group leadership learning experience that is challenge based and experiential. This experience provides the foundation for a series of reflective, feedback-based activities that informs the development of a personalized leadership development plan and peer and faculty coaching during the lab and in subsequent courses. The development plan informs the student's journey through the leadership program and is housed in an ePortfolio.

LDR 6110. Leading Teams. 3 Hours.

Offers students an opportunity to lead teams through all stages of team development, learn and overcome team challenges, and determine the principles of building high-performing teams while nurturing the cohesion and bonding of team members. The team is the unit of an organization where most leaders begin to develop influence skills. Leading teams involves managing different personalities, cultures, and varying skill levels, while simultaneously securing resources and managing expectations of stakeholders. In this course, students also have an opportunity to learn effective techniques for working with virtual teams, managing conflict in teams, and facilitating team problem solving.

LDR 6115. Leadership Communication. 3 Hours.

Offers students an opportunity to evaluate and utilize numerous communications options to develop an authentic, powerful, leadership voice using interpersonal, technology-mediated, and intercultural communications competencies and techniques; to develop a personal model for leadership communication; and to define an action plan for their growth in powerful leadership communications. In today's dynamic, global work environment, leaders need to be able to communicate effectively with people located in the same geographical location or located anywhere across the globe.

LDR 6120. Developing Organizational Leadership. 3 Hours.

Offers students an opportunity to learn the best practices for onboarding, developing, and coaching leaders, as well as creating organizational systems that ensure the company has strong leadership talent for current and future success. The acquisition and development of a company's current and future leaders is one of the most vital activities for healthy organizational identity, strong organizational performance, and ensuring long-term growth. Searching for, anticipating, and securing a pipeline of leadership talent, often referred to as developing "bench strength," requires a proactive organizational environment that ensures the right processes are in place to support leadership development and succession planning.

LDR 6135. Ethical Leadership. 3 Hours.

Considers leadership dilemmas that can arise when individual values conflict with those of the organization or when a situation requires decisions with conflict value sets. Offers students an opportunity to use case studies, their own experiences, and current events to examine actions leaders have taken and consequences faced when confronted with ethical dilemmas. Students work on a real-life ethical dilemma for understanding in-depth reasoning of the problem and to develop an action plan for solving and preventing similar problems at the organizational and societal levels. From these discussions, students have an opportunity to develop a personal model for ethical leadership.

LDR 6140. Strategy Development and Implementation. 3 Hours.

Offers students an opportunity to build strategic thinking competencies through case analyses of relevant businesses, nonprofits, and state organizations, as well as through strategic analysis of their own career path. Students work in a consultative role with partner organizations to develop strategic action plans, to perform critical analyses of external and internal environments for a real organization, and to develop recommendations for the organization's strategic positioning and actions. From these discussions and personal development exercises, students have an opportunity to develop an action plan for personal growth as a strategic leader.

LDR 6145. Global Leadership. 3 Hours.

Explores changing demographics as they impact organizations of today and in the future and examines best-in-class organizations' motivations to more fully appreciate the backgrounds, cultures, experiences, viewpoints, styles, and contributions of all workforce members. Offers students an opportunity to reflect on leadership from key ethical, legal, policy, business, political, and societal frameworks. In a global economy, leaders of best-in-class organizations understand that creating an inclusive work environment is essential for continued competitive advantage. The world's exploding diversity coupled with technological advancements demand effective collaboration among employees from countries with different cultures, beliefs, and backgrounds.

LDR 6150. Innovation and Organizational Transformation. 3 Hours.

Offers students an opportunity to learn the framework for organizational transformation and obtain the skills and competencies required to develop and implement a holistic model of change. The strategies incorporate revealing the problems that ask to be solved, designing what the future change will look like, assessing the current situation in relation to the desired change, and planning and managing the transition from the current situation to the desired future. Within this course, students serve as consultants for real-life organizations, helping managers in their endeavors for organizational transformation. From these discussions, students have an opportunity to develop a personal model for change leadership and define an action plan for personal growth as a change agent.

LDR 6323. Event Management. 3 Hours.

Examines strategies and techniques required to run successful events. Offers students an opportunity to learn how to manage logistics; the who, what, where, when, and how of running the event; how to develop checklists and manage processes to keep things running smoothly; and how to have contingency plans. Covers the basic details involved in running events— size, budget, venue, hospitality, marketing, publicity management— and working with vendors, community organizations, spectators, and celebrities.

LDR 6360. Dynamics of Change at the Community and Social Level. 3 Hours.

Offers students an opportunity to learn to assess the needs and interests of multiple stakeholders simultaneously; examine national and international trends, issues, and political shifts; and consider ways to bring the public interest and common good into organizational decision-making processes. Given the interplay among government, business, and society, leaders may be called upon to effect change at a community or social level. Understanding the dynamics of change at this level requires understanding the needs of the multiple stakeholders involved.

LDR 6400. Sports Management. 3 Hours.

Provides an overview of management and administration pertaining to all levels of athletics. Focuses on basic theories of management and administration in athletic organizations. Addresses planning, scheduling, and financing aspects required to run a successful athletics program. Offers students an opportunity to learn to develop communication and management skills with an emphasis placed on decision making.

LDR 6405. Sport in Society. 3 Hours.

Examines the role sports plays in society. Emphasizes improving society through sports by creating and developing community service, drug awareness, and violence prevention programs. Discusses sports within sociological, economic, and political backgrounds. Topics include ethics, organizational code of conduct, and ethical behavior within competitive athletic settings.

LDR 6410. Leadership and Organization in Sport. 3 Hours.

Introduces a set of personal, interpersonal, and team-based skills and competencies required for leadership roles in sport organizations. These skills include self-awareness, managing stress, creative problem solving, communicating effectively, gaining power and influencing others, correcting performance and motivation problems, managing conflict, and delegation. Also explores the application of these skills in various contexts within the sports industry.

LDR 6427. Gender and Diversity in Sport. 3 Hours.

Examines gender and diversity in sport. Emphasizes creating equal opportunity for participants and administrative and leadership personnel. Explores affirmative action, human resources, and recruiting tactics and strategies.

LDR 6430. Sports Law. 3 Hours.

Addresses the legal aspects of sports, recreation, and leisure services, with a focus on tort and contractual liability. Covers legal concepts of negligence and principles of risk management, legal issues related to equipment use, facility management, and accommodation for special populations. Offers sports managers an opportunity to obtain the fundamental legal knowledge necessary to operate in the increasingly complex sports environment.

LDR 6435. Fiscal Practices in Sports. 3 Hours.

Examines the financial and regulatory issues confronting sports, fitness, and recreation industry managers. Covers accounting principles, financial statements, and related concepts that help determine the viability and strength of financial decision making.

LDR 6440. Sports Marketing and Promotions. 3 Hours.

Studies marketing and promotion strategies utilized in various aspects of the sports industry. Examines marketing sports as a product and marketing of nonsports products using sports as a promotional tool.

LDR 6441. Sports Media Relations. 3 Hours.

Studies the basic knowledge and understanding of media relations in sports. Emphasizes building and managing an effective media relations program on the intercollegiate and professional level. Examines news releases, hometown features, contest management, press conferences, statistics, and publications.

LDR 6442. Athletic Fund-Raising. 3 Hours.

Examines the fundamental tools and strategies necessary to raise funds within college athletics. Emphasizes annual fund-raising through solicitations via the mail, telephone, and interpersonal meetings and major gift and capital campaign solicitations and presentations. Discusses the role of the annual fund within the scope of an athletics department.

LDR 6443. Ticket Sales and Strategies. 3 Hours.

Provides an overview of ticket sales as a revenue source in athletics. Examines sales strategies for single-game, season ticket, and group sales; ticket office operations; and building a database for ticket sales.

LDR 6445. Corporate Sponsorships. 3 Hours.

Offers students an opportunity to develop a complete understanding of how sports properties can create effective commercial partnerships with corporations through the creation and execution of sponsorship agreements and how to prepare and critically evaluate the strategic implications of sponsorship proposals.

LDR 6455. NCAA Compliance. 3 Hours.

Provides a thorough study of the governing structure, rules, and legislative process within the NCAA. Examines compliance issues within a collegiate athletic department, including drug testing, self-reporting, and student-athlete eligibility.

LDR 6460. Risk Management in Athletics. 3 Hours.

Offers students an opportunity to develop the tools to conduct a thorough risk assessment for their organization and events by identifying potential risks, estimating their frequency and severity, determining how to control them, and developing safety policies and processes for staff and event participants. Emphasizes how to conduct a safety review and risk assessment and how to run an event that complies with health, safety, and security regulations.

LDR 6465. Title IX. 3 Hours.

Examines Title IX laws governing gender equity. Emphasizes managing an athletic department within the guidelines set forth by Title IX. Examines the original Title IX legislation, subsequent regulations issued by the Office of Civil Rights, and relevant court decisions.

LDR 6470. Bystander Strategies for the Prevention of Gender-Based Violence. 3 Hours.

Offers participants an opportunity to learn about the theoretical and practice models used to understand and respond to gender-based violence. Emphasizes bystander models of prevention. This interactive course is designed for students who are interested in research and practice directed at youth. Explores topics such as battery, gender roles, teen dating violence, sexual harassment, sexual assault/rape, and homophobia as facets of men's violence against women. Emphasizes trainer skill development for higher education, secondary education, public health, and social professionals. Offers participants an opportunity to learn how to effectively convene and facilitate public discourse about gender-based violence utilizing mentors in violence prevention curriculum with high school and college populations and to apply these concepts in service-learning opportunities.

LDR 6615. Academic Advising for Student-Athletes. 3 Hours.

Offers an overview of the foundations of academic advising and life-skill training as an essential component of student-athlete success and retention programs on higher education campuses. Topics include definitions and concepts for developmental advising; literature and research on the key concepts of academic advising; exploration of the various models and delivery systems for academic advising; skills for effective advising; advising diverse populations; and training, development, evaluation, assessment, and reward systems for advisers and advising programs.

LDR 6961. Internship. 1-4 Hours.

Offers students an opportunity, while under the supervision of a sports professional and utilizing relationships with local college, professional, and amateur organizations, to work on a term basis in specific sports-related assignments. Students share their experiences through a discussion board forum as well as deliver a final paper and develop a Web portfolio. The Web portfolio highlights the student's skills, knowledge, development, quality of writing, and critical thinking by showcasing a comprehensive collection of work samples and artifacts from the student's experiences in the sports leadership program. May be repeated without limit.

LDR 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

LDR 6980. Capstone. 1-4 Hours.

Offers students an opportunity to complete their academic experience with an in-depth, sports leadership internship. Students share their experiences through a discussion board forum as well as deliver a final paper and develop a Web portfolio. The Web portfolio highlights the student's skills, knowledge, development, quality of writing, and critical thinking by showcasing a comprehensive collection of work samples and artifacts from the student's experiences in the sports leadership program. By selecting an assignment of academic and professional interest, students are offered an opportunity to deepen their knowledge of a particular area of sports leadership through the senior project option. Intended for students already employed in the sports field.

LDR 6995. Project. 1-6 Hours.

Focuses on an in-depth project in which a student conducts research or produces a product related to the student's major field. May be repeated without limit.

LDR 7962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions.

LDR 7980. Capstone. 4 Hours.

Offers students an opportunity to increase their impact and effectiveness as a leader. Students develop an initiative for a real-life project that can be work-, community-, or university-based or, for a consulting case project, students develop a case study and case analysis. The case is a short description of a situation facing an organization and must be based on field research, depict real-life events, and describe a situation that requires a decision. The case analysis outlines the key issues in the case, identifies alternative scenarios for solutions, and provides the conceptual justification for the student's recommendation using relevant reference material from College of Professional Studies graduate courses. The capstone project is an action-based leadership project.

Legal Studies (LS)

Search LS Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=LS>)

LS 6101. Introduction to Legal Studies 1: Law and Legal Reasoning. 3 Hours.

This course will provide students with an introduction to the American legal system and legal reasoning. The course materials will cover rights and obligations created by contracts, fundamental principles of property law, accident law, the regulation of criminal conduct, and the laws associated with business formation and relationships. Students will also complete writing exercises to enable them to synthesize their understanding, and to find and use legal sources in support of their work.

LS 6102. Introduction to Legal Studies 2. 3 Hours.

This course builds on LS 6101 with its emphasis on common law by introducing students to statutes and regulations. The setting involves federal administrative agencies governing employment, consumer protection, environment, labor, cyberlaw, intellectual property, and international trade. Exercises and discussions require finding, summarizing, applying and arguing about the applicability of statutes and regulations in concrete situations. The capstone of the course allows students to create a project to illustrate the lessons learned in the course.

LS 6110. Law of Information and Records. 3 Hours.

This course will present a comprehensive survey of procedural and evidentiary rules in the context of recordkeeping, document production, due diligence, and investigations. It will include an exploration of rights to privacy, issues of confidentiality and conflicts of interest, contractual and legal liability, evidentiary consequences in administrative and court settings resulting from work-place disputes, and other related areas.

LS 6120. Law and Strategy. 3 Hours.

This course will introduce students to the implications and impact of law on strategy, with attention to applying legal knowledge and resources to strategic planning and strategy implementation. The course will use several examples of readily understood strategies to provide opportunities for students to identify the legal environment, consider the legal rights and requirements implicated by relevant law or regulation (e.g., intellectual property, contracts, administrative law) and their potential impact on management, incorporating law as a resource on the resource based view of the firm. The range of examples will include considering law and strategy implementation in multiple contexts. The focus will be on developing an appreciation of the legal environment and making effective use of legal resources and lawyers as advisors in strategic management aimed at attaining sustainable competitive advantage over rivals.

LS 6130. Negotiation and Advocacy. 3 Hours.

Students will learn core elements of negotiations that are the precursors to any final agreement or resolutions of informal disputes: negotiation planning from opposing sides and counseling, analysis of the bargaining range and opponent's needs, principled concession patterns, problem-solving strategies to avoid deadlock, information bargaining and authority clarification, principles of drafting, settlement, and ethics.

LS 6140. Data Regulation and Compliance. 3 Hours.

Institutions increasingly face a host of regulatory compliance issues. This course (building on LS 6102) will cover the challenges facing organizations in building programs that ensure adherence with legal obligations, especially regarding data. We will explore statutes covering a broad range of areas, especially when it involves data protection and privacy.

LS 6150. Law and Organizational Management. 3 Hours.

Students will learn the rules governing organizations, including corporations, partnerships, governmental organizations, and non-profits. The focus will include relationships within the organizations and powers of members of organizations. In addition, the course will cover employment issues relevant to relationships in organizations. Topics will include rights of workers to be free of discrimination in the workplace, the importance of workplace rules, and policies governing the workplace.

LS 6160. Regulation and Global Business Strategies. 3 Hours.

This course provides an introduction to the international legal concepts, principles and institutions that define and shape international business relations. Globalization has increased the number of economic interactions across national borders. The globalization of production and consumption takes place in the background of an international monetary system and an international legal infrastructure facilitating and regulating transnational trade, international finance and global intellectual property and investment protection. The course specifically examines case studies of global governance based on codes of practice, certification and other regulatory initiatives.

LS 6170. Financial Transactions. 3 Hours.

In this course students will explore various aspects of corporate financial transactions, including vendor and supplier contracts, early stage financing, commercial loans, initial public offerings, mergers, and the sale of assets. Issues involving valuation of assets will be covered, and students will learn basic securities laws related to the transactions covered.

LS 6180. Health Law Survey. 3 Hours.

This course examines legal regulations governing the provision of healthcare services. Topics include access to health insurance and healthcare, healthcare financing, the organization and responsibility of healthcare institutions (especially hospitals), healthcare cost containment policies, public and private insurance programs, and the formulation of health policy. The course will also provide an introductory overview of the major statutes, regulations, and case law related to health law, including an introduction to the Patient Protection and Affordable Care Act, otherwise known as Obamacare.

LS 6181. Healthcare Regulation and Compliance. 3 Hours.

This course covers major regulatory issues related to the healthcare field, providing an in-depth regulatory overview of health programs. Statutory schemes covered will include HIPAA/HITECH, Stark/fraud and abuse. In addition, students will learn about compliance programs, including compliance operations, and the code of conduct for particular fields.

LS 6182. Patient Records, Privacy, and Security. 3 Hours.

This course explores the ethical and legal obligations respecting patient records, particularly electronic records. In addition to reviewing HIPAA's privacy and security rules, the course will cover professional ethics regarding confidentiality, common law and state protections for confidentiality, GINA, and the HiTech Act.

LS 6183. Legal Perspectives of Healthcare Ethics. 3 Hours.

This course addresses the intersection of law, medicine and ethics. Laws are the codification of society's ethics in every area, including healthcare. Though the legal regulations may lag behind public opinion, healthcare policy is constantly changing to keep up with advances in healthcare practice. This course addresses the dynamic field of healthcare ethics and law.

LS 6184. Healthcare Compliance 1. 2 Hours.

This course is the first of a two-course series that explores the basics of healthcare compliance. This course focuses on the relationships between various participants in the healthcare system and the compliance concerns and programs that exist because of these relationships. At the end of the course students should be able to identify basic compliance issues, consult relevant sources of guidance on achieving compliance, and propose initial resolutions to compliance issues that appropriately weigh business goals and legal risks.

LS 6190. Introduction to Healthcare Compliance. 1 Hour.

This course introduces students to the compliance function in health-related settings. Through preparatory work and on-the-ground sessions with faculty, students will have an opportunity to learn about the health care industry and familiarize themselves with vocabulary and concepts that are commonly used in connection with compliance programs.

LS 6192. Healthcare Compliance 2. 2 Hours.

This course will provide students with insights into the evolution of healthcare compliance programs and lessons learned by regulators and compliance officers. The course materials will provide an in-depth review of industry best practices for each of the 7 elements of effective compliance programs and risk assessment. Additionally, it will help students build the confidence needed to establish and maintain a business culture of ethics and compliance within a healthcare environment. Students will complete practical research assignments providing them with experiences expected of compliance professionals.

LS 6193. Healthcare Compliance Capstone. 1 Hour.

In this course, students will have the opportunity to deepen their knowledge of healthcare compliance through online exercises, a capstone project, and in-person class sessions that will introduce students to individuals with significant experience in the compliance field.

LS 6210. Special Topics in Employee Rights and Employer Obligations. 3 Hours.

Examines the legal relationship between employer and employee. Addresses issues and topics such as discrimination, affirmative action, the Americans with Disabilities Act, sexual harassment, health and safety, AIDS in the workplace, compliance issues, and legal issues related to downsizing and terminations. Today's HR manager works in a highly complex environment with constantly changing laws and legislation that govern employee rights and employer obligations. Course content may vary from term to term.

LS 6211. Antidiscrimination Law. 3 Hours.

This course will provide an overview of antidiscrimination laws governing the workplace. The focus will be on discrimination based on race and sex, but some attention will also be given to discrimination based on other characteristics, including age, sexual orientation, and disability. In addition to general issues of discrimination, the course will focus on the specific topics of retaliation, harassment, and bullying in the workplace.

LS 6212. Wages and Benefits. 3 Hours.

This course will cover topics related to wage and hour laws (federal and state), ERISA (pensions), health insurance benefits, the Affordable Care Act, and disability insurance.

LS 6230. Intellectual Property Survey. 3 Hours.

In our modern day "information economy," the law of intellectual property (IP) has taken on enormous importance to both creators and users of creative works. Such IP Law is the way we provide legal protection to encourage invention and creativity by guaranteeing an opportunity for financial return to the originator of novel work. This course introduces students to the classic principles of copyright, patent, trademark, and trade secret law and explores the ways in which those principles are shifting and adapting in response to new technology.

LS 6231. Identifying and Securing Intellectual Property Rights. 3 Hours.

This course will focus on intellectual property issues in employment, collaborative environments, and business transactions. It will cover common issues for founders and startups, employers, and contractors—including non-compete agreements, crowd-sourcing, and open innovation practices.

LS 6232. Intellectual Property and Media. 3 Hours.

This course will cover copyrights, trademarks, and unfair competition, with a focus on media, advertising, user-generated content, and other online activities.

LS 6233. Special Topics in Legal Studies. 3 Hours.

Covers special topics in Legal Studies to fulfill student interest. May involve experiential learning and developing legal fields.

LS 6300. Experiential Network. 0 Hours.

This course offers the opportunity to apply what students have learned in the MLS program to a relevant project in the practice setting. Working with an outside sponsor, backed up by law school faculty, a student selects and refines an applied research topic, analyzes that topic, presents useful recommendations to the project sponsor, and creates a plan to implement those recommendations. Alongside this fieldwork, students will participate in an online course that provides a platform to develop, refine and practice key business communication skills, project and client management techniques, and analytic approaches. Each student receives feedback from both the project sponsor and course faculty, reviews "lessons learned," and employs that feedback to advance his or her career development goals and professional plan.

Liberal Studies - CPS (LST)

Search LST Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=LST>)

LST 4850. Capstone Project in Liberal Studies. 3 Hours.

Offers students an opportunity to complete an independent capstone research project, with faculty supervision and guidance, that addresses a research question in line with the student's curriculum plan.

LST 4950. Seminar. 1-4 Hours.

Offers an in-depth study of selected topics.

LST 4955. Project. 1-4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student's major field. May be repeated without limit.

LST 4983. Topics. 1-4 Hours.

Covers special topics in liberal studies. May be repeated without limit.

LST 4991. Research. 1-4 Hours.

Offers students an opportunity to conduct research under faculty supervision.

LST 4992. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic.

LST 4993. Independent Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic.

LST 4994. Internship. 1-4 Hours.

Provides students with an opportunity for internship work.

LST 4995. Practicum. 1-4 Hours.

Provides eligible students with an opportunity for practical experience.

LST 4996. Experiential Education Directed Study. 1-4 Hours.

Draws upon the student's approved experiential activity and integrates it with study in the academic major.

Linguistics (LING)

Search LING Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=LING>)

LING 1000. Linguistics at Northeastern. 1 Hour.

Introduces first-year linguistics majors to the discipline, the department, and the University as a whole; offers students an opportunity to familiarize themselves with the skills needed for success as a university student.

LING 1150. Introduction to Language and Linguistics. 4 Hours.

Introduces students to their tacit linguistic knowledge of word structure (morphology), sentence structure (syntax), meaning (semantics), and speech sounds (phonetics and phonology). This structural knowledge is the basis for exploring the social dimensions of language: geographic dialects (e.g., Boston speech), Black English (Ebonics), men's and women's language, as well as biological questions of nature vs. nurture, language acquisition, and animal communication.

LING 1449. English Now and Then. 4 Hours.

Introduces the linguistic study of the English language from current and historical perspectives. Topics include the Latin and Greek etymology of English words; the linguistics of modern English dialects; English as a global language; and the origins of English as a Germanic language, closely related to German and Dutch.

LING 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

LING 2350. Linguistic Analysis. 4 Hours.

Offers a workshop that focuses on the three core areas in the study of language: syntax, morphology, and phonology. Examines the regularities that lie inside each language user's mind, with a slant toward "doing" linguistics: playing with data, analyzing it, and ultimately explaining it.

LING 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

LING 3150. Field Linguistics. 4 Hours.

Exposes students to the basic techniques of field methods with the goal of reinforcing the fundamental skills used in linguistic analysis. Through readings, discussions, and practical experience, students explore best practices in conducting linguistic field work: working with a native speaker consultant, eliciting linguistic structures, managing data effectively, analyzing the data collected, and presenting findings formally.

LING 3412. Language and Culture. 4 Hours.

Explores the complex, often inexplicit relationship between language and culture, using a variety of methods drawn from the fields of anthropological linguistics and sociolinguistics. Questions may include: How do language and thought interact? How is language used to create and maintain social institutions and individual personae? How is language used differently by and across gender, ethnicity, and social class?.

LING 3420. Phonetics. 4 Hours.

Surveys phonetics, the study of speech sounds, including articulatory, acoustic, and auditory phonetics. Articulatory phonetics topics include anatomy and physiology; cross-linguistic consonant and vowel articulation; aerodynamics of speech production; coarticulation phenomena; and phonetics of supersegmentals such as syllables, stress, tone, and pitch accent. Acoustic phonetics topics include the physics of sound waves, reading spectrograms, and performing acoustic analyses. Auditory phonetics topics include audition and speech perception.

LING 3422. Phonology. 4 Hours.

Examines phonology, the study of the mental representation, organization, and patterning of sounds in human language. Major topics include phonological typology, phonemes, underlying and surface representations, phonological rules and alternations, natural classes of sounds, syllables and prosody, autosegmental phonology, rule-based vs. constraint-based approaches, morphophonology, diachronic phonology, and current theoretic models of sound systems.

LING 3424. Morphology. 4 Hours.

Introduces morphology, the study of the structure, distributional behavior, and use of words. Covers descriptive methods of analysis, hierarchical word structure, morphological processes and rules, productivity, morphological change, and the interaction of morphology with phonology and syntax. Introduces major contemporary theories, including split morphology and single-component architecture.

LING 3434. Bilingualism. 4 Hours.

Focuses on the fact that half of the world's population is bilingual, that is, uses two or more languages on a regular basis. Also explores the fact that bilingualism remains a poorly understood phenomenon surrounded by a number of myths: those that hold that bilinguals are found in bilingual countries and are equally fluent in both languages; that bilingual children suffer from cognitive impoverishment; and that bilingual education hinders the assimilation of minority groups. Reviews all aspects of bilingualism (in the world, in society, in the child, and in the adult). Discusses topics such as biculturalism and language change.

LING 3442. Sociolinguistics. 4 Hours.

Focuses on why people choose to say things in different ways in different situations. Examines language behavior in its social context and outlines the linguistic constructs that allow conversation to occur, the types of variation that can occur in registers and dialects, and the possible reasons for choosing different linguistic varieties. Also explores linguistic variation in relation to social context, gender, socioeconomic class, race, and ethnicity.

LING 3450. Syntax. 4 Hours.

Introduces syntax, the theory of sentence structure. Explores how to do syntactic analysis using linguistic evidence and argumentation. Focuses primarily on English, with some discussion on the syntax of other languages. Other topics include syntactic universals and the relation between syntax and semantics. Students who do not meet course prerequisites may seek permission of instructor.

LING 3452. Semantics. 4 Hours.

Focuses on meaning and how it is expressed in language—through words, sentence structure, intonation, stress patterns, and speech acts. Considers how content, logic, and speakers' and listeners' assumptions affect what sentences can mean and how linguistic meaning is determined by one's perceptual system or culture. Requires completion of the mathematical/analytical thinking level-1 requirement of the NU Core.

LING 3454. History of English. 4 Hours.

Surveys the linguistic and social history of the English language from its Indo-European beginnings to the present. Examines the changes that have occurred in the sound system, word and sentence structures, vocabulary, semantics, and spelling from a formal linguistic perspective. Considers issues in language change—the influence of foreign invasion and migration, differences in dialect, and the emergence of English as a "world" language.

LING 3456. Language and Gender. 4 Hours.

Investigates the relationship between language and gender. Topics include how men and women talk; the significant differences and similarities in how they talk, why men and women talk in these ways, and social biases in the structure of language itself.

LING 3458. Topics in Linguistics. 4 Hours.

Focuses on one of a range of topics from the perspective of current linguistics, such as American dialectics, contemporary syntactic theory, language and law, women's and men's language, words and word structures, or issues in linguistics and literature. May be repeated without limit.

LING 3460. Historical Linguistics. 4 Hours.

Introduces diachronic linguistics, the study of language change over time. Surveys common changes in the areas of sound systems, word and sentence structure, and semantic meaning. Introduces methodologies to access earlier stages of language, including the comparative method and internal reconstruction. Other topics include linguistic borrowing, analogical change, linguistic paleontology, and areal diffusion.

LING 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

LING 4654. Seminar in Linguistics. 4 Hours.

Explores a topic in current linguistics research. Requires prior completion of either two 3000-level LING courses or one 3000-level LING course and permission of instructor. May be repeated without limit.

LING 4891. Research Seminar in Linguistics. 4 Hours.

Offers individualized research experience on a chosen topic under the direction of a faculty member. Also includes group meetings of students and the faculty member to study relevant research methods, to discuss relevant research literature, and to present research progress and results. Research content and requisites depend on the instructor, and prior arrangements should be made with the faculty member well in advance of registration. May be repeated up to eight times.

LING 4970. Junior/Senior Honors Project 1. 4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student's major field. Combined with Junior/Senior Project 2 or college-defined equivalent for 8-credit honors project. May be repeated without limit.

LING 4971. Junior/Senior Honors Project 2. 4 Hours.

Focuses on second semester of in-depth project in which a student conducts research or produces a product related to the student's major field. May be repeated without limit.

LING 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

LING 4991. Directed Study Research. 4 Hours.

Offers individualized research experience on a chosen topic under the direction of a faculty member. Research content and requisites depend on the instructor, and prior arrangements should be made with the faculty member well in advance of registration.

LING 4993. Independent Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

LING 4996. Experiential Education Directed Study. 4 Hours.

Draws upon the student's approved experiential activity and integrates it with study in the academic major. Fulfills the college's experiential education requirement. May be repeated without limit.

LING 5100. Introduction to Linguistics. 4 Hours.

Introduces the structural areas central to the study of human language: phonetics (speech sounds); phonology (sound systems); morphology (word structure); syntax (sentence structure); semantics (meaning); and pragmatics (the study of meaning in discourse).

Management (MGMT)

Search MGMT Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=MGMT>)

MGMT 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MGMT 2115. Nonprofit Leadership and Social Innovation. 4 Hours.

Designed to help students understand how nonprofits exercise leadership in society and how to exercise leadership in nonprofits while participating in a Dialogue of Civilizations experience in Cochabamba, Bolivia. Explores theory, policy, management, and the social innovation of nonprofit organizations through the lens of leadership.

MGMT 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MGMT 3302. Negotiating in Business. 4 Hours.

Focuses on the nature of conflict, conflict resolution, and the structure and process of negotiations, negotiation ethics, as well as skills to deal with "difficult" negotiators. Negotiation is a lifelong skill that we use every day, not just a tactic to get a higher salary or a better deal. No matter what direction one's professional life takes, negotiation is an essential part of one's job and one's life. To be effective, one must be a skillful negotiator. While some of us are naturally gifted negotiators, most of us are not; the concepts and techniques of skillful negotiations can be learned and practiced in the classroom. Offers students numerous opportunities to develop and practice negotiating skills.

MGMT 3315. Managing Organizational Change and Disruption. 4 Hours.

Covers fundamentals of change leadership as a set of integrated skills, focusing on examples of both proactive change (leveraging opportunities to grow and improve), as well as reactive change (leading in times of crisis). Uses case studies, media coverage, simulations, and guest speakers to examine some of the most dramatic changes encountered by business leaders in recent times and to evaluate different approaches to managing change at all levels of the organization. Examines the psychology of change, including overcoming fear of and resistance to change, and introduces practical frameworks that students can leverage in their own change efforts. Requires a student-led change project.

MGMT 3340. Healthcare Management, Innovation, and Design. 4 Hours.

Offers an overview of key U.S. health system components and imperatives and how to manage and innovate within the system to improve performance and the customer experience. Designed for students interested in healthcare careers that may have meaningful managerial, analytical, or consulting-type responsibilities. Covers essential elements of how healthcare delivery is organized and delivered; how to implement change and innovation in healthcare organizations such as hospitals and physician offices; and the interrelationships between facets of the business such as the drive for value and efficiency, promoting high-quality care, and enhancing the patient experience. Analyzes and critiques cutting-edge changes in the industry. Offers students an opportunity to learn about and use skills in process improvement, performance management, talent management, quality improvement, and work redesign.

MGMT 3350. Managing a Diverse Workforce. 4 Hours.

Examines issues related to managing oneself and others in an increasingly diverse workforce. Organizations need to address diversity issues in some manner if they are to compete effectively in a global economy. Covers diversity-related issues with management implications including religion, social identity, socialization, employment decisions by applicants and organizations, team dynamics, leadership, sexual harassment, workplace romance, career development, work and family, accommodation of people with disabilities, and organizational strategies for promoting equal opportunity and a multicultural approach toward diversity. Offers students an opportunity to conduct self-assessments to monitor their own workforce needs as they relate to issues of diversity, careers, and work-life integration.

MGMT 3360. Law and the Legal Process. 4 Hours.

Introduces U.S. laws and legal system, with a focus on the legal rights of individuals and business organizations and the legal obligations they each owe to others. Considers the role of the legal system in making and enforcing laws and resolving disputes. Uses exercises, team projects, and presentations to offer students an opportunity to identify and gain understanding of the particular legal environment for different activities and situations. Explores the impact of the legal environment on the internet; employment; innovation; and relationships with sellers, customers, and competitors. Includes consideration of contract, intellectual property, negligence, incorporation, and criminal and agency laws.

MGMT 3380. Leading with Character. 4 Hours.

Designed to help develop students' leadership skills and prepare themselves to lead with integrity. Uses discussion, case studies, exercises, and video/audio to explore both the science and the art of leadership. Topics include leadership theories, power and politics, counseling, communication, and followership. Additionally, this class includes a heavy focus on ethical philosophy and its application to leadership.

MGMT 3420. Managing Human Capital. 4 Hours.

Offers an overview of the human resources management (HRM) function, including recruiting and hiring new employees, overseeing compensation and benefits, improving employee relations, and ensuring compliance with labor laws. Focuses on what a (non-HRM) manager needs to know about HRM and also seeks to provide a foundation for the HRM professional.

MGMT 3520. Consulting Fundamentals and Frameworks. 4 Hours.

Introduces students to a framework of consulting and to the core managerial skills that are useful in all consultative roles, not only as a consultant. Content includes design of a basic consulting engagement and template for use in future business or consulting ventures. Offers students an opportunity to learn critical and analytical thinking, how to challenge assumptions in an ongoing business, how to gain and exercise influence within both consulting firms and clients, as well as the business rationale for consulting (from a client company perspective).

MGMT 3530. Project Management. 4 Hours.

Discusses why good project management skills are essential to a wide variety of business careers. Covers why many important business projects fail due to poor planning, poor time management, going over budget, and/or ineffective communication. Includes a balance of strategic, technical, and behavioral issues in project management.

MGMT 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MGMT 4310. The Management Practices of Great Organizations. 4 Hours.

Focuses on a wide range of management practices, many of which are "radical" and represent organizations that "dare to be different." The course uses many teaching approaches, including case studies, class exercises, and "competitions" that require students—and seek to increase their ability—to debate, present, think on their feet, and ask tough questions. Some organizations seem "to work"; they provide high-quality products and services, they treat their employees with respect, they behave ethically, they are strong financially, and the like. Students study and debate the criteria for a great organization in order to answer the key question of this course: how do they do it; i.e., why do they work so well?.

MGMT 4410. Workforce Analytics. 4 Hours.

Introduces workforce analytics, including identifying the strategic work that is truly necessary to execute strategy, investing in differentiated management systems that support that work, and designing and implementing targeted measurement systems for strategic talent. Emphasizes shifting from levels or metrics (e.g., what is our cost per hire?) to analytics and impact (e.g., how might an increase in the quality of our project managers affect new product cycle time?). Relevant for students specializing in corporate finance, management, marketing, and international business. Many firms spend over 50 percent of their revenues on the workforce, but these investments are rarely well measured or managed.

MGMT 4550. Management Consulting in Organizations. 4 Hours.

Offers students an opportunity to gain practical experience in finding appropriate solutions for complex and dynamic client organizational issues using a structured curriculum and frequent in-class coaching sessions. Students work as pro bono consultants both onsite and virtually with organizations to help solve real client challenges in the managing and leading of an organization. Students employ management consulting as a framework in demonstrating proficiency in a wide range of knowledge and skill areas in both management and consulting. Structures course deliverables as challenging goals to be achieved within a set time frame by working with students' chosen consulting (Pod) group and through individual assignments.

MGMT 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MGMT 4993. Independent Study. 1-4 Hours.

Allows students who have received approval to undertake independent study in lieu of any course required in the various concentrations. Students present proposals to an Independent Studies Committee for evaluation and approval. Every proposal requires a detailed outline of the objectives and plan of study and must be accompanied by a supporting statement from the supervising faculty member under whose direction the study takes place. A copy of the final report prepared by the student is presented to the appropriate Independent Studies Committee. Further information about the Independent Studies Program can be obtained from concentration coordinators. May be repeated without limit.

MGMT 6210. Law for Managers and Entrepreneurs. 3 Hours.

Covers the legal environment in which businesses operate and its impact on businesses and their transactions. Exposes students to a variety of legal concepts and topics, such as corporations and other legal entities; contract law, mergers and acquisitions, e-commerce, and other types of business transactions; intellectual property; compliance with securities, consumer products, and other regulations; debtor-creditor relations, employment, and agency law; torts and strict liability; and the international legal environment. Addresses the complementary application of legal, financial, business, and ethical analysis to business management and decision making. Offers students an opportunity to sharpen their analytical and critical thinking skills, to develop a manager's understanding of laws and the legal system, and to use those skills and understanding to create opportunities for adding value and managing risk.

MGMT 6211. Business Law and Professional Ethics. 3 Hours.

Examines the critical aspects of business essential in understanding the business and legal environment. Examines contract law and areas of the law that relate directly to the accountancy profession. Develops knowledge of the Uniform Commercial Code as it relates to the law of sales, commercial paper, and secured transactions. Also explores the importance of ethics in the business and accounting environment, and considers potential ethical dilemmas.

MGMT 6213. Managing Ethics in the Workplace and Marketplace. 2 Hours.

Seeks to stimulate creative individual and group thinking and learning for working professionals while offering practical guidance for improved decision making in both common and novel ethical business situations. Recent and historical executive and managerial criminal conduct and ethical lapses have destroyed careers and shareholder value in addition to severely eroding employee and public trust. Uses a series of case studies, readings, and field study experiences to actively engage students in a timely, relevant, and challenging fashion.

MGMT 6214. Negotiations. 2,3 Hours.

Designed to improve students' understanding of the negotiations process and their ability to plan and conduct negotiations effectively. Includes such class activities as readings, lectures, and discussions as well as case discussions and role-playing negotiation exercises.

MGMT 6216. The Chief Executive Officer. 3 Hours.

Explores the CEO's job and role in a business organization. Offers presentations by and discussions with chief executive officers of major corporations in the Greater Boston area. Cases and readings also help address the job requirements, problems, and opportunities facing top management.

MGMT 6222. Healthcare Industry. 3 Hours.

Examines the evolution of the U.S. healthcare delivery system from early forms of organized institutional care through the current dynamic and increasingly integrated and managed care systems. Introduces students to the interactions of regulatory, economic, political, and social aspects of the healthcare system. Compares current policies and proposals for health reform. Students are asked to analyze the impact and consequences of actions in one era on the structure and function of healthcare practice in later years and to project these trends into the future.

MGMT 6223. Strategic Decision Making for Healthcare Professionals. 3 Hours.

Examines how healthcare organizations manage their resources and competitive environment to meet the goals of their many stakeholders. Applies three essential elements of strategic decision making—environmental analysis, strategic formulation, and strategy implementation—to the healthcare industry.

MGMT 6225. Sustainability and Leadership. 3 Hours.

Examines how organizational leaders influence decisions to advance an environmental agenda. Studies the scientific knowledge that organizational leaders must have to make effective sustainability decisions. Analyzes how a variety of organizations, including businesses, governments, government-sponsored enterprises, and nongovernment organizations, interact on environmental issues.

MGMT 6226. Sustainability and the Business Environment. 3 Hours.

Examines how the environment affects corporate strategy, public policy, and individual decision making. Exposes students to the skills and knowledge needed to help organizations understand and act upon the principles of sustainability. Examines a variety of environmental problems, including global warming, use and disposal of toxic substances, and depletion of natural resources. Also studies how companies solve these problems by reducing their impact on the environment through solutions such as zero emissions, green design, and corporate environmental reporting.

MGMT 6233. Introduction to Business Analytics. 3 Hours.

Introduces the key concepts of data science and data analytics as applied to solving data-centered business problems. Emphasizes principles and methods covering the process from envisioning the problem to applying data science techniques to deploying the results to improve financial performance, strategic management, and operational efficiency. Topics include an introduction to data-analytic thinking; application of data science solutions to business problems; data mining, supervised and unsupervised machine learning; methods for the detection of co-occurrences and associations; and achieving and sustaining competitive advantage with data science. Presents the application of these disciplines in the areas of marketing, supply chain management, finance, sales, and innovation.

MGMT 6280. Innovation for Next-Generation Products and Systems. 3 Hours.

Focuses on next-generation products, systems, and services with an integrated framework that applies market innovation, user-centered design, architectural and platform innovation, and business model innovation. Offers students an opportunity to apply these concepts to new product/service/business process innovation opportunities in their own organization with executive sponsorship and faculty guidance.

MGMT 6283. Business Law, Corporate Governance, and Intellectual Property Strategies. 3 Hours.

Covers the fundamentals for business law and contracts, structures and processes for corporate governance, and approaches to risk mitigation. Explores the development, protection, and management of intellectual property across a variety of industry sectors and how such protections work or do not work in emerging markets. Exposes students to the intersection of law, business, and innovation.

MGMT 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

Management - CPS (MGT)

Search MGT Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=MGT>)

MGT 1100. Introduction to Business. 3 Hours.

Offers students an opportunity to develop a business vocabulary, refine business decision-making skills, and foster critical and analytical thinking. Examines key external factors that influence business development, namely political, economic, legal, social, and technological forces. Explores the internal organization of business, analyzing major issues associated with the key management functions of marketing, strategy, finance, accounting, information systems, and operations.

MGT 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MGT 2100. Principles of Management. 3 Hours.

Examines historical changes in workforce composition and the many effects of globalization, technological change, and new workforce arrangements. Offers students an opportunity to apply critical thinking to topics related to the managerial tasks of planning, organizing, leading, and controlling. Emphasizes discussions on diversity in organizations, social responsibility, managerial ethics, and the impact of globalization.

MGT 2210. Information within the Enterprise. 3 Hours.

Addresses the central role of information management (IM) and information technology (IT) systems in running and managing a business and in infusing it with competitive advantage. Business leaders must have ready access to timely, accurate, and relevant information if they are to manage and compete effectively in the global economy. Explores how a wide range of enterprises around the world employ IM to operate, to manage and control, and to plan and innovate. Focuses on real business issues, analysis and problem solving, and out-of-the-box thinking in creating value to the enterprise by effectively applying IM and IT. Rather than focusing on specific technical content or skills, this course is entirely case driven.

MGT 2220. Supply Chain Management. 3 Hours.

Explores the basic concepts of managing a supply chain that produces goods and/or services. Offers students an opportunity to examine the fundamental functions and processes of a fully integrated supply chain, identify the key business and economic drivers of supply chain performance, and understand the strategic decisions that enable a supply chain to directly support business objectives. Topics include basic functions within a supply chain—planning, sourcing, forecasting and demand planning, manufacturing, inventory management, logistics, just-in-time (JIT), lean, Six Sigma, outsourcing, and sustainability.

MGT 2310. Organizational Behavior. 3 Hours.

Studies psychological, sociological, and organizational theories and principles underlying interpersonal communication in the organization. Through written analysis of case studies and role-playing, offers students an opportunity to analyze the impact of varying organizational decisions and dynamics on employee and management behavior. Discusses how embracing human differences and implementing diversity initiatives contribute to both organizational performance and the advancement of the society as a whole.

MGT 2330. Business Law. 3 Hours.

Introduces the foundations and principles of American legal jurisprudence and aspects of the legal environment that impact business executives. Begins with an overview of the court system, litigation, and the U.S. Constitution. Emphasizes the roles of contract law, tort law, criminal law, and property rights in business. Focuses on the legal organization and operation of business entities such as corporations, limited liability companies, and partnerships, including corporate governance models, board of director liability, shareholder conflicts, proxy contests, and stakeholder rights. Special topics affecting business include intellectual property, employment laws, discrimination in the workplace, international law, and securities regulations.

MGT 2550. Sustainable Entrepreneurship. 3 Hours.

Seeks to help students assess the organizational benefits and the social implications of developing sustainable business models, starting from a definition of what a social enterprise is and how it differs from other types of business. Covers recent theories and frameworks on social and sustainable entrepreneurship, exploring best practices and case studies of purpose-driven companies. Offers students an opportunity to apply entrepreneurial business principles to provide social benefits in areas such as the environment, workforce development, education, health, community, and international development. Students develop a sustainable business idea by identifying challenges and opportunities and applying ethical reasoning needed to make business safer, fairer, and more positively impactful.

MGT 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MGT 3220. International Business. 3 Hours.

Focuses on the principles and practices of international business, comparing domestic and international activities and managerial responsibilities. Examines the major facets of the international management environment (legal, political, economic, and cultural). Explores international strategies by assessing the main factors determining success and failure of international companies. Offers students an opportunity to describe and compare domestic and international management operations and issues such as managing a multicultural workforce, designing and executing global marketing strategies, designing global products and services, and managing global R&D.

MGT 3451. Purchasing. 3 Hours.

Addresses the strategic and operational role of purchasing and its impact on the supply chain. Topics include organization of the function, procedures, supplier selection, negotiation, buyer-supplier relationships, quantity, quality, and cost/price considerations for the purchase of goods and services.

MGT 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MGT 4210. Project Management. 3 Hours.

Focuses both on the analytical tools to manage projects as well as the people-management tools necessary for project success. Examines the entire process of implementing a project, from project definition to the evaluation of feasibility, scheduling, quality criteria, and financial and budgetary factors. Offers students an opportunity to apply contemporary management techniques based on Project Management Institute (PMI) current practices and to become familiar with current software options.

MGT 4220. Innovation and Change Management. 3 Hours.

Offers students an opportunity to discuss and apply principles, tools, and methods to successfully implement change and innovation within organizations. The use of multiple perspectives to assess organizational performance seeks to ensure that students are not trapped by a “one-best-way” approach to change management. Discusses strategies to design, implement, communicate, and sustain change; techniques for mapping and assessing when and where change is needed in an organization; organizational development techniques; as well as barriers and enablers to fostering an environment conducive to change and innovation.

MGT 4230. New Venture Creation. 3 Hours.

Examines the theory and practice of developing and managing innovations in startups and in already established firms. Offers students an opportunity to apply frameworks, strategies, business models, idea-generation techniques, and funding methods for introducing new products and services. Examines such topics as the creative process, the formulation of a business plan, and the execution of the plan itself.

MGT 4850. Business Strategy. 3,4 Hours.

Examines how companies in different industries choose goals and strategically position themselves in the business environment. Examines the total management process from planning to execution. Offers students an opportunity to critically reflect about issues, including long-term planning, corporate social responsibility, diversification, and building dynamic capabilities through the application of strategic frameworks. As a capstone course, it relies on and combines skills from several business disciplines—marketing, finance and accounting, organizational behavior, operations, and management information systems.

MGT 4955. Project. 1-4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student's major field. May be repeated without limit.

MGT 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MGT 4995. Experiential Management Practicum. 3 Hours.

Offers students an opportunity to test-drive a potential career, acquire marketable skills, and practice typical obligations of the professional work environment. Students apply knowledge and skills gained through their management degree program to work on challenging short-term projects under faculty supervision. Students are matched with discipline-specific consulting projects provided by a wide range of sponsoring organizations in the private and nonprofit sectors. Examples of projects include developing a project plan, conducting market research, and developing and delivering managerial recommendations to sponsoring organizations. Requires an application process through the experiential network platform.

Management Information Systems (MISM)

Search MISM Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=MISM>)

MISM 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MISM 2301. Management Information Systems. 4 Hours.

Explores how a wide range of enterprises around the world use information and information technology to create better-managed, more innovative, and successful organizations. The twenty-first-century enterprise runs on information, and every part of the business has been transformed by the use of information technology. Today's business leaders, therefore, must have ready access to timely, accurate, and relevant information to manage effectively in the global economy.

MISM 2309. Management Information Systems. 4 Hours.

Does not count as credit for business majors. Counts as MISM 2301 for business minors only.

MISM 2510. Fundamentals of Information Analytics. 4 Hours.

Focuses on information analytics concepts and techniques needed by educated information analysts, designers, and consumers to lead organizations in the contemporary information age. Includes concepts, techniques, methods, and strategies for the entire information life cycle—collection, organization, exploration, analysis, manipulation, visualization, interpretation, and presentation of information for business. Each of these topics is introduced with real-world examples and data sets, grounded in relevant theory and principles, and is reinforced using various user-friendly software tools to gain the necessary analytical skills and knowledge.

MISM 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MISM 3305. Information Resource Management. 4 Hours.

Examines how information technology is used to support the functional areas of business (finance, accounting, marketing, manufacturing, and human resource management) to achieve business results (creating new products and services, redesigning business operations, and altering relations with customers and suppliers to achieve competitive advantage). Offers students an opportunity to understand the business issues involved in investing in new technologies.

MISM 3403. Data Management in the Enterprise. 4 Hours.

Offers students an introduction to and overview of the methodological frameworks and tool sets for the design, development, and implementation of data-management solutions. Today, almost no aspect of business operates without a strong reliance on the flow of information. Even small enterprises track huge volumes of data, from sales transactions and supply chain activities to Web site traffic. Knowledge workers and managers at all levels within the organization require an understanding of data management, database design and operations, and associated decision-support and data-analysis tools and systems to complete even day-to-day tasks. Offers students an opportunity to work hands-on, applying these methods and tools to solve actual business problems.

MISM 3404. Data Communications. 4 Hours.

Introduces data communications concepts and terminology, network design and architecture, distributed information systems, and security within a business systems environment. The modern enterprise relies on being able to get information to where it is needed quickly, accurately, and securely. From the instantaneous global reach of the Internet, to mobile wireless devices, to multimedia communication, innovations in data communication have directly changed the way business is done today. Explores key emerging technologies such as Web services and Web 2.0, service-oriented architecture, wireless and mobile communication, and multimedia networking.

MISM 3501. Information Visualization for Business. 4 Hours.

Introduces the use of design, interaction, and visualization techniques and strategies to support the effective presentation and manipulation of business information. Based on principles from art, design, psychology, and information science, offers students opportunities to learn how to successfully choose appropriate methods of representing various kinds of business data to support analysis, decision making, and communication to organizational stakeholders.

MISM 3515. Data Mining for Business. 4 Hours.

Covers key concepts, techniques, methods, and applications of data mining in the context of business. Offers students opportunities to learn how to distill key insights from a large amount of unknown data, which techniques to choose from, how to apply the techniques and methods to get the answer and insights from the data, and how to interpret the results from the analysis. Example predictive analysis techniques include market basket analysis and principle component analysis. Covers all techniques using business examples and user-friendly tools.

MISM 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MISM 4501. Business Systems Integration. 4 Hours.

Examines significant improvements to business performance, which can be achieved through sharing information within the enterprise and with customers and suppliers. Realizing the full business benefits of shared information requires changing processes and organizational structures. This team- and project-based course offers students an opportunity to design and implement these strategies and to examine significant improvements to business performance.

MISM 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MISM 4993. Independent Study. 1-4 Hours.

Allows students who have received approval to undertake independent study in lieu of any course required in the various concentrations. Students present proposals to an Independent Studies Committee for evaluation and approval. Every proposal requires a detailed outline of the objectives and plan of study and must be accompanied by a supporting statement from the supervising faculty member under whose direction the study takes place. A copy of the final report prepared by the student is presented to the appropriate Independent Studies Committee. Further information about the Independent Studies Program can be obtained from concentration coordinators. May be repeated without limit.

MISM 6200. Introduction to Business Analytics. 3 Hours.

Provides a comprehensive approach to understanding how business analytics enable companies to become more competitive. Offers students an opportunity to learn how to apply value chain analysis and other strategic perspectives to determine how business analytics can be integrated effectively into a firm's operations. Interactive activities such as simulations and case studies allow students to explore how insights from data can improve business decisions. Examines real-world examples of how companies have used business analytics perspectives and tools to enhance different types of business processes, such as inventory prediction, customer service quality, and resolution of ethical dilemmas.

MISM 6202. Foundations of Data Analysis for Business. 3 Hours.

Covers basic principles and techniques of descriptive and predictive analytics. What are the essential data analysis concepts underlying business analytics? Topics include descriptive statistics, data visualization, probability and modeling uncertainty, sampling, estimation and confidence intervals, hypothesis testing, analysis of variance, simple and multiple regression analysis, time-series analysis, and forecasting. Emphasizes an understanding of how these tools can support decision making and analytics initiatives in a business context with real-world examples and case studies. Uses various software packages for analyzing data sets and creating visualizations.

MISM 6203. Business Analytics Methods. 3 Hours.

Introduces key analytics methods for using data through the perspectives of applied statistics and operations analysis. Covers application of these methods to business areas including marketing, supply chain management, and finance. Topics include business-analytic thinking; application of business analytics solutions to business problems; data mining, supervised and unsupervised machine learning; methods for detecting co-occurrences and associations; and achieving and sustaining competitive advantage by using business analytics methods.

MISM 6210. Information Visuals and Dashboards for Business. 3 Hours.

Introduces design principles for creating meaningful displays of information to support effective business decision making. Studies how to collect and process data; create interactive visualizations; and use them to demonstrate or provide insight into a problem, situation, or phenomenon. Introduces methods to critique visualizations along with ways to identify design principles that make good visualizations effective. Discusses the challenges of making data understandable across a wide range of audiences. Provides an overview of data visualization, key design principles and techniques for visualizing data, and the fundamentals of communication that are required for effective data presentation. Other topics may include ethical uses of information displays, storytelling, infographics, immersive visualizations, and information dashboard design. Offers students an opportunity to use one or more software tools.

MISM 6212. Data Mining and Machine Learning for Business. 3 Hours.

Examines data mining perspectives and methods in a business context. Introduces the theoretical foundations for major data mining methods and studies how to select and use the appropriate data mining method and the major advantages for each. Students use contemporary data mining software applications and practice basic programming skills. Focuses on solving real-world problems, which require data cleaning, data transformation, and data modeling.

MISM 6213. Business Information Design, Quality, and Strategy. 3 Hours.

Covers the leading data practices from early adopters, focusing on innovative information design, data quality, data sharing, and data integration perspectives and methods for managing data and business analytics. Explores how data analytics and management can be strategically implemented to transform a company. Discusses theories and contemporary industry practice, and real-world data and cases are used for discussion and projects. Offers students an opportunity to prepare for problem identification and solution perspectives of data-related projects, gearing up for MISM 6214.

MISM 6214. Business Analytics Capstone. 3 Hours.

Offers students an opportunity to engage in a real-world project that engages all concepts and methods covered over the course of the business analytics program. Students apply the business analytics knowledge they have gained to collect, visualize, analyze, and manage data from a real company (or companies). Based on their results, students present a proposal for strategic actions to be taken by the company with a viable scope. The project is reviewed by peers, faculty, and external judges from industry.

Management Information Systems - CPS (MIS)

Search MIS Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=MIS>)

MIS 6080. Network Security Concepts. 3 Hours.

Focuses on security concepts, issues, terms and definitions, as well as the strategic value of being secured. Key topics include planning for network security, security and network protocols, end-user and administrator training, and securing existing networks. Addresses management issues related to network security, including the ethical considerations that arise from decisions regarding access, reporting, monitoring, and use.

MIS 6082. Network Protection. 3 Hours.

Examines the technical methods used to ensure that information using wired and wireless media reaches only those for whom it was intended. Covers the technical tools to protect information from external compromise. Explores load balancing, wireless access, Web security issues, and network intrusion detection. Offers students an opportunity to develop a detailed understanding of authentication, firewall configuration, and rule sets and to learn to address and prevent security issues related to intranets, extranets, enterprise networks, and the Internet.

MIS 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

Management Science (MGSC)

Search MGSC Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=MGSC>)

MGSC 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MGSC 2301. Business Statistics. 4 Hours.

Offers students an opportunity to obtain the necessary skills to collect, summarize, analyze, and interpret business-related data. Covers descriptive statistics, sampling and sampling distributions, statistical inference, relationships between variables, formulating and testing hypotheses, and regression analysis in the context of business. Use of the SPSS statistical programming package is an integral part of the course.

MGSC 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MGSC 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MGSC 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MGSC 4993. Independent Study. 1-4 Hours.

Allows students who have received approval to undertake independent study in lieu of any course required in the various concentrations. Students present proposals to an Independent Studies Committee for evaluation and approval. Every proposal requires a detailed outline of the objectives and plan of study and must be accompanied by a supporting statement from the supervising faculty member under whose direction the study takes place. A copy of the final report prepared by the student is presented to the appropriate Independent Studies Committee. Further information about the Independent Studies Program can be obtained from concentration coordinators. May be repeated without limit.

MGSC 6200. Information Analysis. 3 Hours.

Provides students with basic information analysis skills and tools needed to manage effectively in today's information-intensive business climate. Exposes students to analytical problems from different areas of business and the quantitative concepts and techniques that can analyze them. Course objectives are to improve the information analysis skills of the students, to provide students with a working knowledge of important statistical tools, to help students become more critical evaluators of studies and reports involving statistical and quantitative methods, and to improve skills in communicating the results of analyses. Offers students the opportunity to learn how to evaluate, analyze, and interpret data, and present their findings and conclusions that will be most useful for managerial decision making through the use of business applications and analytical software.

MGSC 6201. Information Systems and Technology. 3 Hours.

Provides students with a fundamental understanding of the impact of technology on the organization and its financial systems. In particular, students are exposed to the new business models that technology enables and the control issues that these business models create. Discusses emerging technologies, digital business, supply chain, customer relationship management, and other technology subjects. Requires admission to MS/MBA program.

MGSC 6202. Introduction to Data Analytics for Accounting. 3 Hours.

Provides an overview of data collection, organization, analysis, interpretation, and presentation techniques used by contemporary organizations. Introduces statistical analysis to understand relationships in data sets and to assist in decision making. Students use Excel and visualization software tools to collect, prepare, manage, analyze, evaluate, understand, critique, visualize, and present data sets of various types. Businesses run on data, and financial professionals need to understand how to properly use and interpret data to support their roles as auditors, financial managers, and general managers.

MGSC 6204. Managing Information Resources. 1.5 Hour.

Focuses on issues of the strategic uses of information technology for competitive advantage, support of business processes, information and control, digital business, integration of business with technology, organizational communication, and data management. Information has become a key resource in doing business. Managers must understand that high-quality information adds value to existing products and services, enhances the creation of new products, changes the efficiency and effectiveness of business processes, and affects relationships with customers, suppliers, and competitors.

MGSC 6205. Management of Information Resources. 2 Hours.

Examines information and its role as a key resource in business. Today's managers must understand that well-managed information can add value to facilitate the creation and revision of new products and services; promote the efficiency and effectiveness of business processes of the global extended enterprise; and transform the relationships with customers, suppliers, and competitors. Covers topics including the strategic uses of information and information technology; the role of information for transforming business processes; e-commerce; and the alignment of business processes, technology, and information.

MGSC 6207. Data Analysis for Decision Making. 2 Hours.

Covers basic statistical skills in using methods of data analysis. Seeks to improve analytical skills of the students, to develop knowledge and appreciation for models and other technical tools, and to prepare students to be effective communicators of their analyses and findings to management. Uses business applications and computer software to teach students how to evaluate, analyze, and interpret data and models and present their findings and conclusions to assist in rational decision making. Topics include statistical sampling, estimation, testing hypotheses, and basic regression models.

MGSC 6209. Business Statistics. 3 Hours.

Offers an introductory course in business statistics. Seeks to provide students with the opportunity to learn the most common statistical and analytical tools used in business decision making and to develop skills that enable them to recognize business problems and which statistical methods can be used most effectively given the problem.

MGSC 6221. Introduction to Health Informatics and Health Information Systems. 3 Hours.

Introduces the history and current status of information systems in healthcare: information architectures, administrative and clinical applications, evidence-based medicine, information retrieval, decision support systems, security and confidentiality, bioinformatics, information system cycles, the electronic health record, key health information systems and standards, and medical devices.

MGSC 6281. Service Innovation and Management. 3 Hours.

Examines innovation in services and the internal management of business processes. Uses a framework of service/process redesign. Emphasizes strategic initiatives and key organizational change elements critical for improving services to customers; increasing profitability; and building long-term customer loyalty across multiple industry sectors, including information technology, healthcare, financial services, and government. Introduces the various strategic aspects of process improvement in the delivery of services, including managing change and the resulting impact on the organization, supply-chain management in the service industry, process improvement, overcoming organizational resistance, customer involvement, empowerment, and the role of leadership in managing operations. Through guided project work, offers students an opportunity to apply these concepts to services and internal business processes at their own organizations.

MGSC 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MGSC 7976. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on chosen topics. May be repeated without limit.

Management Science - CPS Specialty (MNSC)

Search MNSC Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=MNSC>)

MNSC 1201. Business Statistics. 4 Hours.

Provides students with the necessary skills to collect, summarize, analyze, and interpret business-related data. Covers the basic language and concepts of statistics including the sources and methods of data collection, useful numeric and graphic summaries, variability, data distributions, sampling and sampling distributions, and basic ideas of statistical inference, relationships between variables, and formulating and testing hypotheses. Also explores how to build prediction and forecasting models for chosen variables using related variables, such as time. Statistical software tools, learning aids, and sources on the Internet are used. Students conduct a semester-long data analysis project, and they practice communicating their findings via written reports.

Managerial Economics (MECN)

Search MECN Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=MECN>)

MECN 6200. Global Competition and Market Dominance. 3 Hours.

Trains managers to understand the competitive implications of global economic policies, the business effects of technological change, and the commercial imperatives of alternative political systems at a macro level. At a micro level, it creates a framework for industry analysis in a global setting that combines economic analysis, competitive analysis, and business decision-making skills.

MECN 6203. Global Managerial Economics. 3 Hours.

Develops understanding of the organization of the global economy and how this helps managers assess the winds of economic change and make better decisions for their shareholders. Addresses interactions among competitors, suppliers and customers, central banks and other financial intermediaries, and governments and how these interactions impact business decision making. Leads to a framework for industry analysis in a global setting that involves economic analysis, competitive analysis, and business decision-making skills.

MECN 6205. Sustainability and the Economics of Markets. 3 Hours.

Examines the idea that building a sustainable business enterprise often involves correcting market failures. Examines the responsibilities of the business enterprise to society at large. Also explores the causes of and remedies for market failures, such as immigration, education, healthcare, climate change, and finance, and what these mean for governments, businesses, and individuals.

MECN 6208. Economics for Managerial Decision Making. 2 Hours.

Focuses on the application of economic concepts to business decision making in an international setting. The goal is understanding those aspects of creating and sustaining shareholder value that managers control and those arising from external sources. Topics include analyses of competitive market forces, demand-supply interactions, production, costs and profits, market structures and industrial organization, and pricing strategies. Focuses also on the social, political, economic, and institutional forces that influence value and wealth. Topics include national income accounting, aggregate economic behavior, financial markets analysis, the determination of income, employment and inflation, growth and productivity, exchange rate determination, and absolute versus comparative advantage. Helps student-managers learn how to better evaluate economic trends and conditions enabling them to make more informed choices on behalf of their stakeholders.

MECN 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

Marine Studies (MARS)

Search MARS Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=MARS>)

MARS 3210. Marine Mammals. 4 Hours.

Designed to familiarize students with biology and conservation of marine mammals. The course content is primarily scientific, but the goal of the course is to consider how scientific knowledge is used as a tool of conservation. Topics include the evolution and taxonomy of whales, seals, and other marine mammals, adaptations to the ocean environment, feeding and social behavior, and population ecology. Issues include whaling and sealing, environmental contaminants, entanglements in fishing gear, tuna /dolphin interactions, and the decline of Stellar Sea lions.

MARS 3310. Water Resources Policy and Management. 4 Hours.

Explores the ways in which water has affected our bodies, our planet, our history, our culture, and the danger posed by increasing demand, waste, and pollution on our limited supply of usable fresh water. Considers water through scientific, historical, and cultural viewpoints. Surveys contemporary water problems in all their dimensions-political, economic, and technological.

MARS 3315. Wetlands: Ecology and Hydrology. 4 Hours.

Investigates the vital role of wetlands in the hydrology and ecology of global landscapes. Topics include function of inland and coastal marshes, and swamps and bogs in water and nutrient cycles, and in support of biodiversity from microbes to vertebrates. Examines biological links between wetlands and human activities, such as agriculture, coastal development, and fisheries. Also covers legal framework for the protection and restoration of endangered wetlands.

MARS 3325. Coastal Zone Management. 4 Hours.

Focuses on outstanding issues in coastal environment affairs. Discusses scientific, legal, economic, and technical aspects of coastal issues and intergrates them into problem-solving exercises.

MARS 3425. Biology of Fishes. 4 Hours.

Covers the evolution, systematics, anatomy, physiology, and behavior of freshwater, marine, and anadromous fishes from temperate to tropical environments. Examines the diversity of fish interactions in aquatic communities; predator/prey relationships, host/symbiont interactions, and the various roles of fishes as herbivores. Studies inter- and intraspecific predator-prey relationships among fish populations in aquatic communities and integrates principles of ecology. Provides access to the collection of the New England Aquarium resulting in an extraordinary opportunity to understand principles of ichthyology through the study of living fish. Hosted each year by a consortium member institution, this Massachusetts Bay Marine Studies Consortium is an intermediate-level survey course.

MARS 3430. Biology of Whales. 4 Hours.

Offers a comprehensive review of the biology, ecology, and management of cetaceans. A thorough grounding in cetacean mammalogy and population biology seeks to prepare students to understand conservation problems presented as case histories. Requires students to complete an independent research paper on a topic related to cetacean biology. Hands-on activities may include the dissection of a small cetacean and a shore-based whale watch in Cape Cod Bay. Hosted each year by a consortium member institution (at Northeastern University's Boston campus), this is a Massachusetts Bay Marine Studies Consortium course.

Marketing (MKTG)

Search MKTG Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=MKTG>)

MKTG 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MKTG 2201. Introduction to Marketing. 4 Hours.

Provides an overview of the role of marketing in business and society. Considers the planning, implementation, and evaluation of marketing efforts in consumer and business-to-business companies, in service and goods companies, and in for-profit and nonprofit organizations. Also examines contemporary issues in marketing that can affect organizational success. A term project is used to enable students to apply their learning about the fundamentals of marketing.

MKTG 2202. Introduction to Marketing in a Global Context. 4 Hours.

Covers the role of marketing in business and society. Considers the planning, implementation, and evaluation of marketing efforts in consumer and business-to-business companies, in services and goods companies, and in for-profit and nonprofit organizations. Focuses on the cultural, social, and political challenges faced by global firms as they conduct market research and develop and vary marketing strategies to be successful in multiple markets internationally. Also examines contemporary issues in marketing that can affect organizational success. Requires students to apply their learning about the fundamentals of marketing in a term project.

MKTG 2209. Introduction to Marketing. 4 Hours.

Does not count as credit for business majors. Counts as MKTG 2201 for business minors only.

MKTG 2301. Marketing and Society. 4 Hours.

Examines the role of marketing and business in society's central contemporary problems as well as the way marketing can take a positive and influential role in the efforts to address these problems. Reviews some of our society's main problems and a critical view of marketing and business in today's world. Also examines changing marketing practices and roles for businesses as firms and institutions become more socially responsible and ethically aware. Finally, introduces and analyzes the role of prosocial marketing, how marketing can influence people's behavior for advancing a socially desirable change. Offers students an opportunity to better understand our society and enhance an ethical mind-set, while highlighting the ways marketers can contribute to societal well-being.

MKTG 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MKTG 3301. Marketing Management. 4 Hours.

Focuses on the marketing process through the use of case studies simulating actual business settings and marketing challenges. Develops skill in marketing decision making, critical analysis, and communication. Topics include techniques for undertaking market analysis, marketing strategy (segmentation and positioning), and marketing implementation (4 Ps). A marketing plan project is used to enable students to apply their understanding about the marketing process.

MKTG 3401. Marketing Research. 4 Hours.

Focuses on the marketing research process and the analysis of data using statistical software. Helps students develop an understanding of consumer attitudes and behavior processes as the basis of the design of marketing problems. Topics include problem definition, research design, sampling, attitude measurement, questionnaire design, data collection, and data analysis. Students are expected to work on group projects. The course requires no previous computer experience. Requires prior completion of 56 SH toward degree.

MKTG 3501. Marketing Analytics. 4 Hours.

Studies the importance of using an analytical approach to support marketing decision making in organizations and offers students an opportunity to learn how to implement such an approach in practice. Focuses on data science in marketing: identifying and acquiring the right data for addressing different marketing challenges, building skills necessary for conducting relevant quantitative analyses, and guiding how to use obtained insights to make better marketing decisions. Topics may include product innovation, market identification and segmentation, customer valuation, media attribution models, and assessment of digital and social media. Students are expected to apply statistical concepts and use relevant software packages for analyzing marketing datasets.

MKTG 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MKTG 4220. Marketing in Asia. 4 Hours.

Studies the opportunities and challenges associated with the increasing globalization of Indian and Asian markets. During this Dialogue of Civilizations, students study key environmental forces shaping consumer needs and preferences, the impact of foreign political and economic factors on entering companies, the influence of international competition, market segmentation, and strategy decisions specific to Asian marketing. Analyzes the impact of cultural, social, political, and economic factors on marketing strategies. Offers students an opportunity to learn how to determine when to use different market entry and penetration strategies and how to examine the different skills and systems required to implement marketing strategies in India and broader Asia. May be repeated without limit.

MKTG 4420. Sales Management. 4 Hours.

Focuses on the entire sales effort. Offers students the opportunity to apply a proven selling process and present compelling solutions to customers. Topics include how to translate product features into buyer benefits, how to handle customer objections, and how to close sales and deals. Covers team selling and relationship marketing. Intended for students interested in a sales career as well as future product managers who must rely on the sales force to introduce new products and promotions.

MKTG 4502. Marketing in the Service Sector. 4 Hours.

Provides a basic treatment of methods and techniques for marketing in the service sector, which includes sports, recreation, public service, banking, insurance, and hotels. Analyzes a number of descriptive studies covering the application of marketing principles in key service areas as well as the principles themselves.

MKTG 4504. Advertising and Brand Promotion. 4 Hours.

Focuses on managing and integrating marketing communications in relation to a company's overall marketing objectives. Includes advertising; creative and media strategy; the communication process; direct and interactive marketing; consumer and trade promotions; public relations; and the social, ethical, and economic considerations underlying marketing communications in the twenty-first century.

MKTG 4506. Consumer Behavior. 4 Hours.

Focuses on demographics, lifestyle, social and cultural trends, and their impact on consumer motivations and behavior. A thorough understanding of the consumer is at the heart of marketing. Topics include the consumer decision-making process, family, learning, personality, and group dynamics, and their impacts on the business world. Ultimately, we are all consumers and we are all part of society, so consumer behavior is critical to all of us.

MKTG 4508. Digital Marketing. 4 Hours.

Examines the impact of technology on the marketing of goods and services. Focuses on the Internet and the World Wide Web. Investigates recent trends in e-business and identifies marketing strategies that work in this new environment. Introduces students to frameworks that help explain current issues in electronic marketing. Although the focus is on Internet marketing strategy, phenomena such as television home shopping and database marketing are also explored. Readings, cases, discussions, lectures, guest speakers, student reports, and exercises on the World Wide Web are all utilized.

MKTG 4510. New Product Development. 4 Hours.

Provides an overview of the new-product-development process, with an emphasis on customer involvement in this process. Detailed insights are provided on such topics as new-product strategy, idea generation, idea selection and evaluation, concept development and testing, product development and testing, and market testing and product launch.

MKTG 4512. International Marketing. 4 Hours.

Introduces those aspects of marketing that are unique to international business within the framework of traditional functional areas of marketing. Focuses on the environment and the modifications of marketing concepts and practices necessitated by environmental differences. Topics include cultural dynamics in international markets, political and legal environmental constraints, educational and economic constraints, international marketing research, international marketing institutions, and marketing practices abroad.

MKTG 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MKTG 4993. Independent Study. 1-4 Hours.

Allows students who have received approval to undertake independent study in lieu of any course required in the various concentrations. Students present proposals to an Independent Studies Committee for evaluation and approval. Every proposal requires a detailed outline of the objectives and plan of study and must be accompanied by a supporting statement from the supervising faculty member under whose direction the study takes place. A copy of the final report prepared by the student is presented to the appropriate Independent Studies Committee. Further information about the Independent Studies Program can be obtained from concentration coordinators. May be repeated without limit.

MKTG 6200. Creating and Sustaining Customer Markets. 3 Hours.

Focuses on marketing analysis and planning. Emphasizes analysis of customer needs and company and competitor capabilities. This analysis forms the basis of a sound marketing strategy that provides value to customers in a way superior to competitors. Discusses how to deliver this strategy through the development of an integrated marketing program covering product offerings, pricing, promotion, and distribution. Includes professional accounting students.

MKTG 6206. International Marketing. 3 Hours.

Develops understanding of the opportunities and challenges facing the international marketing executive, the decision-making process in marketing goods abroad, and the environmental forces—economic, cultural, and political—affecting the marketing process in the international marketplace.

MKTG 6208. Marketing and Customer Value. 4 Hours.

Examines the role of marketing as an organizational function and a set of processes in creating, communicating, and delivering offerings that provide superior value to customers. Gives students an opportunity to develop skills in market analysis, including customer, competitor, and company analysis, as well as decision-making capabilities in both marketing strategy and implementation. Emphasizes methods for the identification, acquisition, and retention of customers in a way that provides mutual value to the customer and the organization in the context of a global business environment.

MKTG 6210. Marketing Research. 3 Hours.

Provides an overview of the major qualitative and quantitative marketing research methodologies available to marketing managers. Explores customer relationship management (CRM) and multivariate statistical techniques including conjoint analysis, customer satisfaction, and service quality measurement.

MKTG 6212. International Marketing. 3 Hours.

Develops understanding of the opportunities and challenges facing the international marketing executive, the decision-making process in marketing goods abroad, and the environmental forces—economic, cultural, and political—affecting the marketing process in the international marketplace.

MKTG 6214. New Product Development. 3 Hours.

Focuses on the challenges and decisions new-product managers face as they take ideas through the new-product-development process. Companies need to create, develop, and market new products and services continually to compete effectively in a rapidly changing environment. Provides an overview of the new-product-development process, with an emphasis on customer involvement in this process. Provides detailed insights on such topics as new-product strategy, idea generation, idea selection and evaluation, concept development and testing, product development and testing, and market testing.

MKTG 6216. Market Focused Strategy. 3 Hours.

Offers an advanced course in defining and managing an organization's product-market strategy. Intended for marketing specialists and nonspecialists interested in incorporating a market focus from a general management or consulting perspective. Emphasizes using market information to choose and manage the company's relationships with customers and competitors in a complex, changing environment, as well as the practical concerns of implementing and evaluating marketing strategy.

MKTG 6218. Marketing in Service Sector. 3 Hours.

Provides students with knowledge of management needs and techniques associated with the service sector of the economy. Includes understanding the differences between goods and service marketing, and how these differences influence marketing strategy and the tactical design of marketing mix variables. Assists in understanding the difference between tangible goods and services, differences in the consumer evaluation process between goods and services, special marketing problems created by the differences between goods and services, and strategies that address the unique problems in service marketing.

MKTG 6222. Digital Marketing. 3 Hours.

Explores the latest trends in technology and new media, their effect on marketing goods and services, and how to deliver value to the customer using the latest technological innovations. Examines the latest trends in digital marketing, such as mobile marketing, and how the mobile platform can be used for branding purposes and to enhance customer relationships. Explores topics such as branding and advertising via mobile phones, online social networks and communities, technology adoption in global emerging markets, and how the Internet empowers customers and enables firms to engage in customer advocacy. Also examines how marketing research is conducted for technological innovations and ethical concerns that arise with technology usage, such as privacy and security issues, identity theft, and the role of trust in digital marketing.

MKTG 6223. Brand and Advertising Management. 3 Hours.

Offers students an opportunity to obtain an in-depth understanding of the brand-building process amid radical changes in today's marketing communications platforms. Exposes students to concepts, frameworks, and theories critical to developing branding and advertising strategy in the twenty-first century, including brand positioning, target audiences definition, creative advertising, integrated marketing communications, the influence of social media, and assessing marketing and media effectiveness.

MKTG 6224. B2B and Strategic Sales. 3 Hours.

Covers business-to-business marketing and the key roles of managing relationships with large buyers, going to market, and the sales organization. Begins with an understanding of why and how firms, institutions, and organizations purchase products and services and the importance of the multifunctional buying center. Covers a proven selling process and presents compelling solutions to customers. Going-to-market topics include managing value-added resellers and distributors. Intended for all interested in marketing: future product managers who must rely on the sales force and distributors to introduce new products and promotions, future sales managers, and marketing executives who must manage the marketing-sales interface.

MKTG 6226. Consumer Behavior. 3 Hours.

Focuses on the consumer as the key element of marketing strategy and application. Explores demographic, lifestyle, social, and cultural trends and their impact on consumer attitudes, motivations, and behavior. Other topics include group dynamics, family, learning, personality, and emotions and their impact on the business world. Offers an in-depth look at the consumer decision process as a model to guide the planning and evaluation of marketing strategies.

MKTG 6230. Driving Marketing Performance: Measure, Analyze, Profit. 3 Hours.

Introduces how to measure, analyze, and evaluate the profit impact of marketing actions (MAP) by bringing together marketing, strategy, and finance. Your organization is going to spend millions on a new marketing or strategic initiative, but how will you know if it is working? Marketing performance measurement and feedback systems enable managers to take smarter risks by assessing experimental projects and forecasting the profit potential of bigger, bolder initiatives. Offers students an opportunity to explore systems that summarize marketing productivity and suggest steps for performance improvement in marketing strategy and tactics.

MKTG 6232. Engaging Customers and Markets. 3 Hours.

Introduces informationcentric methods that help to choose which customer markets are worth pursuing; that identify what benefits would be most attractive to offer these customers; and that develop, communicate, and deliver products and services that provide value to both customers and organizations. In the current customercentric marketplace, every member within an organization is responsible for understanding and engaging customers, regardless of their specific functional role. Properly collecting and utilizing data from inside and outside the organization is necessary to support this process. Using real-world cases, scenarios, and data, offers students an opportunity to learn how customer relationships can be created and sustained.

MKTG 6234. Marketing Analytics. 3 Hours.

Offers students an opportunity to understand the importance of using an analytical approach to support marketing decision making in organizations and approaches to implementation practice. Focuses on identifying and acquiring the right data for addressing different marketing challenges; building skills necessary for conducting relevant quantitative analyses; and using insights to make better marketing decisions. Topics may include product innovation, market identification and segmentation, customer valuation, media attribution models, and assessment of digital and social media. Students are expected to apply statistical concepts and have the opportunity to use SPSS, Python, and/or R for analyzing marketing data sets. .

MKTG 6260. Special Topics in Marketing. 3 Hours.

Offers an in-depth examination of selected issues and problems in marketing that are of current interest to faculty and students. Specific topics alternate depending on faculty availability and interest as well as student enrollment criteria. May be repeated without limit.

MKTG 6280. Gaining Customer Insight. 3 Hours.

Introduces the substantive and procedural aspects of marketing strategy and customer markets. Topics include how to identify target markets, how to leverage data and analyses to enhance the development of a marketing strategy, and how to develop knowledge of various techniques for uncovering customer needs/wants. Studies the importance of customer insights to business success. Offers students an opportunity to develop and implement a concept test.

MKTG 6283. Marketing and Selling Innovation. 3 Hours.

Reviews the product portfolio concept, examining the need for balanced portfolios and focusing on issues related to product proliferation and simplification. Discusses market-based pricing strategies, sales efforts, distribution, and communication in the context of enhancing the firm's product position in the marketplace. Focuses on developing and executing sales. Explores business-to-business and business-to-customer strategies.

MKTG 6294. Customer-Centric Research Methods for Marketing. 3 Hours.

Focuses on the marketing research process and the analysis of data using software applications. Marketing research helps businesses know their customers and aids in business decision making. Covers topics such as problem definition, research design, sampling, attitude measurement, survey design, data collection, and data analysis. Students apply course topics to their organizations and analyze real company customer satisfaction data to provide managerial insights for a decision maker. Cases highlight the research process, mobile qualitative methods, and practical decision-making skills. SPSS, Qualtrics, and IBM Watson Analytics may be used to develop and analyze the project components.

MKTG 6295. Customer Performance Modeling. 3 Hours.

Addresses the question of how you know if and when your company's marketing initiatives are impacting customers and creating profit. Covers customer performance measurement, modeling, and feedback systems managers can use to take smarter risks by assessing the marketing initiatives and forecasting profit potentials. Offers students an opportunity to learn how to develop marketing dashboards, through which marketing productivity and profits can be assessed and evaluated. Also covers strategy and tactics that can be developed and communicated, with accountability in mind.

MKTG 6318. Customer Value and the Enterprise. 2 Hours.

Examines the role of marketing as an organizational function and a set of processes to manage offerings that provide superior value to customers. Focuses on developing student skill in analyzing the customer and business environment and using that analysis to build an effective marketing strategy. Emphasizes methods for the identification, acquisition, and retention of customers in a way that provides mutual value to the customer and the organization.

MKTG 6320. Advanced Marketing Management. 3 Hours.

Examines the specific elements of marketing management, including market research, metrics, positioning, planning, and the marketing mix. Focuses on developing student skills in putting together a marketing plan based on a thorough understanding of the market. Emphasizes predicting consumer behavior, developing points of difference and parity, calibrating the different elements of the market offering, and going to market with clear performance indicators.

MKTG 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MKTG 7001. Interdisciplinary Research in Marketing Science. 4 Hours.

Exposes students to cutting-edge research in quantitative marketing to help them define and advance their interdisciplinary research interests. Explains the process of generating feasible, interesting, and managerially relevant research ideas. Focuses on research opportunities arising from applications of new algorithms and technologies to generate consumer insights and automate product recommendations; improve privacy-preserving personalization; understand the increasingly complex advertising landscape and smart devices ecosystem; capture and analyze large unstructured data such as biomarkers, geolocation, networks, video, voice, and text in order to improve consumer experiences. Designed for graduate students with a background in computational social science, computer science, data analytics, digital humanities, economics, engineering, and network science who are interested in consumer-focused interdisciplinary empirical research projects. Expects students to produce a major paper suitable for publication.

MKTG 7976. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on chosen topics. May be repeated without limit.

Marketing - CPS (MKT)

Search MKT Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=MKT>)

MKT 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MKT 2100. Principles of Marketing. 3 Hours.

Introduces the fundamentals of marketing management, including marketing strategy, consumer decision making, market segmentation and targeting, product, promotion, distribution, and pricing strategies. Emphasizes the importance of ethical behavior in marketing in both profit and nonprofit organizations operating at a domestic or a global level.

MKT 2220. Consumer Behavior. 3 Hours.

Examines the major theoretical approaches to consumer behavior. Examines how the concepts of affect and cognition, behavior, and learning can be used to design and execute an effective marketing strategy in an environment that is more consumer empowered. Understanding the decision-making process, attitude, and behavior of buyers, as well as the impact of the environment, is essential to developing marketing plans in which sophisticated customer relationship management approaches are dependent upon knowing the customer needs and motives. Offers students an opportunity to gain a better understanding of their own buying behavior.

MKT 2700. Product Design and Development. 3 Hours.

Introduces the methods used by companies to design and develop new products. New product development is a process that requires cross-functional collaboration and inter-disciplinary skills, which requires students to be exposed to concepts and analytical methods from a variety of disciplines, including marketing, project management, supply chain management, design and manufacturing, and cost accounting. Students are provided an opportunity to work individually and in teams to solve real business challenges, designing and developing products, as well as formulating strategies on how to improve their market success.

MKT 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MKT 3010. Digital Marketing. 3 Hours.

Explores the transition of traditional marketing to human-centric marketing in the digital age. Topics include power shifts, human connectivity, changing of human lives, and the new breed of customer—youth, women, and netizens. Focuses on greater understanding of customer paths in the digital era, new marketing metrics and marketing practices, human centric content and omnichannel marketing, and customer engagement. Discusses the use of social media, as well as display advertising, content marketing, email marketing, etc.

MKT 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MKT 4955. Project. 1-4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student's major field. May be repeated without limit.

MKT 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MKT 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MATL 5380. Particulate Materials Processing. 4 Hours.

Covers the processing of metallic and ceramic materials from particulate form. Includes particulate fabrication, characterization, handling, and consolidation for alloys, ceramics, and composites. Other topics include the principles of sintering in the absence and presence of liquid, advanced materials processing by rapid-solidification powder metallurgy, and the processing and structures of advanced ceramics.

MATL 6250. Soft Matter. 4 Hours.

Introduces the relatively young field of soft matter, which encompasses the physical description of various states of soft materials including liquids, colloids, polymers, foams, gels, granular materials, and a number of biological materials. Soft matter (also known as "soft condensed matter" or "complex fluids") is less ordered than metals and oxides (hard condensed matter) and is more subject to thermal fluctuations and applied forces. Focuses on critical thinking, problem diagnosis, estimation, statistical analysis, and data-based decision making. Includes many in-class demonstrations from colloidal assembly to emulsion stability to cellular apoptosis. Highlights applications such as industrial processing, life sciences, and environmental remediation. Requires graduate study in related field or permission of instructor.

MATL 6270. Principles, Devices, and Materials for Energy Storage and Energy Harvesting. 4 Hours.

Introduces students to materials, devices, and mechanisms for clean and sustainable energy while providing a broad overview of energy storage and energy harvesting. Offers examples related to materials and devices used in energy storage and harvesting and delves into the principles that underlie the performance of advanced electrochemical storage and harvesting systems, for example solar energy and mechanical energy. Also covers efficient energy usage, such as energy-efficient lighting and building. Beyond course content, assignments provide students with opportunities to practice concise writing and peer review of abstracts, deliver scientific presentations, and explore optimum ways to present technical information. Students should have some prior knowledge of materials science, electrochemistry, and/or semiconductor physics.

MATL 6285. Structure, Properties, and Processing of Polymeric Materials. 4 Hours.

Provides an introduction to the organic chemistry of polymers, the effects of chemical composition on structure, melting point, and degradation, and the thermodynamics of polymers. Other topics include the mechanical properties of polymers, analysis and testing, the effects of processing on structures and properties, and the processing of industrial polymers, with applications.

MATL 6290. Fundamentals of Nanostructured Materials. 4 Hours.

Covers fundamentals of 1D and 2D nanomaterials such as carbon nanotubes, graphene, nanowires, 2D atomic crystals (transition metal dichalcogenides), nanostructured graphites and their novel physical properties, and related nanotechnology. Draws from various textbooks and from seminal scientific journal articles that paved the new era of nanomaterials and nanotechnology in the past couple of decades. Includes lab demonstrations and assignments for some nanomaterials synthesis and characterization. An introduction to materials science and engineering, solid-state physics, chemistry of materials, or any related materials engineering background is strongly recommended.

MATL 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

Materials Engineering (MATL)

Search MATL Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=MATL>)

MATL 7350. Mechanical Behavior and Strengthening Mechanisms. 4 Hours.

Covers dislocation theory and includes such topics as crystalline defects, elastic properties of dislocation, movement of dislocations, multiplication, intersection, annihilation, dislocations in crystalline materials, and dislocation arrays and crystal boundaries. Examines application of dislocation theory to microplasticity, dynamic recovery and recrystallization, strengthening mechanisms, and high-temperature deformation. Requires knowledge of materials science.

MATL 7355. Thermodynamics of Materials. 4 Hours.

Covers fundamentals of materials thermodynamics that encompass the first, second, and third laws, entropy, enthalpy, and free energy. Emphasis is on phase stability and equilibria, phase diagram computation with applications to phases in metals, alloys, and ionic compounds. Requires knowledge of thermodynamics course and materials science course.

MATL 7360. Kinetics of Phase Transformations. 4 Hours.

Focuses on the different types of phase transformations that occur in materials in relation to theory and practice. Topics include the diffusion equations, mechanisms of diffusion in crystalline solids, random walk theory, ionic conduction, high-diffusivity paths, diffusional and nondiffusional phase transformations, and microstructural evolution in material processing.

MATL 7365. Properties and Processing of Electronic Materials. 4 Hours.

Focuses on electronic principles and the processing techniques underlying the processing/structure/property relationships of materials. Covers metals and alloys, semiconductors, and insulators. Topics include electronic structures, band theory; thermal, electrical, and magnetic properties; and processing methods including film deposition.

MATL 7374. Special Topics in Materials Engineering. 4 Hours.

Offers topics of interest to the staff member conducting this class for advanced study. May be repeated without limit.

MATL 7395. Fundamentals of Solidification. 4 Hours.

Discusses fundamental aspects of the solidification of metals and alloys in both conventional and advanced solidification processing. Topics covered include the nucleation and growth of solids, the morphological stability of the solid/liquid interface, capillarity effects, cellular and dendritic solidification, effects of diffusion and convection, eutectic solidification, and the solidification of undercooled melts.

MATL 7945. Master's Project. 4 Hours.

Offers theoretical or experimental work under individual faculty supervision.

MATL 7962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MATL 7978. Independent Study. 1-4 Hours.

Offers theoretical or experimental work under individual faculty supervision. May be repeated without limit.

MATL 7990. Thesis. 1-8 Hours.

Offers analytical and/or experimental work conducted under the direction of the faculty in fulfillment of the requirements for the degree. Requires first-year students to attend a graduate seminar program that introduces the students to the methods of choosing a research topic, conducting research, and preparing a thesis. Requires successful completion of the seminar program. May be repeated without limit.

MATL 7996. Thesis Continuation. 0 Hours.

Offers continuing master's thesis supervision under individual faculty supervision.

Mathematics (MATH)

Search MATH Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=MATH>)

MATH 1000. Mathematics at Northeastern. 1 Hour.

Designed for freshman math majors to introduce them to one another, their major, their college, and the University. Students are introduced to our advising system, register for next semester's courses, and learn more about co-op. Also helps students develop the academic and interpersonal skills necessary to succeed as a university student.

MATH 1120. Precalculus. 4 Hours.

Focuses on linear, polynomial, exponential, logarithmic, and trigonometric functions. Emphasis is placed on understanding, manipulating, and graphing these basic functions, their inverses and compositions, and using them to model real-world situations (that is, exponential growth and decay, periodic phenomena). Equations involving these functions are solved using appropriate techniques. Special consideration is given to choosing reasonable functions to fit numerical data.

MATH 1130. College Math for Business and Economics. 4 Hours.

Introduces students to some of the important mathematical concepts and tools (such as modeling revenue, cost and profit with functions) used to solve problems in business and economics. Assumes familiarity with the basic properties of linear, polynomial, exponential, and logarithmic functions. Topics include the method of least squares, regression curves, solving equations involving functions, compound interest, amortization, and other consumer finance models. (Graphing calculator required, see instructor for make and model.)

MATH 1213. Interactive Mathematics. 4 Hours.

Develops problem-solving skills while simultaneously teaching mathematics concepts. Each unit centers on a particular applied problem, which serves to introduce the relevant mathematical topics. These may include but are not limited to polling theory, rate of change, the concepts behind derivatives, probability, binomial distributions, and statistics. The course is not taught in the traditional lecture format and is particularly suited to students who work well in collaborative groups and who enjoy writing about the concepts they are learning. Assessment is based on portfolios, written projects, solutions to "problems of the week," and exams.

MATH 1215. Mathematical Thinking. 4 Hours.

Focuses on the development of mathematical thinking and its use in a variety of contexts to translate real-world problems into mathematical form and, through analysis, to obtain new information and reach conclusions about the original problems. Mathematical topics include symbolic logic, truth tables, valid arguments, counting principles, and topics in probability theory such as Bayes' theorem, the binomial distribution, and expected value.

MATH 1216. Recitation for MATH 1215. 0 Hours.

Provides small-group discussion format to cover material in MATH 1215.

MATH 1220. Mathematics of Art. 4 Hours.

Presents mathematical connections and foundations for art. Topics vary and may include aspects of linear perspective and vanishing points, symmetry and patterns, tilings and polygons, Platonic solids and polyhedra, golden ratio, non-Euclidean geometry, hyperbolic geometry, fractals, and other topics. Includes connections and examples in different cultures.

MATH 1231. Calculus for Business and Economics. 4 Hours.

Provides an overview of differential calculus including derivatives of power, exponential, logarithmic, logistic functions, and functions built from these. Derivatives are used to model rates of change, to estimate change, to optimize functions, and in marginal analysis. The integral calculus is applied to accumulation functions and future value. Emphasis is on realistic business and economics problems, the development of mathematical models from raw business data, and the translation of mathematical results into verbal expression appropriate for the business setting. Also features a semester-long marketing project in which students gather raw data, model it, and use calculus to make business decisions; each student is responsible for a ten-minute presentation. (Graphing calculator required, see instructor for make and model.)

MATH 1241. Calculus 1. 4 Hours.

Serves as both the first half of a two-semester calculus sequence and as a self-contained one-semester course in differential and integral calculus. Introduces basic concepts and techniques of differentiation and integration and applies them to polynomial, exponential, log, and trigonometric functions. Emphasizes the derivative as rate of change and integral as accumulator. Applications include optimization, growth and decay, area, volume, and motion.

MATH 1242. Calculus 2. 4 Hours.

Continues MATH 1241. Introduces additional techniques of integration and numerical approximations of integrals and the use of integral tables; further applications of integrals. Also introduces differential equations and slope fields, and elementary solutions. Introduces functions of several variables, partial derivatives, and multiple integrals.

MATH 1251. Calculus and Differential Equations for Biology 1. 4 Hours.

Begins with the fundamentals of differential calculus and proceeds to the specific type of differential equation problems encountered in biological research. Presents methods for the solutions of these equations and how the exact solutions are obtained from actual laboratory data. Topics include differential calculus: basics, the derivative, the rules of differentiation, curve plotting, exponentials and logarithms, and trigonometric functions; using technology to understand derivatives; biological kinetics: zero- and first-order processes, processes tending toward equilibrium, bi- and tri-exponential processes, and biological half-life; differential equations: particular and general solutions to homogeneous and nonhomogeneous linear equations with constant coefficients, systems of two linear differential equations; compartmental problems: nonzero initial concentration, two-compartment series dilution, diffusion between compartments, population dynamics; and introduction to integration.

MATH 1252. Calculus and Differential Equations for Biology 2. 4 Hours.

Continues MATH 1251. Begins with the integral calculus and proceeds quickly to more advanced topics in differential equations. Introduces linear algebra and uses matrix methods to analyze functions of several variables and to solve larger systems of differential equations. Advanced topics in reaction kinetics are covered. The integral and differential calculus of functions of several variables is followed by the study of numerical methods in integration and solutions of differential equations. Provides a short introduction to probability. Covers Taylor polynomials and infinite series. Special topics include reaction kinetics: Michaelis-Menten processes, tracer experiments, and inflow and outflow through membranes.

MATH 1260. Math Fundamentals for Games. 4 Hours.

Discusses linear algebra and vector geometry in two-, three-, and four-dimensional space. Examines length, dot product, and trigonometry. Introduces linear and affine transformations. Discusses complex numbers in two-space, cross product in three-space, and quaternions in four-space. Provides explicit formulas for rotations in three-space. Examines functions of one argument and treats exponentials and logarithms. Describes parametric curves in space. Discusses binomials, discrete probability, Bézier curves, and random numbers. Concludes with the concept of the derivative, the rules for computing derivatives, and the notion of a differential equation.

MATH 1340. Intensive Calculus for Engineers. 6 Hours.

Contains the material from the first semester of MATH 1341, preceded by material emphasizing the strengthening of precalculus skills. Topics include properties of exponential, logarithmic, and trigonometric functions; differential calculus; and introductory integral calculus.

MATH 1341. Calculus 1 for Science and Engineering. 4 Hours.

Covers definition, calculation, and major uses of the derivative, as well as an introduction to integration. Topics include limits; the derivative as a limit; rules for differentiation; and formulas for the derivatives of algebraic, trigonometric, and exponential/logarithmic functions. Also discusses applications of derivatives to motion, density, optimization, linear approximations, and related rates. Topics on integration include the definition of the integral as a limit of sums, antidifferentiation, the fundamental theorem of calculus, and integration by substitution.

MATH 1342. Calculus 2 for Science and Engineering. 4 Hours.

Covers further techniques and applications of integration, infinite series, and introduction to vectors. Topics include integration by parts; numerical integration; improper integrals; separable differential equations; and areas, volumes, and work as integrals. Also discusses convergence of sequences and series of numbers, power series representations and approximations, 3D coordinates, parameterizations, vectors and dot products, tangent and normal vectors, velocity, and acceleration in space. Requires prior completion of MATH 1341 or permission of head mathematics advisor.

MATH 1365. Introduction to Mathematical Reasoning. 4 Hours.

Covers the basics of mathematical reasoning and problem solving to prepare incoming math majors for more challenging mathematical courses at Northeastern. Focuses on learning to write logically sound mathematical arguments and to analyze such arguments appearing in mathematical books and courses. Includes fundamental mathematical concepts such as sets, relations, and functions.

MATH 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MATH 2201. History of Mathematics. 4 Hours.

Traces the development of mathematics from its earliest beginning to the present. Emphasis is on the contributions of various cultures including the Babylonians, Egyptians, Mayans, Greeks, Indians, and Arabs. Computations and constructions are worked out using the techniques and notations of these peoples. The role of mathematics in the development of science is traced throughout, including the contributions of Descartes, Kepler, Fermat, and Newton. More modern developments are discussed as time permits.

MATH 2230. Mathematical Encounters. 4 Hours.

Covers interesting and significant developments in pure and applied mathematics, from ancient times to the present. Fundamental mathematical ideas have a power and utility that are undeniable and a beauty and clarity that can be inspirational. Selected topics may include: prime and irrational numbers, different infinities and different geometries, map coloring, and famous unsolved and recently solved problems. Provides students with an opportunity for hands-on experience actually doing some of the mathematics discussed and to research topics in the library and on the Web.

MATH 2280. Statistics and Software. 4 Hours.

Provides an introduction to basic statistical techniques and the reasoning behind each statistical procedure. Covers appropriate statistical data analysis methods for applications in health and social sciences. Also examines a statistical package such as SPSS or SAS to implement the data analysis on computer. Topics include descriptive statistics, elementary probability theory, parameter estimation, confidence intervals, hypothesis testing, nonparametric inference, and analysis of variance and regression with a minimum of mathematical derivations.

MATH 2321. Calculus 3 for Science and Engineering. 4 Hours.

Extends the techniques of calculus to functions of several variables; introduces vector fields and vector calculus in two and three dimensions. Topics include lines and planes, 3D graphing, partial derivatives, the gradient, tangent planes and local linearization, optimization, multiple integrals, line and surface integrals, the divergence theorem, and theorems of Green and Stokes with applications to science and engineering and several computer lab projects. Requires prior completion of MATH 1342 or MATH 1252.

MATH 2322. Recitation for MATH 2321. 0 Hours.

Provides small-group discussion format to cover material in MATH 2321.

MATH 2323. Calculus 3 for Business, Economics, and Mathematics. 4 Hours.

Covers multivariable calculus with applications from economics and business. Designed for combined majors in business and mathematics and in economics and mathematics, but open to all who have taken first-year calculus. Topics include Gaussian elimination, matrix algebra, determinants, linear independence, calculus of several variables, chain rule, implicit differentiation, optimization, Lagrange multipliers, and integration of functions of several variables with applications to probability.

MATH 2331. Linear Algebra. 4 Hours.

Uses the Gauss-Jordan elimination algorithm to analyze and find bases for subspaces such as the image and kernel of a linear transformation. Covers the geometry of linear transformations: orthogonality, the Gram-Schmidt process, rotation matrices, and least squares fit. Examines diagonalization and similarity, and the spectral theorem and the singular value decomposition. Is primarily for math and science majors; applications are drawn from many technical fields. Computation is aided by the use of software such as Maple or MATLAB, and graphing calculators.

MATH 2341. Differential Equations and Linear Algebra for Engineering. 4 Hours.

Studies ordinary differential equations, their applications, and techniques for solving them including numerical methods (through computer labs using MS Excel and MATLAB), Laplace transforms, and linear algebra. Topics include linear and nonlinear first- and second-order equations and applications include electrical and mechanical systems, forced oscillation, and resonance. Topics from linear algebra, such as matrices, row-reduction, vector spaces, and eigenvalues/eigenvectors, are developed and applied to systems of differential equations. Requires prior completion of MATH 1342.

MATH 2342. Recitation for MATH 2341. 0 Hours.

Provides small-group discussion format to cover material in MATH 2341.

MATH 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MATH 3000. Co-op and Experiential Learning Reflection Seminar 1. 1 Hour.

Intended for math majors who have completed their first co-op assignment or other integrated experiential learning component of the NU Core. The goal is to examine the mathematical problems encountered in these experiences and relate them to courses already taken and to the student's future program. Faculty members and other guests contribute to the discussion. Grades are determined by the student's participation in the course and the completion of a final paper.

MATH 3081. Probability and Statistics. 4 Hours.

Focuses on probability theory. Topics include sample space; conditional probability and independence; discrete and continuous probability distributions for one and for several random variables; expectation; variance; special distributions including binomial, Poisson, and normal distributions; law of large numbers; and central limit theorem. Also introduces basic statistical theory including estimation of parameters, confidence intervals, and hypothesis testing.

MATH 3082. Recitation for MATH 3081. 0 Hours.

Provides small-group discussion format to cover material in MATH 3081.

MATH 3090. Exploration of Modern Mathematics. 4 Hours.

Offers students a research-minded, elementary, and intuitive introduction to the interplay between algebra, geometry, analysis, and topology using an interactive and experimental approach. Intended for math majors, math combined majors, and students pursuing a math minor; all others should obtain permission of instructor.

MATH 3150. Real Analysis. 4 Hours.

Provides the theoretical underpinnings of calculus and the advanced study of functions. Emphasis is on precise definitions and rigorous proof. Topics include the real numbers and completeness, continuity and differentiability, the Riemann integral, the fundamental theorem of calculus, inverse function and implicit function theorems, and limits and convergence. Required of all mathematics majors.

MATH 3175. Group Theory. 4 Hours.

Presents basic concepts and techniques of the group theory: symmetry groups, axiomatic definition of groups, important classes of groups (abelian groups, cyclic groups, additive and multiplicative groups of residues, and permutation groups), Cayley table, subgroups, group homomorphism, cosets, the Lagrange theorem, normal subgroups, quotient groups, and direct products. Studies structural properties of groups. Possible applications include geometry, number theory, crystallography, physics, and combinatorics.

MATH 3275. Advanced Group Theory. 4 Hours.

Serves as an accelerated introduction to the theory of groups, intended for students who wish to take a more advanced version of MATH 3175. Prior knowledge of group theory is not assumed. Introduces homomorphisms, subgroups, normal subgroups, quotient groups, and group actions, illustrated with a variety of examples. Subsequent topics include the class equation, simple groups, the Sylow theorems, and their applications to the classification of finite simple groups. Discusses classical matrix groups, with an emphasis on $SU(2)$ and $SO(3)$ as fundamental examples, and introduces the notion of a Lie algebra. Develops representation theory of finite groups and its correspondence to the representation theory of compact Lie groups sketched, again using $SU(2)$ as an example. Students not meeting course prerequisites may seek permission of instructor. .

MATH 3331. Differential Geometry. 4 Hours.

Studies differential geometry, focusing on curves and surfaces in 3D space. The material presented here can serve as preparation for a more advanced course in Riemannian geometry or differential topology.

MATH 3341. Dynamical Systems. 4 Hours.

Studies dynamical systems and their applications as they arise from differential equations. Solutions are obtained and analyzed as parameterized curves in the plane and used as a means of understanding the evolution of physical processes. Applications include conservative systems, predator-prey interactions, and cooperation and competition of species.

MATH 3527. Number Theory 1. 4 Hours.

Introduces number theory. Topics include linear diophantine equations, congruences, design of magic squares, Fermat's little theorem, Euler's formula, Euler's phi function, computing powers and roots in modular arithmetic, the RSA encryption system, primitive roots and indices, and the law of quadratic reciprocity. As time permits, may cover diophantine approximation and Pell's equation, elliptic curves, points on elliptic curves, and Fermat's last theorem.

MATH 3530. Numerical Analysis. 4 Hours.

Considers various problems including roots of nonlinear equations; simultaneous linear equations: direct and iterative methods of solution; eigenvalue problems; interpolation; and curve fitting. Emphasizes understanding issues rather than proving theorems or coming up with numerical recipes.

MATH 3533. Combinatorial Mathematics. 4 Hours.

Introduces techniques of mathematical proofs including mathematical induction. Explores various techniques for counting such as permutation and combinations, inclusion-exclusion principle, recurrence relations, generating functions, Polya enumeration, and the mathematical formulations necessary for these techniques including elementary group theory and equivalence relations.

MATH 3545. Introduction to Graph Theory. 4 Hours.

Offers a mathematical introduction to networks and graphs, which find applications in social and natural sciences. Introduces paths, cycles, trees, bipartite graphs, matchings, colorings, connectivity, and network flows. Discusses special cases of planar, Eulerian, and Hamiltonian graphs; Tait's theorem; and possible advanced topics. Students who do not meet course prerequisites may seek permission of instructor.

MATH 3560. Geometry. 4 Hours.

Studies classical geometry and symmetry groups of geometric figures, with an emphasis on Euclidean geometry. Teaches how to formulate mathematical propositions precisely and how to construct and understand mathematical proofs. Provides a line between classical and modern geometry with the aim of preparing students for further study in group theory and differential geometry.

MATH 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MATH 4020. Research Capstone. 4 Hours.

Offers students the experience of engaging in mathematical research that builds upon the math courses that they have taken and, possibly, their co-op assignments. Requires students to complete a research project of their own choosing. Focus is on the project and on the students presenting their work. Also requires students to write a reflection paper. Intended for juniors or seniors with experience or interest in mathematics research. Students who do not meet course prerequisites may seek permission of instructor.

MATH 4025. Applied Mathematics Capstone. 4 Hours.

Emphasizes the use of a variety of methods—such as optimization, differential equations, probability, and statistics—to study problems that arise in epidemiology, finance, and other real-world settings. Course work includes assigned exercises, a long-term modeling project on a topic of the student's choosing, and a reflection paper.

MATH 4525. Applied Analysis. 4 Hours.

Demonstrates the applications of mathematics to interesting physical and biological problems. Methods are chosen from ordinary and partial differential equations, calculus of variations, Laplace transform, perturbation theory, special functions, dimensional analysis, asymptotic analysis, and other techniques of applied mathematics.

MATH 4527. Number Theory 2. 4 Hours.

Continues MATH 3527. Topics include Diophantine approximation, the Gaussian integers, irrational numbers and transcendental numbers, nonlinear polynomial congruences, systems of linear congruences, mobius inversion, elliptic curves, modular curves, modular forms, and L-functions.

MATH 4541. Advanced Calculus. 4 Hours.

Offers a deeper and more generalized look at the ideas and objects of study of calculus. Topics include the generalized calculus of n-space, the inverse and implicit function theorems, differential forms and general Stokes-type theorems, geometry of curves and surfaces, and special functions.

MATH 4545. Fourier Series and PDEs. 4 Hours.

Provides a first course in Fourier series, Sturm-Liouville boundary value problems, and their application to solving the fundamental partial differential equations of mathematical physics: the heat equation, the wave equation, and Laplace's equation. Green's functions are also introduced as a means of obtaining closed-form solutions.

MATH 4555. Complex Variables. 4 Hours.

Provides an introduction to the analysis of functions of a complex variable. Starting with the algebra and geometry of complex numbers, basic derivative and contour integral properties are developed for elementary algebraic and transcendental functions as well as for other analytic functions and functions with isolated singularities. Power and Laurent series representations are given. Classical integral theorems, residue theory, and conformal mapping properties are studied. Applications of harmonic functions are presented as time permits.

MATH 4565. Topology. 4 Hours.

Introduces the student to fundamental notions of topology. Introduces basic set theory, then covers the foundations of general topology (axioms for a topological space, continuous functions, homeomorphisms, metric spaces, the subspace, product and quotient topologies, connectedness, compactness, and the Hausdorff condition). Also introduces algebraic and geometric topology (homotopy, covering spaces, fundamental groups, graphs, surfaces, and manifolds) and applications. Other topics are covered if time permits.

MATH 4567. Differential Topology. 4 Hours.

Introduces students to the geometry of smooth manifolds. Topics include transversality, oriented intersection theory, Lefschetz fixed-point theory, Poincaré-Hopf theorem, Hopf degree theorem, differential forms, and integration. Explores concepts and techniques of smooth geometry for understanding significant topological characteristics of manifolds. Students not meeting course prerequisites may seek permission of instructor.

MATH 4569. Knot Theory. 4 Hours.

Introduces the mathematical study of knots and links in space. Knot theory provides a concrete application for fundamental ideas in topology. Topics include knot diagrams and Reidemeister moves; connected sum and prime decomposition; satellites and companionship; Seifert surfaces and knot genus; Seifert matrices; knot signature and determinant; the Alexander polynomial; the Kauffman bracket and Jones polynomial; and braid presentations. Also discusses examples of knotting phenomena in physical systems. .

MATH 4571. Advanced Linear Algebra. 4 Hours.

Provides a more detailed study of linear transformations and matrices: LU factorization, QR factorization, Spectral theorem and singular value decomposition, Jordan form, positive definite matrices, quadratic forms, partitioned matrices, and norms and numerical issues. Topics and emphasis change from year to year.

MATH 4575. Introduction to Cryptography. 4 Hours.

Presents the mathematical foundations of cryptology, beginning with the study of divisibility of integers, the Euclidian Algorithm, and an analysis of the Extended Euclidian Algorithm. Includes a short study of groups, semigroups, residue class rings, fields, Fermat's Little Theorem, Chinese Remainder Theorem, polynomials over fields, and the multiplicative group of residues modulo a prime number. Introduces fundamental notions used to describe encryption schemes together with examples, which include affine linear ciphers and cryptanalysis and continues with probability and perfect secrecy. Presents the Data Encryption Standard (DES) and culminates in the study of the Advanced Encryption Standard (AES), the standard encryption scheme in the United States since 2001.

MATH 4576. Rings and Fields. 4 Hours.

Introduces commutative rings, ideals, integral domains, fields, and the theory of extension fields. Topics include Gaussian integers, Galois groups, and the fundamental theorem of Galois theory. Applications include the impossibility of angle-trisection and the general insolubility of fifth- and higher-degree polynomials. Other topics are covered as time permits.

MATH 4577. Commutative Algebra. 4 Hours.

Introduces the basics of commutative algebra. Emphasizes rigorously building the mathematical background needed for studying this subject in more depth. Seeks to prepare students for more advanced classes in algebraic geometry, robotics, invariant theory of finite groups, and cryptography. Covers geometry, algebra, and algorithms; Grobner bases; elimination theory; the algebra-geometry dictionary; robotics and automatic geometric theorem proving. .

MATH 4581. Statistics and Stochastic Processes. 4 Hours.

Continues topics introduced in MATH 3081. The first part of the course covers classical procedures of statistics including the t-test, linear regression, and the chi-square test. The second part provides an introduction to stochastic processes with emphasis on Markov chains, random walks, and Brownian motion, with applications to modeling and finance.

MATH 4586. Algebraic Geometry. 4 Hours.

Concentrates on the basics of algebraic geometry, which is the study of geometric objects, such as curves and surfaces, defined by solutions of polynomial equations. Algebraic geometry has links to many other areas of mathematics—number theory, differential geometry, topology, mathematical physics—and has important applications in such fields as engineering, computer science, statistics, and computational biology. Emphasizes examples and indicates along the way interesting problems that can be studied using algebraic geometry.

MATH 4606. Mathematical and Computational Methods for Physics. 4 Hours.

Covers advanced mathematical methods topics that are commonly used in the physical sciences, such as complex calculus, Fourier transforms, special functions, and the principles of variational calculus. Applies these methods to computational simulation and modeling exercises. Introduces basic computational techniques and numerical analysis, such as Newton's method, Monte Carlo integration, gradient descent, and least squares regression. Uses a simple programming language, such as MATLAB, for the exercises.

MATH 4681. Probability and Risks. 4 Hours.

Reviews main probability and statistics concepts from the point of view of decision risks in actuarial and biomedical contexts, including applications of normal approximation for evaluating statistical risks. Also examines new topics, such as distribution of extreme values and nonparametric statistics with examples. May be especially useful for students preparing for the first actuarial exam on probability and statistics.

MATH 4682. Theory of Interest and Basics of Life Insurance. 4 Hours.

Reviews basic financial instruments in the presence of interest rates, including the measurement of interest and problems in interest (equations of value, basic and more general annuities, yield rates, amortization schedules, bonds and other securities). Examines numerous practical applications. Also introduces problems of life insurance with examples. May be especially useful for students preparing for the second actuarial exam on theory of interest.

MATH 4683. Financial Derivatives. 4 Hours.

Presents the mathematical basis of actuarial models and their application to insurance and other financial risks. Includes but is not limited to financial derivatives such as options and futures. Techniques and applications may be useful for students preparing for actuarial Exam 3F (Society of Actuaries Exam MFE).

MATH 4970. Junior/Senior Honors Project 1. 4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student's major field. Combined with Junior/Senior Project 2 or college-defined equivalent for 8-credit honors project. May be repeated without limit.

MATH 4971. Junior/Senior Honors Project 2. 4 Hours.

Focuses on second semester of in-depth project in which a student conducts research or produces a product related to the student's major field. May be repeated without limit.

MATH 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MATH 4991. Research. 4 Hours.

Offers an opportunity to conduct research under faculty supervision.

MATH 4992. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

MATH 4993. Independent Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

MATH 4994. Internship. 4 Hours.

Offers students an opportunity for internship work. May be repeated without limit.

MATH 4996. Experiential Education Directed Study. 4 Hours.

Draws upon the student's approved experiential activity and integrates it with study in the academic major. Restricted to mathematics majors who are using it to fulfill their experiential education requirement; for these students it may count as a mathematics elective, subject to approval by instructor and adviser. May be repeated without limit.

MATH 5050. Advanced Engineering Calculus with Applications. 4 Hours.

Introduces methods of vector analysis. Expects students to master over thirty predefined types of problems. Topics include analytic geometry in three dimensions, geometric vectors and vector algebra, curves in three-space, linear approximations, the gradient, the chain rule, the Lagrange multiplier, iterated integrals, integrals in curvilinear coordinates, change of variables, vector fields, line integrals, conservative fields, surfaces and surface integrals, the flux and the circulation of a vector field, Green's theorem, the divergence theorem, and Stokes' theorem. Illustrates the material by real-world science and engineering applications using the above techniques. Requires familiarity with single-variable calculus.

MATH 5101. Analysis 1: Functions of One Variable. 4 Hours.

Offers a rigorous, proof-based introduction to mathematical analysis and its applications. Topics include metric spaces, convergence, compactness, and connectedness; continuous and uniformly continuous functions; derivatives, the mean value theorem, and Taylor series; Riemann integration and the fundamental theorem of calculus; interchanging limit operations; sequences of functions and uniform convergence; Arzelà-Ascoli and Stone-Weierstrass theorems; inverse and implicit function theorems; successive approximations and existence/uniqueness for ordinary differential equations; linear operators on finite-dimensional vector spaces and applications to systems of ordinary differential equations. Provides a series of computer projects that further develop the connections between theory and applications. Requires permission of instructor and head advisor for undergraduate students.

MATH 5102. Analysis 2: Functions of Several Variables. 4 Hours.

Continues MATH 5101. Studies basics of analysis in several variables. Topics include derivative and partial derivatives; the contraction principle; the inverse function and implicit function theorems; derivatives of higher order; Taylor formula in several variables; differentiation of integrals depending on parameters; integration of functions of several variables; change of variables in integrals; differential forms and their integration over simplexes and chains; external multiplication of forms; differential of forms; Stokes' formula; set functions; Lebesgue measure; measure spaces; measurable functions; integration; comparison with the Riemann integral; L_2 as a Hilbert space; and Parseval theorem and Riesz-Fischer theorem. Requires permission of instructor and head advisor for undergraduate students.

MATH 5110. Applied Linear Algebra and Matrix Analysis. 4 Hours.

Offers a robust introduction to the basic results of linear algebra on real and complex vector spaces with applications to differential equations and Markov chains. Introduces theoretical results along the way, along with matrix analysis, eigenvalue analysis, and spectral decomposition. Includes a significant computational component, focused on applications of linear algebra to mathematical modeling.

MATH 5111. Algebra 1. 4 Hours.

Covers vector spaces and linear maps. Topics include row and column operations and their application to normal form; eigenvalues and eigenvectors of an endomorphism; characteristic polynomial and Jordan canonical form; multilinear algebra that covers tensor products, symmetric and exterior powers of vector spaces, and their universality properties; quadratic forms, reduction to diagonal form, and Sylvester theorem; hyperbolic spaces and Witt theorem; the orthogonal group and isotropic subspaces; antisymmetric forms and their reduction to canonical form; the symplectic group; and Pfaffian and Affine geometry, and classification of conic sections. Requires permission of instructor and head advisor for undergraduate students.

MATH 5112. Algebra 2. 4 Hours.

Continues MATH 5111. Topics include groups, such as subgroups, normal subgroups, homomorphism of groups, abelian groups, solvable groups, free groups, finite p -groups, Sylow theorem, permutation groups, and the sign homomorphism; rings, such as homomorphism, ideals, quotient rings, integral domains, extensions of rings, unique factorization domain, Chinese remainder theorem, and Gauss's lemma; and modules, such as homomorphism, submodules, quotient modules, exact sequence, and structure of finitely generated modules over principal ideal domains. Examples include abelian groups and Jordan canonical form. Also covers representations of finite groups, group rings and irreducible representations, Frobenius reciprocity, Maschke theorem and characters of finite groups, and dual groups. Requires permission of instructor and head advisor for undergraduate students.

MATH 5131. Introduction to Mathematical Methods and Modeling. 4 Hours.

Presents mathematical methods emphasizing applications. Uses ordinary and partial differential equations to model the evolution of real-world processes. Topics chosen illustrate the power and versatility of mathematical methods in a variety of applied fields and include population dynamics, drug assimilation, epidemics, spread of pollutants in environmental systems, competing and cooperating species, and heat conduction. Requires students to complete a math-modeling project. Requires undergraduate-level course work in ordinary and partial differential equations.

MATH 6000. Introduction to Cooperative Education. 0 Hours.

Seeks to prepare students for the transition from college student to full-time employee.

MATH 6954. Co-op Work Experience - Half-Time. 0 Hours.

Provides eligible students with an opportunity for work experience. May be repeated without limit.

MATH 6961. Internship. 1-4 Hours.

Offers students an opportunity for internship work. May be repeated without limit.

MATH 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MATH 6964. Co-op Work Experience. 0 Hours.

Provides eligible students with an opportunity for work experience. May be repeated without limit.

MATH 6965. Co-op Work Experience Abroad. 0 Hours.

Provides eligible students with an opportunity for work experience abroad. May be repeated without limit.

MATH 7202. Partial Differential Equations 1. 4 Hours.

Introduces partial differential equations, their theoretical foundations, and their applications, which include optics, propagation of waves (light, sound, and water), electric field theory, and diffusion. Topics include first-order equations by the method of characteristics; linear, quasilinear, and nonlinear equations; applications to traffic flow and geometrical optics; principles for higher-order equations; power series and Cauchy-Kowalevski theorem; classification of second-order equations; linear equations and generalized solutions; wave equations in various space dimensions; domain of dependence and range of influence; Huygens' principle; conservation of energy, dispersion, and dissipation; Laplace's equation; mean values and the maximum principle; the fundamental solution, Green's functions, and Poisson kernels; applications to physics; properties of harmonic functions; the heat equation; eigenfunction expansions; the maximum principle; Fourier transform and the Gaussian kernel; regularity of solutions; scale invariance and the similarity method; Sobolev spaces; and elliptic regularity.

MATH 7203. Numerical Analysis 1. 4 Hours.

Introduces methods and techniques used in contemporary number crunching. Covers floating-point computations involving scalars, vectors, and matrices; solvers for sparse and dense linear systems; matrix decompositions; integration of functions and solutions of ordinary differential equations (ODEs); and Fast Fourier transform. Focuses on finding solutions to practical, real-world problems. Knowledge of programming in Matlab is assumed. Knowledge of other programming languages would be good but not required.

MATH 7205. Numerical Analysis 2. 4 Hours.

Covers numerical analysis and scientific computation. Topics include numerical solutions of ordinary differential equations (ODEs) and one-dimensional boundary value problems; solving partial differential equations (PDEs) using modal expansions, finite-difference, and finite-element methods; stability of PDE algorithms; elementary computational geometry and mesh generation; unconstrained optimization with application to data modeling; and constrained optimization of convex functions: linear and quadratic programming. Focuses on techniques commonly used for data fitting and solving problems from engineering and physical science. Knowledge of programming in MATLAB is assumed. Knowledge of other programming languages beneficial but not required.

MATH 7206. Inverse Problems: Radon Transform, X-Ray Transform, and Applications. 4 Hours.

Introduces the radon transform, which is the integration of a two-dimensional function along all possible lines in the plane, and its generalization to higher-dimensional case, the X-ray transform. This is the mathematical framework behind the medical imaging technique known as computed tomography (CT scan) and seismic imaging in geoprospection. The transforms are also introductory examples of integral geometry, as well as the basic tools in microlocal analysis. Covers the theory of radon transform (X-ray transform), including the inversion formula, the stability, and the range characterization, and the numerical applications on the inverse problems of imaging.

MATH 7221. Topology 2. 4 Hours.

Continues MATH 5121. Introduces homology and cohomology theory. Studies singular homology, homological algebra (exact sequences, axioms), Mayer-Vietoris sequence, CW-complexes and cellular homology, calculation of homology of cellular spaces, and homology with coefficients. Moves on to cohomology theory, universal coefficients theorems, Bockstein homomorphism, Kunneth formula, cup and cap products, Hopf invariant, Borsuk-Ulam theorem, and Brouwer and Lefschetz-Hopf fixed-point theorems. Ends with a study of duality in manifolds including orientation bundle, Poincaré duality, Lefschetz duality, Alexander duality, Euler class, Lefschetz numbers, Gysin sequence, intersection form, and signature.

MATH 7233. Graph Theory. 4 Hours.

Covers fundamental concepts in graph theory. Topics include adjacency and incidence matrices, paths and connectedness, and vertex degrees and counting; trees and distance including properties of trees, distance in graphs, spanning trees, minimum spanning trees, and shortest paths; matchings and factors including matchings in bipartite graphs, Hall's matching condition, and min-max theorems; connectivity, such as vertex connectivity, edge connectivity, k -connected graphs, and Menger's theorem; network flows including maximum network flow, and integral flows; vertex colorings, such as upper bounds, Brooks, theorem, graphs with large chromatic number, and critical graphs; Eulerian circuits and Hamiltonian cycles including Euler's theorem, necessary conditions for Hamiltonian cycles, and sufficient conditions; planar graphs including embeddings and Euler's formula, characterization of planar graphs (Kuratowski's theorem); and Ramsey theory including Ramsey's theorem, Ramsey numbers, and graph Ramsey theory.

MATH 7234. Optimization and Complexity. 4 Hours.

Offers theory and methods of maximizing and minimizing solutions to various types of problems. Studies combinatorial problems including mixed integer programming problems (MIP); pure integer programming problems (IP); Boolean programming problems; and linear programming problems (LP). Topics include convex subsets and polyhedral subsets of n -space; relationship between an LP problem and its dual LP problem, and the duality theorem; simplex algorithm, and Kuhn-Tucker conditions for optimality for nonlinear functions; and network problems, such as minimum cost and maximum flow-minimum cut. Also may cover complexity of algorithms; problem classes P (problems with polynomial-time algorithms) and NP (problems with nondeterministic polynomial-time algorithms); Turing machines; and NP-completeness of traveling salesman problem and other well-known problems.

MATH 7235. Discrete Geometry 1. 4 Hours.

Discusses basic concepts in discrete and combinatorial geometry. Topics may include convex sets and their basic properties; theorems of Helly, Radon, and Carathéodory; separation theorems for convex bodies; convex polytopes; face vectors; Euler's theorem and Dehn-Sommerville equations; upper bound theorem; symmetry groups; regular polytopes and tessellations; reflection groups and Coxeter groups; regular tessellations on surfaces; abstract regular and chiral polytopes; and other topics at instructor's discretion.

MATH 7241. Probability 1. 4 Hours.

Offers an introductory course in probability theory, with an emphasis on problem solving and modeling. Starts with basic concepts of probability spaces and random variables, and moves on to the classification of Markov chains with applications. Other topics include the law of large numbers and the central limit theorem, with applications to the theory of random walks and Brownian motion.

MATH 7243. Machine Learning 1: Statistical Learning Theory and Algorithms. 4 Hours.

Introduces both the mathematical theory of learning and the implementation of modern machine-learning algorithms appropriate for data science. Modeling everything from social organization to financial predictions, machine-learning algorithms allow us to discover information about complex systems, even when the underlying probability distributions are unknown. Algorithms discussed include regression, decision trees, clustering, and dimensionality reduction. Offers students an opportunity to learn the implications of the mathematical choices underpinning the use of each algorithm, how the results can be interpreted in actionable ways, and how to apply their knowledge through the analysis of a variety of data sets and models. Requires students to complete a novel project using machine learning. Prior programming experience not required, but students are expected to learn a datacentric programming language.

MATH 7301. Functional Analysis. 4 Hours.

Provides an introduction to essential results of functional analysis and some of its applications. The main abstract facts can be understood independently. Proof of some important basic theorems about Hilbert and Banach spaces (Hahn-Banach theorem, open mapping theorem) are omitted, in order to allow more time for applications of the abstract techniques, such as compact operators; Peter-Weyl theorem for compact groups; spectral theory; Gelfand's theory of commutative C^* -algebras; mean ergodic theorem; Fourier transforms and Sobolev embedding theorems; and distributions and elliptic operators.

MATH 7303. Complex Manifolds. 4 Hours.

Introduces complex manifolds. Discusses the elementary local theory in several variables including Cauchy's integral formula, Hartog's extension theorem, the Weierstrass preparation theorem, and Riemann's extension theorem. The global theory includes the definition of complex manifolds, sheaf cohomology, line bundles and divisors, Kodaira's vanishing theorem, Kodaira's embedding theorem, and Chow's theorem on complex subvarieties of projective space. Special examples of dimension one and two illustrate the general theory.

MATH 7312. Lie Theory. 4 Hours.

Examines Lie groups and Lie algebras, the exponential map, examples, basic structure theorems, representation theory, and applications. Additional topics vary with the instructor and may include infinite-dimensional Lie algebras, algebraic groups, finite groups of Lie type, geometry, and analysis of homogenous spaces.

MATH 7315. Algebraic Number Theory. 4 Hours.

Covers rings of integers, Dedekind domains, factorization of ideals, ramification, and the decomposition and inertia subgroups; units in rings of integers, Minkowski's geometry of numbers, and Dirichlet's unit theorem; and class groups, zeta functions, and density sets of primes.

MATH 7316. Lie Algebras. 4 Hours.

Introduces notions of solvable and nilpotent Lie algebras. Covers semisimple Lie algebras: Killing form criterion, Cartan decomposition, root systems, Weyl groups, Dynkin diagrams, weights. Also discusses universal enveloping algebra, PBW theorem, representations of semisimple Lie algebras, weight spaces, highest weight modules, multiplicities, characters, Weyl character formula.

MATH 7317. Modern Representation Theory. 4 Hours.

Introduces students to modern techniques of representation theory, including those coming from geometry and mathematical physics. Covers applications of geometry to the representation theory of semisimple Lie algebras, algebraic groups and related algebraic objects, questions related to the representation theory of infinite dimensional Lie algebras, quantum groups, and p -adic groups, as well as category theory methods in representation theory.

MATH 7320. Modern Algebraic Geometry. 4 Hours.

Introduces students to modern techniques of algebraic geometry, including those coming from Lie theory, symplectic and differential geometry, complex analysis, and number theory. Covers subjects related to invariant theory, homological algebra questions of algebraic geometry, including derived categories and complex analytic, differential geometric, and arithmetic aspects of the geometry of algebraic varieties. Students not meeting course prerequisites or restrictions may seek permission of instructor.

MATH 7335. Discrete Geometry 2. 4 Hours.

Discusses fundamental concepts in discrete and combinatorial geometry. Topics may include basic convex geometry; convex bodies and polytopes; lattices and quadratic forms; Minkowski's theorem and the geometry of numbers; Blichfeldt's theorem; packing, covering, tiling of spaces; Voronoi diagrams; crystallographic groups and Bieberbach theorems; tilings and aperiodicity; packing and covering densities; Minkowski-Hlawka theorem; sphere packings and codes; polytopes and groups; and other topics at instructor's discretion.

MATH 7340. Statistics for Bioinformatics. 4 Hours.

Introduces the concepts of probability and statistics used in bioinformatics applications, particularly the analysis of microarray data. Uses statistical computation using the open-source R program. Topics include maximum likelihood; Monte Carlo simulations; false discovery rate adjustment; nonparametric methods, including bootstrap and permutation tests; correlation, regression, ANOVA, and generalized linear models; preprocessing of microarray data and gene filtering; visualization of multivariate data; and machine-learning techniques, such as clustering, principal components analysis, support vector machine, neural networks, and regression tree.

MATH 7341. Probability 2. 4 Hours.

Continues MATH 7241. Studies probability theory, with an emphasis on its use in modeling and queueing theory. Starts with basic properties of exponential random variables, and then applies this to the study of the Poisson process. Queueing theory forms the bulk of the course, with analysis of single-server queues, multiserver queues, and networks of queues. Also includes material on continuous-time Markov processes, renewal theory, and Brownian motion.

MATH 7342. Mathematical Statistics. 4 Hours.

Introduces mathematical statistics, emphasizing theory of point estimations. Topics include parametric estimations, minimum variance unbiased estimators, sufficiency and completeness, and Rao-Blackwell theorem; asymptotic (large sample) theory, maximum likelihood estimator (MLE), consistency of MLE, asymptotic theory of MLE, and Cramer-Rao bound; and hypothesis testing, Neyman-Pearson fundamental lemma, and likelihood ratio test.

MATH 7343. Applied Statistics. 4 Hours.

Designed as a basic introductory course in statistical methods for graduate students in mathematics as well as various applied sciences. Topics include descriptive statistics, inference for population means, analysis of variance, nonparametric methods, and linear regression. Studies how to use the computer package SPSS, doing statistical analysis and interpreting computer outputs.

MATH 7344. Regression, ANOVA, and Design. 4 Hours.

Discusses one-sample and two-sample tests; one-way ANOVA; factorial and nested designs; Cochran's theorem; linear and nonlinear regression analysis and corresponding experimental design; analysis of covariance; and simultaneous confidence intervals.

MATH 7345. Nonparametric Methods in Statistics. 4 Hours.

Presents methods for analyzing data that is not necessarily normal. Emphasizes comparing two treatments (the Wilcoxon test, Kolmogorov-Smirnov test), comparison of several treatments (the Kruskal-Wallis test), randomized complete blocks, tests of randomness and independence, asymptotic methods (the delta method, Pitman efficiency), and bootstrapping.

MATH 7346. Time Series. 4 Hours.

Includes analysis of time series in the time domain, the frequency domain and the ARMA models, and Kalman filters.

MATH 7349. Stochastic Calculus and Introduction to No-Arbitrage Finance. 4 Hours.

Introduces no-arbitrage discounted contingent claims and methods of their optimization in discrete and continuous time for a finite fixed or random horizon. Establishes the relation of no-arbitrage to the martingale calculus. Introduces stochastic differential equations and corresponding PDE describing functionals of their solutions. Presents examples of contingent claims (such as options) evaluation including the Black-Scholes formula.

MATH 7350. Pseudodifferential Equations. 4 Hours.

Covers Sobolev spaces and pseudodifferential operators on manifolds, applications to the theory of elliptic operators, elliptic regularity, Fredholm property, analytic index, and Hodge theory.

MATH 7351. Mathematical Methods of Classical Mechanics. 4 Hours.

Overviews the mathematical formulation of classical mechanics. Topics include Hamilton's principle and Lagrange's equations; solution of the two-body central force problem; rigid body rotation and Euler's equations; the spinning top; Hamilton's equations; the Poisson bracket; Liouville's theorem; and canonical transformations.

MATH 7352. Mathematical Methods of Quantum Mechanics. 4 Hours.

Introduces the basics of quantum mechanics for mathematicians. Introduces the von Neumann's axiomatics of quantum mechanics with measurements in the first part of the course. Discusses the notions of observables and states, as well as the connections between the quantum and the classical mechanics. The second (larger) part is dedicated to some concrete quantum mechanical problems, such as harmonic oscillator, one-dimensional problems of quantum mechanics, radial Schrödinger equation, and the hydrogen atom. The third part deals with more advanced topics, such as perturbation theory, scattering theory, and spin. Knowledge of functional analysis and classical mechanics recommended.

MATH 7361. Schemes. 4 Hours.

Studies some of the main tools and key objects of algebraic geometry; in particular, the Hilbert scheme that parametrizes subschemes of a projective variety. Topics include coherence of the higher direct images of coherent sheaves under a projective map, theorem on formal functions, Zariski's main theorem and Zariski's connectedness theorem, and the construction of the Hilbert and Picard schemes. May be repeated without limit.

MATH 7362. Topics in Algebra. 4 Hours.

Focuses on various advanced topics in algebra, the specific subject matter depending on the interests of the instructor and of the students. Topics may include homological algebra, commutative algebra, representation theory, or combinatorial aspects of commutative algebra. May be repeated without limit.

MATH 7364. Topics in Representation Theory. 4 Hours.

Offers topics in the representation theory of the classical groups, topics vary according to the interest of the instructor and students. Topics may include root systems, highest weight modules, Verma modules, Weyl character formula, Schur commutator lemma, Schur functors and symmetric functions, and Littlewood-Richardson rule. May be repeated up to five times.

MATH 7371. Morse Theory. 4 Hours.

Covers basic Morse theory for nondegenerate smooth functions, and applications to geodesics, Lie groups and symmetric spaces, Bott periodicity, Morse inequalities, and Witten deformation.

MATH 7374. Riemannian Geometry and General Relativity. 4 Hours.

Introduces Riemannian and pseudo-Riemannian geometry with applications to general relativity. Topics include Riemannian and pseudo-Riemannian metrics, connections, geodesics, curvature tensor, Ricci curvature and scalar curvature, Einstein's law of gravitation, the gravitational red shift, the Schwarzschild solution and black holes, and Einstein equations in the presence of matter and electromagnetic field.

MATH 7376. Topics in Differential Geometry. 4 Hours.

Offers various advanced topics in differential geometry, the subject matter depending on the instructor and the students. Topics may include symplectic geometry, general relativity, gauge theory, and Kähler geometry. May be repeated without limit.

MATH 7381. Topics in Combinatorics. 4 Hours.

Offers various advanced topics in combinatorics, the subject matter depending on the instructor and the students. May be repeated without limit.

MATH 7382. Topics in Probability. 4 Hours.

Offers various advanced topics in probability and related areas. The specific subject matter depends on the interest of the instructor and students. May be repeated up to five times.

MATH 7392. Topics in Geometry. 4 Hours.

Focuses on various advanced topics in geometry. The specific subject matter depends on the interest of the instructor and students. Topics may include symplectic geometry and Kähler geometry. May be repeated up to five times.

MATH 7721. Readings in Topology. 4 Hours.

Offers a reading course to be arranged between an individual student and instructor on a topic of their mutual choice. May be repeated without limit.

MATH 7732. Readings in Combinatorial Geometry. 4 Hours.

Offers a reading course to be arranged between an individual student and instructor on a topic of their mutual choice. May be repeated without limit.

MATH 7733. Readings in Graph Theory. 4 Hours.

Offers a reading course to be arranged between an individual student and instructor on a topic of their mutual choice. May be repeated without limit.

MATH 7734. Readings in Algebra. 4 Hours.

Offers a reading course to be arranged between an individual student and instructor on a topic of their mutual choice. May be repeated without limit.

MATH 7735. Readings in Algebraic Geometry. 4 Hours.

Offers a reading course to be arranged between an individual student and instructor on a topic of their mutual choice. May be repeated without limit.

MATH 7741. Readings in Probability and Statistics. 4 Hours.

Offers a reading course to be arranged between an individual student and instructor on a topic of their mutual choice. May be repeated without limit.

MATH 7751. Readings: Analysis. 4 Hours.

Offers a reading course to be arranged between an individual student and instructor on a topic of their mutual choice. May be repeated without limit.

MATH 7752. Readings in Real Analysis. 4 Hours.

Offers a reading course to be arranged between an individual student and instructor on a topic of their mutual choice. May be repeated without limit.

MATH 7754. Readings in Ordinary Differential Equations. 4 Hours.

Offers a reading course to be arranged between an individual student and instructor on a topic of their mutual choice. May be repeated without limit.

MATH 7771. Readings in Geometry. 4 Hours.

Offers topics in geometry that are beyond the ordinary undergraduate topics. Topics include the regular polytopes in dimensions greater than three, straight-edge and compass constructions in hyperbolic geometry, Penrose tilings, the geometry and algebra of the wallpaper, and three-dimensional Euclidean groups. May be repeated without limit.

MATH 7962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MATH 7978. Independent Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

MATH 8440. Mathematical Tapas Seminar. 4 Hours.

Intended for graduate students in mathematics who have completed their master's degree and are just starting the PhD program but have not yet selected an area of specialization or a thesis adviser. Acquaints students with the areas of research that are represented by our faculty and what it means to be a mathematical scholar. Faculty members give expository lectures on their own work or areas in which they could supervise a doctoral candidate. Gives students the opportunity to read one or two mathematical research papers during the course of the seminar; students may be asked to give an oral presentation near the end of the course. May be repeated up to three times.

MATH 8450. Research Seminar in Mathematics. 4 Hours.

Introduces graduate students to current research in geometry, topology, mathematical physics, and in other areas of mathematics. Requires permission of instructor for undergraduate mathematics students. May be repeated without limit.

MATH 8460. Graduate Seminar in Geometry and Representation Theory. 4 Hours.

Introduces students to topics of fundamental importance for geometry and representation theory by reading foundational papers in these subjects, making presentations, and participating in discussions.

MATH 8986. Research. 0 Hours.

Offers an opportunity to conduct full-time research under faculty supervision. May be repeated without limit.

MATH 9000. PhD Candidacy Achieved. 0 Hours.

Indicates successful completion of the doctoral comprehensive exam.

MATH 9948. Modern Mathematical Research. 4 Hours.

Offers students an opportunity to study the most recent developments in the area of their research, not necessarily directly related to the topic of their dissertation. Seeks to expand students' horizons and to prepare them to understand talks at mathematical conferences in their area of research. May be repeated once.

MATH 9984. Research. 1-4 Hours.

Offers an opportunity to conduct research under faculty supervision. May be repeated without limit.

MATH 9990. Dissertation. 0 Hours.

Offers dissertation supervision by members of the department. May be repeated once.

MATH 9996. Dissertation Continuation. 0 Hours.

Offers dissertation supervision by members of the department. May be repeated without limit.

Mathematics - CPS (MTH)

Search MTH Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=MTH>)

MTH 1100. College Algebra. 3 Hours.

Covers laws of exponents, factoring, inequalities, polynomials, roots, linear and quadratic equations, complex numbers, rational functions, systems of equations, exponential and logarithmic functions, and inverse functions. Requires students to communicate mathematical ideas using symbolic and written forms and to apply algebraic concepts to real-life applications. Seeks to provide students with a solid foundation of concepts and skills necessary to advance to statistics or precalculus. Requires prior knowledge of the manipulation and simplification of basic algebraic expressions.

MTH 1105. Quantitative Skills and Reasoning: Practical Math. 3 Hours.

Uses basic mathematics and statistics concepts to analyze, synthesize, and interpret quantitative data in the context of various disciplines and everyday applications. This is an introductory mathematics course.

MTH 1200. Precalculus. 3 Hours.

Combines algebraic, geometric, and trigonometric concepts and techniques to model real-world situations (that is, exponential growth and decay, periodic phenomena). Successful completion of this course should strengthen the student's conceptual understanding of mathematics and critical reasoning. Focuses on linear, polynomial, exponential, logarithmic, trigonometric functions and conic sections. Emphasizes understanding, manipulating, and graphing these basic functions, their inverses and compositions, and using them to solve applications drawn from the physical and natural sciences.

MTH 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MTH 2100. Calculus 1. 3 Hours.

Focuses primarily on differential calculus. Using mathematical models, offers students an opportunity to make predictions and inferences in a variety of applications that relate to the fields of engineering, economics, biology, etc. For example, students can use differential calculus to determine what is the most cost-effective speed to drive a car, using the least amount of fuel. These types of problems, called optimization problems, require an understanding of the derivative as a rate of change. The course focuses on how to apply rules and properties of derivatives to model and solve application problems in science, engineering, and technology. As a prelude to MTH 2105, at the end of the semester, the concept of the integral is introduced as a limit of sums and antidifferentiation.

MTH 2105. Calculus 2. 3 Hours.

Continues MTH 2100. Uses mathematical models to make predictions and inferences in a variety of applications that relate to the fields of engineering, economics, biology, etc. Focuses primarily on integral calculus and infinite sequences and series. Topics include definite and indefinite integration, the fundamental theorem of calculus, and the use of integration methods in the calculation of areas and volumes and other applications. Introduces improper integrals as well as the study of infinite sequences and series, power series, Taylor series, and techniques for determining convergence or divergence of sequences series. This course offers an in-depth overview of the above concepts and applies them to solve problems in science, engineering, and technology.

MTH 2110. Calculus 3. 3 Hours.

Extends concepts and problem-solving techniques of single-variable calculus to multivariate calculus. Employs techniques to evaluate higher-order differentiation and integration, including vector fields and vector calculus in 2D and 3D. Topics include lines and planes; 3D graphing; partial derivatives; the gradient, tangent planes, and local linearization; optimization; multiple integrals; line and surface integrals; the divergence theorem; and theorems of Green and Stokes with applications to science, engineering, and technology.

MTH 2120. Technical Math 1. 3 Hours.

Reviews topics of trigonometry, differential and integral calculus. Emphasis is placed on limits, continuity, derivatives and integrals of algebraic and transcendental functions of one variable. Upon completion, students should be able to select and use appropriate models and techniques for finding solutions to derivative-related problems with and without technology. This is an accelerated course for designed for Advanced Manufacturing Systems and Engineering Technology students.

MTH 2220. Technical Math 2. 3 Hours.

Continuation of MTH 2120. Focuses primarily on integral calculus and differential equations. Topics include definite and indefinite integration, the fundamental theorem of calculus, and the use of integration methods in the calculation of areas and volumes, ordinary differential equations, and Laplace transforms.

MTH 2300. Business Statistics. 3 Hours.

Offers students an opportunity to obtain the necessary skills to collect, summarize, analyze, and interpret business-related data. Covers descriptive statistics, sampling and sampling distributions, statistical inference, relationships between variables, formulating and testing hypotheses, and regression analysis in the context of business decision making.

MTH 2310. Statistics for the Behavioral and Social Sciences. 3 Hours.

Offers students an opportunity to obtain the necessary skills to collect, summarize, analyze, and interpret social and behavioral science data. Covers descriptive statistics, sampling and sampling distributions, statistical inference, relationships between variables, formulating and testing hypotheses, and regression analysis in the context of the social and behavioral sciences.

MTH 2400. Technology and Applications of Discrete Mathematics. 3 Hours.

Offers students experience with and exposure to ideas and techniques from discrete mathematics, which is at the foundation of the technological disciplines. Focuses on applications and practical use of discrete mathematics as it is applied to the computing sciences and engineering disciplines. Topics covered include sets; logic; Boolean algebra; machine representations of numbers (decimal, binary, octal, hexadecimal) and arithmetic; counting methods; graphs; and trees. Specific applications include algorithms and complexity, circuits and circuit diagrams, searching and sorting, networks, probability, and finite-state machines. Requires students to select and apply appropriate techniques from discrete math to address common problems found in modern technological systems, especially software and computing hardware design.

MTH 2500. Statistical Quality Control. 3 Hours.

Introduces statistical analysis and concepts related to engineering manufacturing quality control, including process capability, control charts, acceptance sampling, and process improvement. Other topics include Six Sigma, statistical and graphical data summaries, quality engineering, and quality design.

MTH 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MTH 3300. Applied Probability and Statistics. 3 Hours.

Covers randomness, finite probability space, probability measure, events; conditional probability, independence, Bayes' theorem; discrete random variables; binomial and Poisson distributions; concepts of mean and variance; continuous random variables; exponential and normal distribution, probability density functions, calculation of mean and variance; central limit theorem and implications for normal distribution; purpose and the nature of sampling; nature of estimates, point estimates, interval estimates; maximum likelihood, least-squares approach; confidence intervals; estimates for one or two samples; development of models and associated hypotheses; nature of hypothesis formulation, null and alternate hypotheses, testing hypotheses; test statistics: t-test, chi-squared test; correlation and regression; Markov processes, discrete time systems, and continuous time systems; queuing theory, including system simulation and modeling, queuing methods.

MTH 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MTH 4955. Project. 1-4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student's major field. May be repeated without limit.

MTH 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MTH 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MTH 7962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions.

Mathematics - CPS Specialty (MATM)

Search MATM Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=MATM>)

MATM 1120. Precalculus. 4 Hours.

Focuses on linear, polynomial, exponential, logarithmic, and trigonometric functions. Emphasis is placed on understanding, manipulating, and graphing these basic functions, their inverses and compositions, and using them to model real-world situations (that is, exponential growth and decay, periodic phenomena). Equations involving these functions are solved using appropriate techniques. Special consideration is given to choosing reasonable functions to fit numerical data.

MATM 1231. Calculus 1 for Business and Economics. 4 Hours.

Provides an overview of differential calculus including derivatives of power; exponential, logarithmic, logistic functions; and functions built from these. Derivatives are used to model rates of change, to estimate change, to optimize functions, and in marginal analysis. The integral calculus is applied to accumulation functions and future value. Emphasizes realistic business and economics problems, the development of mathematical models from raw business data, and the translation of mathematical results into verbal expression appropriate for the business setting. Also features a semester-long marketing project in which students gather raw data, model it, and use calculus to make business decisions; each student is responsible for a ten-minute presentation.

MATM 1341. Calculus 1 for Science and Engineering. 4 Hours.

Covers definition, calculation, and major uses of the derivative, as well as an introduction to integration. Topics include limits; the derivative as a limit; rules for differentiation; and formulas for the derivatives of algebraic, trigonometric, and exponential/logarithmic functions. Also discusses applications of derivatives to motion, density, optimization, linear approximations, and related rates. Topics on integration include the definition of the integral as a limit of sums, antidifferentiation, the fundamental theorem of calculus, and integration by substitution.

MATM 1342. Calculus 2 for Science and Engineering. 4 Hours.

Covers further techniques and applications of integration, infinite series, and introduction to vectors. Topics include integration by parts; numerical integration; improper integrals; separable differential equations; and areas, volumes, and work as integrals. Also discusses convergence of sequences and series of numbers, power series representations and approximations, 3D coordinates, parameterizations, vectors and dot products, tangent and normal vectors, velocity, and acceleration in space.

Mechanical and Industrial Engineering (MEIE)

Search MEIE Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=MEIE>)

MEIE 2000. Introduction to Engineering Co-op Education. 1 Hour.

Designed to introduce engineering students to the Cooperative Education program and assist them through self-assessment in relation to the engineering profession. Students have an opportunity to develop job search and career management skills and learn about the co-op program. Provides students with an introduction to how personality, values, skills and interests relate to their co-op search and shape their work experiences. Employer and student panels assist students exploring employment opportunities within the fields of Mechanical and Industrial Engineering. Also introduces students to the attributes of a global engineer and the possibility of working globally. .

MEIE 2949. Introductory Directed Research in Mechanical and Industrial Engineering. 4 Hours.

Offers an opportunity to pursue project and other independent inquiry opportunities under faculty supervision for first- and second-year students. The course is initiated with a student-developed proposal, including expected learning outcomes and research products, which is approved by a faculty member in the department. Permission of instructor required.

MEIE 3000. Professional Issues in Engineering. 1 Hour.

Provides students with an opportunity to reflect on both academic and co-op experiences in the context of planning for the senior year and beyond. Issues include professional and ethical issues, resolving ethical conflicts, awareness of engineers as professionals in a diverse world, strengthening decision-making skills, career portfolios, and lifelong learning needs, goals, and strategies. Students reflect upon issues of diversity from their experience in the University and in their cooperative education placements. Explores the role of different work and learning styles and diverse personal characteristics on the workplace and the classroom. Professional issues include impact of the cultural context, both in the United States and around the world, on the client, government relations, and the workplace.

MEIE 4701. Capstone Design 1. 1 Hour.

Offers the first in a two-course sequence that culminates the student's education and experience with the design process. Students form teams and are assigned their design project and faculty adviser. Projects can be industrially, departmentally, or externally sponsored. Students are expected to communicate with their faculty adviser, course coordinator, and sponsor using the Internet, teleconferencing, and other electronic methods. Topics include project management, ethics, cost analysis, Internet and library research methods, and engineering codes and standards. Students prepare written reports and make oral presentations. Students are expected to complete a thorough state-of-the-art report on their problem and a problem statement with specifications and requirements.

MEIE 4702. Capstone Design 2. 5 Hours.

Continues MEIE 4701. Students are expected to apply engineering principles acquired throughout their undergraduate academic and co-op experiences to the design of a system, component, or process. Each project includes the development and use of design methodology, formulation of design problem statements and specifications, consideration of alternative solutions, feasibility considerations, and detailed system descriptions. Projects include realistic constraints such as economic factors, safety, reliability, maintenance, aesthetics, ethics, and political and social impact. Students make oral presentations on their results in a series of design reviews. Students document their solutions using a written report that includes an executive summary. A working prototype or simulation, as appropriate, of their solution is required to complete the course.

MEIE 6800. Technical Writing. 0 Hours.

Seeks to provide graduate students with guidelines, tools, and strategies for improving their technical writing. Uses short in-class assignments to reinforce class concepts. Homework assignments related to the students' research offer students an opportunity to practice their skills and receive feedback on their writing. It is hoped that the work students produce is of direct benefit to themselves and their advisors by allowing students to write up their own research to date and have it critiqued in an organized way.

MEIE 6830. Graduate Traineeship 1, Technical Writing and Communications. 2 Hours.

Focuses on technical writing. Covers writing and preparation tips for technical papers. Includes effective communications, such as Ph.D. proposal preparation and presentation, and technical seminar presentation tips.

MEIE 6850. Research Seminar in Mechanical and Industrial Engineering. 0 Hours.

Offers a research seminar presenting topics of current interest in a variety of areas in mechanical and industrial engineering. May be repeated without limit.

MEIE 6860. Graduate Traineeship 2, Research Ethics and Professional Development. 2 Hours.

Focuses on responsible conduct of research, research misconduct (plagiarism, falsification, and fabrication), research ethics, and professional and personal development. Offers optional modules on grant proposal preparation, academic career preparation, faculty and professional jobs search, research and teaching statements preparation, how to become an effective teacher, mentorship, entrepreneurship, and industry insights and real-world experiences.

MEIE 6964. Co-op Work Experience. 0 Hours.

Provides eligible students with an opportunity for work experience. May be repeated without limit. .

MEIE 6965. Co-op Work Experience Abroad. 0 Hours.

Offers eligible students an opportunity for work experience abroad. May be repeated without limit. .

Mechanical Engineering (ME)

Search ME Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=ME>)

ME 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ME 2340. Introduction to Material Science. 4 Hours.

Introduces the materials science field, which emphasizes the structure-processing property-performance relationships for various classes of materials including metals, ceramics, polymers, electronic materials, and magnetic materials. Topics include crystallography, structure of solids, imperfections in crystals, mechanical properties, dislocation theory, slip, strengthening mechanisms, phase equilibrium, phase transformations, diffusion, thermal and optical physical properties, and electrical and magnetic properties. Issues associated with materials selection, including economic and environmental consequences of materials choices, are also addressed. Laboratory experiments, with written memo and report submissions, are required. Includes individual and team-based projects.

ME 2341. Lab for ME 2340. 1 Hour.

Accompanies ME 2340. Covers topics from the course through various activities.

ME 2350. Statics. 4 Hours.

Introduces the vector representation of force and moment, the equivalent force systems, free body diagrams, and equations of equilibrium.

Discusses centroids and center of gravity of rigid bodies. Examines applications to beams, trusses, and pin-connected frames and elementary concepts of friction. Discusses variation of internal forces and moments for beams and cable systems. Theory of dry friction is implemented in simple machine elements. Introduces the concepts of virtual work and potential energy. Includes a design project that demonstrates the fundamental concepts of equilibrium.

ME 2355. Mechanics of Materials. 4 Hours.

Discusses concepts of stress and strain; transformation of stress and strain at a point; stress-strain relations material properties; second moments of cross-sectional areas; stresses and deformations in simple structural members due to axial torsional, and flexural loading for statically determinate and indeterminate cases; design of beams under combined loading; and stability of structures and buckling of columns with various supports. Laboratory experiments and written reports are required.

ME 2356. Lab for ME 2355. 1 Hour.

Accompanies ME 2355. Covers topics from the course through various activities.

ME 2380. Thermodynamics. 4 Hours.

Defines and calculates thermodynamic properties such as energy, entropy, temperature, and pressure. Work and heat interactions are defined. The first and second laws of thermodynamics and concepts of thermodynamic equilibrium are introduced. Conservation of energy and mass and the entropy balance relation are discussed for open and closed systems. Irreversibility, energy, and the energy balance relation are introduced and applied in analyzing thermodynamic systems. Fundamentals of thermodynamics are used to model power generation and refrigeration systems. Covers thermodynamics of nonreacting gas mixtures with applications to air-water vapor mixtures for air-conditioning systems.

ME 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ME 3455. Dynamics. 4 Hours.

Investigates kinematics of rigid bodies in general plane motion. Introduces mass moment of inertia; kinetics of rigid bodies by using force-mass-acceleration, work and energy, and impulse and momentum methods; and free and forced vibration of undamped and damped systems. Treats the kinematics and kinetics of particles by using force, mass and acceleration, and energy and momentum methods.

ME 3456. Lab for ME 3455. 1 Hour.

Accompanies ME 3455. Covers topics from the course through various activities.

ME 3460. Robot Dynamics and Control. 4 Hours.

Covers fundamental components and mechanisms of robotic systems and their multidisciplinary nature. Introduces the robot's kinematics, dynamics, and control. Presents a quick overview of forward and inverse kinematics, robot dynamics, as well as path planning and control techniques. Topics also include dynamic modeling and analysis of mechanically, electrically, and magnetically driven hydraulic and pneumatic drives; kinematics and motion analysis of linkages; as well as sensing technologies (e.g., position, linear and angular displacements, velocity and acceleration, force and torque sensors) used in robotic systems. Presents kinematics and control of automatic machinery and manufacturing processes, automatic assembly, and inspection robotic systems as representative examples.

ME 3465. Introduction to Flight. 4 Hours.

Presents the fundamentals of aerospace engineering at the introductory level. Covers historical developments and background associated with aerospace engineering in parallel with technical discussions. Introduces thermodynamic analyses of flowing gasses and derivations of the governing equations accompanying the anatomy of airplanes and space vehicles. Studies basics of fluid dynamics such as continuity, momentum and energy equations, and isentropic flows. Discusses shapes, designs, characteristics, and usage of different aerodynamic shapes and their corresponding lift, drag, and momentum coefficients. Explores the elements of airplane performance in level flight, takeoff, and landing. Covers the introduction to the dynamics of flight, stability, and control of the airplanes and astronautic vehicles. Designed for students interested in an introductory course in aerospace engineering and the fundamentals and historical traditions of aerodynamics of flight.

ME 3470. Aeronautical Propulsion. 4 Hours.

Introduces basics for the analysis and design of aircraft engines and reviews the history of gas turbine engines. Introduces general conservation laws of mass, energy, and momentum for compressible flows and application to quasi-one-dimensional internal flows and shock waves in external flows. Reviews thrust and thermodynamic performance of the engines. Discusses designing parameters of the inlets in detail. Uses the principles of chemical equilibrium to calculate the composition of combustion products in a chemical reaction to find flame temperature and energy release, which drive the design of combustors and afterburners. Introduces physics and aerodynamics of compressors and turbines, and reviews basics of gas turbine blades cooling.

ME 3475. Fluid Mechanics. 4 Hours.

Studies fundamental principles in fluid mechanics. Topics include hydrostatics (pressure distribution, forces on submerged surfaces and buoyancy); Newton's law of viscosity; dimensional analysis; integral forms of basic laws (conservation of mass, momentum, and energy); pipe flow analysis; differential formulation of basic laws including Navier-Stokes equations; and the concept of boundary layer and drag coefficient. Includes a team-based independent project.

ME 3480. International Applications of Fluid Mechanics. 4 Hours.

Studies fundamental principles in fluid mechanics in an international setting. Students have an opportunity to travel to a foreign locale to develop theoretical understanding while experiencing the issues that affect applications of fluids engineering in a culture and environment different from their own. Topics include hydrostatics (pressure distribution, forces on submerged surfaces, and buoyancy); Newton's law of viscosity; dimensional analysis; integral forms of basic laws (conservation of mass, momentum, and energy); pipe flow analysis; differential formulation of basic laws including Navier-Stokes equations; and the concept of boundary layer and drag coefficient. Includes a team-based independent project that focuses on applications that allow students to delve into issues that affect engineering and technology development in their host country.

ME 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ME 4505. Measurement and Analysis with Thermal Science Application. 4 Hours.

Introduces basic measurements and data analysis techniques. Offers students an opportunity to become familiar with various types of measurement systems and to set up and perform experiments according to a given procedure. Covers basic measurement methods of rotational frequency; temperature, pressure, and power; and analog-to-digital conversion techniques and data acquisition. Data analysis topics include statistical analysis of data, probability and inherent uncertainty, basic measurement techniques, primary and secondary standards, system response characteristics, and computerized data acquisition methods. Includes experiments in thermodynamics, fluid mechanics, and heat transfer. Topics include cycle performance, flow discharge coefficient and heat transfer coefficient measurements, and psychometric applications in the air-conditioning field.

ME 4506. Lab for ME 4505. 1 Hour.

Accompanies ME 4505. Covers topics from the course through various activities.

ME 4508. Mechanical Engineering Computation and Design. 4 Hours.

Highlights the role of finite element analysis in product development. Introduces the theory of finite elements in elastic/plastic, static, and transient problems. Emphasis is on solid modeling in design using available commercial finite element software. Also covers other numerical techniques such as finite difference schemes in the solution of systems of partial differential equations, and numerical solution to systems of linear and nonlinear equations.

ME 4520. Mechanical Vibration. 4 Hours.

Covers concepts in mechanical vibration analysis. Topics include basic concepts of vibrations, vibration problems vs. dynamic problems, linear vs. nonlinear vibrations, vibrational elements, harmonic motion; free vibration of undamped SDOF systems, stability, Rayleigh's energy method, free vibration of viscously damped SDOF systems, free vibration of damped SDOF systems with Coulomb and hysteretic damping; harmonically forced SDOF systems, harmonic motion of base and rotating unbalance, forced vibrations of Coulomb-damped and hysteresis-damped SDOF systems, general (nonperiodically) forced vibrations; free and forced vibrations of 2 DOF systems, damped vibrations, general eigenvalue problem, vibration measuring instruments; tuned vibration absorbers, passive and active vibration absorbers, vibration-control systems (passive, semiactive, and active), modal analysis software, and illustrative examples.

ME 4550. Mechanical Engineering Design. 4 Hours.

Explores development of the mechanical design process and its open-ended nature. Reviews fundamentals of stress and theories of failure including fatigue considerations in the analysis of various machine components. Treatment is given to shafts, springs, screws, connections, lubrications, bearings, gears, and tolerances. Includes team-based design projects that involve modeling and the design process.

ME 4555. System Analysis and Control. 4 Hours.

Presents the theoretical backgrounds for the analysis and design of simple feedback control systems, differential equations, and Laplace transforms. Treats system modeling, linear approximations, transfer functions, and block diagrams; and transient and frequency response and stability-frequency domain and root locus methods. Other topics may include linear systems with time lag and relay servomechanisms with small nonlinearities.

ME 4565. Introduction to Computational Fluid Dynamics. 4 Hours.

Introduces numerical methods applied to solve fluid flow problems. Includes basic mathematics and physics related to computational fluid dynamics (CFD), together with practical assignments that use commercial CFD packages. Emphasizes finite difference and finite volume methods. Other topics include mathematical properties of partial differential equations, accuracy and stability analysis of numerical solution, CFD verification and validation, application to variety of fluid dynamics problems, grid generation, and turbulence modeling.

ME 4570. Thermal Systems Analysis and Design. 4 Hours.

Introduces theories of thermal energy transport, including conduction, convection, and thermal radiation, and the design of thermal systems. Solution methods are developed for steady-state and transient conduction problems including thermal circuit analogies, internal energy sources and extended surfaces. Convective heat transfer mechanisms are introduced and correlations to evaluate the heat transfer coefficient are discussed. Methodologies for calculating the thermal radiation heat transfer between surfaces are introduced. These theories are integrated with thermodynamics and fluid mechanics in the design of thermal systems, including heat exchangers. Includes an open-ended design project and students are expected to use computational methods throughout the course.

ME 4630. Ceramic Science and Engineering. 4 Hours.

Examines the structure-property relationship of ceramics, focusing mostly on modern engineered ceramics and glasses. Ceramics are broadly defined as materials that are inorganic and nonmetallic and so encompass an extremely broad range of materials and material properties. Discusses their structures from the atomic through the microstructural level and properties from across the thermal, mechanical, optical, electrical, and chemical spectrum. Considers the ideal crystalline and glassy structures, as well as the crucial role of point, linear, and planar defects. Relates phase equilibria and transformations to a survey of modern techniques for ceramic and glass fabrication.

ME 4640. Mechanical Behavior and Processing of Materials. 4 Hours.

Continues studies of the physical basis for the mechanical behavior of solid materials including elasticity, plasticity, viscoelasticity, fracture, fatigue, and creep properties. Also covers materials processing and includes casting, forming, joining, and machining.

ME 4670. Internal Combustion Engine. 4 Hours.

Presents the concepts and theories of operation of internal combustion engines based upon the fundamental engineering sciences of thermodynamics, gas dynamics, heat transfer, and mechanics. Discusses the design and operating characteristics of conventional spark-ignition, compression-ignition, Wankel, and stratified charge. Explores the relationship between vehicle load and engine load through differential and transmission gear-ratio selections. Includes laboratory experiments.

ME 4699. Special Topics in Mechanical Engineering. 4 Hours.

Focuses on an advanced mechanical engineering project agreed upon between the student and instructor. May be repeated without limit.

ME 4970. Junior/Senior Honors Project 1. 4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student's major field. Combined with Junior/Senior Project 2 or college-defined equivalent for 8-credit honors project. May be repeated without limit.

ME 4971. Junior/Senior Honors Project 2. 4 Hours.

Focuses on second semester of in-depth project in which a student conducts research or produces a product related to the student's major field. May be repeated without limit.

ME 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ME 4991. Research. 4 Hours.

Offers an opportunity to conduct research under faculty supervision.

ME 4992. Directed Study. 1-4 Hours.

Offers theoretical or experimental work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

ME 5240. Computer Aided Design and Manufacturing. 4 Hours.

Covers basic aspects of computer graphics and CAD/CAM. Topics include hardware and software concepts, generic structure of CAD/CAM software and its modules, and CAD/CAM database structure. Also covers the parametric representations of curves, surfaces, solids, and features that are widely used in existing commercial CAD/CAM systems. Discusses geometrical transformations, CAD/CAM data exchange formats, prototyping techniques, and PDM. Presents applications such as mass properties calculations, assemblies, mechanical tolerancing, simulation, finite element mesh generation, process planning and CAPP, CNC part programming, and Web-based CAD/CAM.

ME 5245. Mechatronic Systems. 4 Hours.

Covers integration of electronic/electrical engineering, computer technology, and control engineering with mechanical engineering to provide a self-contained, modern treatment of mixed systems along with their computer simulation and applications. Topics include mixed-systems integration; sensors, actuation systems; brief overview of dynamic systems modeling, response characterization, and closed-loop controllers; interfacing; data presentation systems and processes; microprocessors; real-time monitoring and control; and applications of mechatronic systems. The course also offers numerous MATLAB/Simulink examples of select mechatronic systems and devices along with open-ended design projects and assignments.

ME 5250. Robot Mechanics and Control. 4 Hours.

Covers kinematics and dynamics of robot manipulators, including the development of kinematics equations of manipulators, the inverse kinematics problem, and motion trajectories. Employs Lagrangian mechanics to cover dynamics of manipulators for the purpose of control. Covers control and programming of robots, steady state errors, calculations of servoparameters, robot vision systems and algorithms, as well as imaging techniques and the concept of mobile robots.

ME 5374. Special Topics in Mechanical Engineering. 4 Hours.

Offers topics of current interest in mechanical engineering.

ME 5600. Materials Processing and Process Selection. 4 Hours.

Covers the fundamentals and usage of processes and techniques for bulk, thick film, thin film, and patterned structures. Covers techniques for improvement of mechanical or functional properties, for reliability, or for operation in harsh environments. Includes case studies for which processes are selected based on efficacy, material input, and cost. Systems studied include biocompatible implants and materials for the telecommunication, semiconductor, energy, and aerospace industries.

ME 5620. Fundamentals of Advanced Materials. 4 Hours.

Offers a deep dive into the interdisciplinary field of materials science that addresses the discovery, design, and prediction of new materials, with an emphasis on solids. Offers students an opportunity to gain knowledge and practice in issues of materials science. Consists of fundamentals, properties (emphasis on electronic properties), applications, and advanced topics. Provides specific readings from the literature assigned to support the in-class lectures. Offers a variety of opportunities to practice and demonstrate comprehension and learning.

ME 5645. Environmental Issues in Manufacturing and Product Use. 4 Hours.

Explores environmental and economic aspects of different materials used in products throughout the product life cycle. Introduces concepts of industrial ecology, life cycle analysis, and sustainable development. Students work in teams to analyze case studies of specific products fabricated using metals, ceramics, polymers, or paper. These case studies compare cost, energy, and resources used and emissions generated through the mining, refining, manufacture, use, and disposal stages of the product life cycle. Debates issues in legislation (extended product responsibility, recycling mandates, and ecolabeling) and in disposal strategies (landfill, incineration, reuse, and recycling). Discusses difficulties associated with environmental impact assessments and the development of decision analysis tools to weigh the tradeoffs in technical, economic, and environmental performance, and analyzes specific case studies.

ME 5650. Advanced Mechanics of Materials. 4 Hours.

Covers stress, strain, and deformation analysis of simple structures including beams, plates, and shells. Topics include classical theory of circular and rectangular plates; combined effects of bending and in-plane forces; buckling of plates; effects of shear deformation and of large deflections; membrane theory of shells; analysis of cylindrical shells; introduction to energy methods with applications to beams, frames, and rings; Ritz method; and the concept of stability as applied to one and two degree-of-freedom systems buckling of bars, frames, and rings. Permission of instructor required for undergraduate students.

ME 5655. Dynamics and Mechanical Vibration. 4 Hours.

Covers dynamic response of discrete and continuous media. Topics include work and energy, impulse and momentum, Lagrangian dynamics, free and forced response to periodic and transient excitations, vibration absorber, free and forced response of multiple degree-of-freedom systems with and without damping, method of modal analysis, vibrations of continuous media such as extensional, torsional, and bending vibrations of bars, and approximate methods of analysis. Permission of instructor required for undergraduate students.

ME 5657. Finite Element Method. 4 Hours.

Focuses on numerical techniques for solving engineering problems. Topics include introduction to the finite element method; methods of approximations and variational methods; Rayleigh-Ritz method and Galerkin formulation; interpolation functions; truss, beam, plate, shell, and solid elements; stiffness matrix and assembly of element equations; application of finite element method in fluid and heat transfer problems; linear, nonlinear, and transient problems; numerical integration and methods of solving systems of equations for static and dynamic problems; and use of a finite element general-purpose commercial package. Permission of instructor required for undergraduate students.

ME 5659. Control Systems Engineering. 4 Hours.

Covers concepts in design and control of dynamical systems. Topics include review of continuous-time system modeling and dynamic response; principles of feedback, classical and modern control analyses, and design techniques such as root locus, frequency response (e.g., Bode plots and Nyquist Criteria), and state-space feedback; dynamic analysis, design, and control of electromechanical systems; block diagram algebra or signal-flow graphs, effects of poles and zeros on system response characteristics; principles of controllability, observability, observer designs, and pole placement techniques; introduction to adaptive and learning control and digital implementation of control algorithms.

ME 5665. Musculoskeletal Biomechanics. 4 Hours.

Using a three-part format, emphasizes the quantitative analysis of human musculoskeletal system statics and dynamics, including, in part I, gait analysis and estimation of the complex loads on human joint systems. Investigates how the form of connective tissue and bone is derived from function in part II, including a quantitative analysis of the material properties of bone, ligament, tendon, and cartilage. Working in groups in part III, students select and investigate a relevant, current topic in musculoskeletal biomechanics and present their findings to the class. Requires prior completion of an undergraduate course in biomechanics (Northeastern's BIOE 2350 or equivalent). Permission of instructor required for undergraduate students.

ME 5685. Solar Thermal Engineering. 4 Hours.

Develops a model for the hourly direct and diffuse radiation under a cover of scattered clouds and the transmission and absorption of this radiation by passive and active systems. Considers the design of air heating systems and the storage of the collected energy by a pebble bed, and considers elements of heater exchanger design. Makes a study of the economics of a domestic water and/or space heating system using f-chart analysis. Requires prior completion of ME 4570 or equivalent.

ME 5690. Gas Turbine Combustion. 4 Hours.

Offers students an opportunity to obtain an understanding of the basic physical, chemical, and aerodynamic processes associated with combustion in gas turbine engines and their relevance to combustor design and performance in applications ranging from aeronautical to power generation. Topics include the history and evolution of gas turbine engines, thermodynamic cycles, conventional and alternative aviation fuels, combustion fundamentals, fuel injection and atomization, advanced wall cooling techniques, mechanisms of combustion noise and approaches to noise control, and design and performance for ultra-low emissions.

ME 5695. Aerodynamics. 4 Hours.

Focuses on topics of practical importance in applications of fluid mechanics to external flows over bodies. Covers compressible flow analysis in order to use the concepts of sound speed and Mach number and to design subsonic and supersonic nozzles, diffusers, and airfoils. Introduces normal and oblique shock waves and the Prandtl-Meyer expansion applied to supersonic flows over bodies and surfaces. Discusses Rayleigh and Fanno flows. Studies and applies the Bernoulli equation and potential flow theory to external flow analyses and the theory of lift generation on airfoils.

ME 5978. Independent Study. 1-4 Hours.

Offers theoretical or experimental work under individual faculty supervision. May be repeated without limit.

ME 5984. Research. 1-4 Hours.

Offers an opportunity to conduct research under faculty supervision. May be repeated without limit.

ME 6200. Mathematical Methods for Mechanical Engineers 1. 4 Hours.

Focuses on ordinary differential equations (ODEs) with mechanical engineering applications, linear algebra, and vector analysis. Topics include Laplace transform, power series, Fourier series, numerical methods for ODEs, matrices, finite dimensional linear vector spaces, eigenvalue problems, applications to systems of ODEs, vector field theory, curvilinear coordinates, and integral theorems.

ME 6201. Mathematical Methods for Mechanical Engineers 2. 4 Hours.

Focuses on partial differential equations with applications to mechanical engineering. Includes function spaces; Sturm-Liouville theory; eigenfunction expansions; special functions; potential theory; solution of elliptic, parabolic, and hyperbolic PDEs using separation of variables; eigenfunction expansions, transform methods, and numerical methods.

ME 6260. Introduction to Microelectromechanical Systems (MEMS). 4 Hours.

Provides an introduction to microelectromechanical systems including principles of sensing and actuation, microfabrication technology for MEMS, noise concepts, and packaging techniques. Covers a wide range of disciplines, from electronics to mechanics, material properties, microfabrication technology, electromagnetics, and optics. Studies several classes of devices including inertial measurement devices, pressure sensors, rf components, and optical MEMS. Devotes the last third of the semester largely to design projects, involving design of MEMS devices to specifications in a realistic fabrication process.

ME 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ME 7205. Advanced Mathematical Methods for Mechanical Engineers. 4 Hours.

Covers applications to applied mechanics and thermal science problems in advanced engineering applications. Topics may include complex variables, analytic functions, Laurent and Taylor series, singularities, branch points, and contour integration. Additional topics may include generalized functions and integral transforms; variational calculus and applications; and approximate methods of engineering analysis, including asymptotic expansions, perturbation methods, and weighted residual methods.

ME 7210. Elasticity and Plasticity. 4 Hours.

Covers stress and strain analysis in continuous media. Analyzes Cartesian tensors using indicial notation; stress and strain concepts; point stress and strain; relation to tensor concepts; equations of equilibrium and compatibility; constitutive laws for elastic, general, axisymmetric, plane stress, and plane strain formulations and solutions; the relation of elasticity to structural mechanics theories; physical basis of plastic/inelastic deformation of solids; and constitutive descriptions of plasticity including yielding, hardening rules, Prandtl-Reuss constitutive laws, and viscoplasticity.

ME 7220. Mechanics of Contact and Lubrication. 4 Hours.

Covers issues related to friction, wear, and lubrication of contacting surfaces. Topics include brief review of elasticity, fluid mechanics and probability theory, characterization of engineering surfaces, standard surface topography descriptors, Gaussian and fractal characterization of surface topography, surface profilers, contact mechanics, Hertzian contact, contact of rough surfaces, real area of contact, empirical contact formulas, rolling contact, friction of solids, wear mechanisms, theory of lubrication, compressible and incompressible Reynolds equation, effects of slip flow, classification of bearing types, elastohydrodynamic lubrication, foil bearings, and boundary lubrication.

ME 7232. Theory of Plates and Shells. 4 Hours.

Covers the mechanics of plates using classical theory (cylindrical bending, rectangular plates, and circular plates) and plate theory with shear deformation. Includes combined effects of bending and in-plane forces, buckling of plates, moderately large deflections, membrane theory of shells, analysis of thin cylindrical shells of revolution, and general theory of thin elastic shells.

ME 7238. Advanced Finite Element Method. 4 Hours.

Focuses on advanced techniques for solving engineering problems with the finite element method. Topics include review of finite element method; solution of linear and nonlinear algebraic problems; solution of dynamics problems; solution of contact problems using penalty and Lagrange multiplier methods; solution of nonlinear beams, plates, and shells; finite element formulations of solid continua including Lagrangian and updated Lagrangian formulations, material nonlinearities, and use of a commercially available finite element package.

ME 7245. Fracture Mechanics and Failure Analysis. 4 Hours.

Explores the fundamentals of fracture and failure of materials. Includes Orwan and Griffith theory of fracture, energy release rate and stress intensity factor as fracture parameters, fracture toughness and its determination, crack growth resistance, R curve, crack opening displacement, J integral methodology, prediction of fatigue crack growth using fracture mechanics, test for measurement of fatigue crack growth parameters, optical fractography in failure analysis, overview of nonlinear fracture mechanics, probabilistic method for fracture prediction for ceramic materials with random populations of microscopic flaws, and application of fracture mechanics in failure analysis.

ME 7247. Advanced Control Engineering. 4 Hours.

Reviews topics from modern control engineering and characteristics of nonlinear systems. Covers fundamentals of Lyapunov theory and stability analysis as well as nonlinear feedback control systems using the Lyapunov method. Includes an introduction to advanced topics: variable structure system control, adaptive control-system analysis and design, robust adaptive control, and optimal and digital control. Requires prior completion of ME 5659 or a graduate-level course in modern control.

ME 7253. Advanced Vibrations. 4 Hours.

Covers advanced concepts in mechanical vibration analysis. Topics include introduction to variational approach and energy methods applied to motions of deformable body in three dimensions; vibrations of distributed-parameters systems including strings, bars, shafts, beams, membranes, and plates. Covers approximate methods, Rayleigh's Quotient, Rayleigh-Ritz method, method of functions expansion, Galerkin's and assumed mode methods, design and analysis of a variety of vibration-control systems, and recent advances in vibration of micro- and nanoscale systems. Permission of instructor required for undergraduate students.

ME 7255. Continuum Mechanics. 4 Hours.

Covers the stresses, strains, and displacements in general continuous media. Topics include vector and tensor calculus; definitions of stress, strain, and deformation; kinematics of a continuous medium; material derivatives; rate of deformation tensor, finite strain, and deformation; Eulerian and Lagrangian formulations; geometric measures of strain; relative deformation gradient, rotation, and stretch tensors; compatibility conditions; general principles; conservation of mass; momentum principles; energy balance; and principle of virtual displacements.

ME 7270. General Thermodynamics. 4 Hours.

Examines fundamentals of equilibrium thermodynamics. Topics include work, energy, heat, temperature, available energy, entropy, first and second law of thermodynamics, simple systems, closed and open systems, availability loss and irreversibility, heat engines, multicomponent systems, mixtures of gases, chemical reactions, and chemical equilibrium.

ME 7275. Essentials of Fluid Dynamics. 4 Hours.

Offers a fundamental course in fluid dynamics designed to prepare the student for more advanced courses in the thermofluids curriculum while providing a strong background in fluid mechanics. Topics include Cartesian tensors; differential and integral formulation of the equations of conservation of mass, momentum, and energy; molecular and continuum transport phenomena; the Navier-Stokes equations; vorticity; inviscid incompressible flow, the velocity potential, and Bernoulli's equation; viscous incompressible flow; the stream function; some exact solutions; energy equation including heat conduction and viscous dissipation, low Reynolds number flow, exact and approximate approaches to laminar boundary layers in high Reynolds number flows, stability of laminar flows and the transition to turbulence, and treatment of incompressible turbulent mean flow; and internal and external flows.

ME 7278. Complex Fluids. 4 Hours.

Covers the physical phenomena in complex fluids, including polymeric liquids, structured fluids, and cells and biofluids undergoing deformation and flow. Focuses on kinematics and material functions for complex fluids; techniques of viscometry, rheometry, and linear viscoelastic measurements for such fluids; mathematical expressions and constitutive laws describing rich and complex behavior of complex fluids under different flow conditions; continuum mechanics frame invariance and convected derivatives for finite strain viscoelasticity; differential and integral constitutive equations for viscoelastic fluids; the roles of non-Newtonian behavior, linear viscoelasticity, and time- and rate-dependent properties of a wide range of fluids, from cells and saliva, to oil and polymers, with examples on normal stresses; elastic recoil; stress relaxation in processing flows; molecular theories for dynamics of complex fluids; and more.

ME 7280. Statistical Thermodynamics. 4 Hours.

Provides insight into the laws of classical thermodynamics and the behavior of substances. Topics include introduction to probability; ensemble theory, elementary kinetic theory of an ideal gas including the distribution of molecular velocities, and the mean free path treatment of transport properties; classical statistics of independent particles, equipartition of energy, the partition function, and laws of thermodynamics; some results from quantum mechanics, quantum statistics of independent particles; applications to gases; and systems of interacting particles.

ME 7285. Heat Conduction and Thermal Radiation. 4 Hours.

Emphasizes analytical techniques in conduction and radiative transfer. Topics include formulation of steady- and unsteady-state one-dimensional and multidimensional heat conduction problems, solution techniques for linear problems including the method of separation of variables, Laplace transforms and integral transforms, approximate analytical methods, phase change problems, and nonlinear problems. Offers an introduction to thermal radiation heat transfer including the electromagnetic background of radiation, nature of thermal radiation, radiation intensity, black body intensity, and radiation through nonparticipating media. Discusses the fundamentals of radiation in absorbing, emitting, and scattering media including the equation of radiative transfer with methods of solution, pure radiative transfer in participating media, and interaction of radiation with conduction and/or convection. Requires undergraduate heat transfer course.

ME 7290. Convective Heat Transfer. 4 Hours.

Focuses on the fundamental equations of convective heat transfer including heat transfer in incompressible external laminar boundary layers, integral boundary layer equations, laminar forced convection in internal flows, and turbulent forced convection in internal and external flows. Develops analogies between heat and momentum transfer including the Reynolds, Taylor, and Martinelli analogies. Covers natural convection, heat transfer in high-speed flow, and transient forced convection.

ME 7295. Multiscale Flow and Transport Phenomena. 4 Hours.

Covers the fundamentals of flow and transport phenomena in multiscale systems. Begins with an overview of momentum, energy, and mass transport phenomena, emphasizing microscale phenomena such as the slip flow regime. Introduces other driving forces and transport processes relevant to microscale flows, such as surface tension (capillarity) and electrokinetics. These basic concepts provide the preamble for the presentation of the more complex multiphase and porous flow transport behavior. This course material is supplemented with class projects and presentations by the students. Requires knowledge of thermodynamics, fluid mechanics, and heat transfer.

ME 7300. Combustion and Air Pollution. 4 Hours.

Deals with the formation of pollutants during combustion processes and their subsequent transformations in the atmosphere. Emphasis is on the effects of design and operating parameters of combustion devices on the nature and composition of exhaust gases, improvements, postcombustion treatment of effluent gases, atmospheric chemistry, and atmospheric transport of pollutants, smog formation, acid rain, ozone formation, and destruction.

ME 7305. Fundamentals of Combustion. 4 Hours.

Provides an advanced course that is a comprehensive treatment of the problems involved in the combustion of liquid, gaseous, and solid fuels in both laminar and turbulent flow. Discusses the fundamentals of chemical kinetics. Examines the equations for the transport of mass, momentum, and energy with chemically reacting gases. Topics include diffusion and premixed flames, combustion of droplets and sprays, and gasification and combustion of coal.

ME 7310. Computational Fluid Dynamics with Heat Transfer. 4 Hours.

Offers an advanced course in numerical methods applied to fluid flows with heat transfer. Topics include finite difference and finite volume methods for solving partial differential equations, with particular emphasis on the equations of fluid dynamics and heat transfer. Other topics include mathematical properties of partial differential equations, accuracy and stability analysis of numerical solutions, applications to a variety of fluid dynamics and heat transfer problems, grid generation, and an introduction to turbulence modeling. Requires knowledge of computer programming.

ME 7374. Special Topics in Mechanical Engineering. 4 Hours.

Offers topics of interest to the staff member conducting this class for advanced study. May be repeated without limit.

ME 7440. Mechanical Engineering Leadership Challenge Project 1. 4 Hours.

Offers students an opportunity to develop and present a plan for the demonstration of a marketable technology product or prototype with a mechanical engineering focus. Constitutes the first half of a thesis-scale project in technology commercialization. Requires work/training with a sponsoring organization or employer to improve a process or develop a project that is of significant value to the organization and demonstrates a quantifiable market impact while enhancing the student's technological and engineering depth and fostering the student's leadership development.

ME 7442. Mechanical Engineering Leadership Challenge Project 2. 4 Hours.

Continues ME 7440, a thesis-scale project in technology commercialization. Offers students an opportunity to demonstrate their development of a marketable technology product or prototype with a mechanical engineering focus and to produce a written documentary report on the project to the satisfaction of an advising committee. Requires work/training with a sponsoring organization or employer to improve a process or develop a project that is of significant value to the organization and demonstrates a quantifiable market impact while enhancing the student's technological and engineering depth and fostering the student's leadership development.

ME 7945. Master's Project. 4 Hours.

Offers theoretical or experimental work under individual faculty supervision.

ME 7962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ME 7978. Independent Study. 1-4 Hours.

Offers theoretical or experimental work under individual faculty supervision. An independent study must be petitioned and approved by the academic advisor. The petition must clearly state the reason for taking the course; a brief description of goals; as well as the expected outcomes, deliverables, and grading scheme. Master's degree students in thesis or project options are not eligible to take independent study.

ME 7990. Thesis. 1-8 Hours.

Offers analytical and/or experimental work conducted under the direction of the faculty in fulfillment of the requirements for the degree. Requires first-year students to attend a graduate seminar program that introduces the students to the methods of choosing a research topic, conducting research, and preparing a thesis. Requires successful completion of the seminar program. May be repeated without limit.

ME 7996. Thesis Continuation. 0 Hours.

Continues thesis work conducted under the supervision of a departmental faculty member.

ME 8960. Candidacy Preparation—Doctoral. 0 Hours.

Offers students an opportunity to prepare for the PhD qualifying exam under faculty supervision. Intended for students who have completed all required PhD course work and have not yet achieved PhD candidacy; students who have not completed all required PhD course work are not allowed to register for this course. May be repeated once.

ME 8986. Research. 0 Hours.

Offers students an opportunity to conduct full-time research under faculty supervision. May be repeated without limit.

ME 9000. PhD Candidacy Achieved. 0 Hours.

Indicates successful completion of program requirements for PhD candidacy.

ME 9986. Research. 0 Hours.

Offers students an opportunity to conduct full-time research under faculty supervision. May be repeated without limit.

ME 9990. Dissertation. 0 Hours.

Offers dissertation supervision under individual faculty supervision. May be taken twice for course credit. May be repeated once.

ME 9996. Dissertation Continuation. 0 Hours.

Offers continuing dissertation supervision under individual faculty supervision. May be repeated without limit.

Mechanical Engineering Technology - CPS (MET)

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MET 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MET 2000. Engineering Computer-Aided Design and Tolerance Analysis. 3 Hours.

Covers design topics relative to the creation, modification, analysis, and optimization of engineering components and assemblies with extensive use of selected computer-aided design software (CAD). Concentrates on the use of contemporary parametric and/or explicit CAD modeling, management of associative relationships between geometries, and digital prototyping. Studies the role of CAD in product development and product life-cycle management. Involves extensive hands-on practice using commands and featured capabilities of the selected CAD software and completion of individual or team design projects. Projects focus primarily on mechanical systems design. Emphasizes accurate dimensioning, symbol interpretation, and accurate tolerancing of digital designs. Also includes introductory topics of graphical analysis of mechanical stress of elements and assemblies.

MET 2020. Computer Solid Modeling and Virtual Simulation. 3 Hours.

Offers students an opportunity to use computer-aided design tools to perfect, optimize, and simulate functioning of digital engineering designs. Concentrates on 3D solid modeling, structural and thermal graphical analysis, and virtual simulation of digital elements and assemblies. Applies featured capabilities of selected modern CAD software to a host of different mechanical engineering applications, and investigates optimization of designs through virtual experimentation and testing of design parameters including durability, cost, static and dynamic response, assembly motion, and graphical analysis of mechanical stresses. Requires completion and presentation of advanced and comprehensive individual or team-based CAD projects.

MET 2040. Engineering Manufacturing Process. 3 Hours.

Introduces technologic and economic aspects of engineering that require application of physical and chemical processes to alter properties, geometry, and appearance of a given starting material and transform it into parts, devices, or products. Discusses typical engineering materials used in manufacturing and shaping; metal forming and sheet metal working; machining operations; and joining, molding, and assembling processes such as welding, brazing, and fastening. Introduces fundamental principles of rapid prototyping and advanced manufacturing including numerical control 2, lithography, and product inspection and quality. This is an introductory course. Involves demonstrations of manufacturing processes in the lab and development of small manufacturing projects with opportunities for students to learn the characteristics and use of typical manufacturing machinery such as welders, lathes, milling machines, and CNC equipment.

MET 2100. Mechanics 1: Statics. 3 Hours.

Introduces the fundamental concepts and principles needed to analyze the mechanical equilibrium of engineering systems. Topics include Newton's fundamental laws, systems of units, vector operations, forces, mechanical equilibrium of particles and rigid bodies, moments of forces, moments of couples, free-body diagrams, 2D and 3D equilibrium of bodies, centers of gravity, centroids, concentrated and distributed loads, analysis of mechanical structures, dry friction, moments of areas and inertia, and an introduction to the concepts and definitions of mechanical work and potential energy.

MET 2200. Mechanics 2: Dynamics. 3 Hours.

Expands and uses the underlying principles and concepts of Newtonian mechanics to study, analyze, and solve problems relative to mechanical systems in motion. Explores approaches to analyze motion both neglecting and considering the cause of motion and their relationship to the design of engineering systems. Discusses subjects pertaining to the study of kinematics and dynamics of particles and rigid bodies in detail. Topics include linear, curvilinear, and rotational motion of particles and rigid bodies, as well as conservation principles and concepts and inherent definitions for the analysis and design of dynamic systems such as velocity, acceleration, linear and angular momentum, impulse, forces, work, kinetic and potential energy, total mechanical energy, and power.

MET 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MET 3100. Engineering Stress Analysis. 3 Hours.

Covers theoretical principles and methods for analyzing and quantifying mechanical stresses in members and systems subjected to loads. Studies the effects of axial, transversal, and torsional loads, such as elongation, deflection, twisting, buckling, and rupture. Allowable loads and mechanical properties of engineering materials are concatenated to the concept and the prediction of mechanical failure. Covers normal, shear, bearing, and torsional stresses and strains, as well as methods to design mechanical elements by examining their condition of load and the ability of materials to withstand stresses. Concentrates on stresses within the elastic region of mechanical behavior, and includes factors of safety, thermal stresses, geometric concentration of stresses, combined stresses, and theories of failure.

MET 3101. Lab for MET 3100. 2 Hours.

Accompanies MET 3100. Relates the concepts, theoretical principles, and problem-solving techniques to real-life conditions via experimental activity performed in a lab. A variety of elements, components, and systems are subjected to tensile, compressive, torsional, and bending loads in order to quantify the strength of the materials involved and identify and characterize the associated types of failure experimentally. Seeks to reinforce comprehension of theoretical concepts imparted in the lectures about stress, strain, and parameters associated with mechanical failure.

MET 3200. Fluid Mechanics. 3 Hours.

Studies underlying concepts, principles, and definitions relative to the behavior of fluids at rest and in motion. Covers physical properties of fluids, distribution of force and static pressure on walls containing fluids, and buoyancy and stability in submerged or floating bodies in static fluids. Studies principles, definitions, and characterization of fluid flow, the effect of moving flows in submerged bodies, and foundations of aerodynamics. Discusses approaches to solving engineering problems involving fluids in motion and applicability of principles of fluid flow in analysis, design, and/or selection of common engineering devices and systems.

MET 3201. Lab for MET 3200. 2 Hours.

Accompanies MET 3200. Relates concepts, theoretical principles, and problem-solving techniques in real-life conditions via experimental activity performed in the lab. Investigates physical properties of fluids; absolute and manometric pressures; flow velocity; flow rate; flow velocity profiles; pump performance; energy losses in pipe lines and fittings; and the use of widespread instruments such as nozzles, orifice plates, and venturi tubes to measure fluid flow parameters.

MET 3300. Engineering Materials Science. 3 Hours.

Studies the foundation of physical and chemical characteristics, properties, behavior, and selection. Discusses the influence of fabrication and treatment methods on the characteristics of typical materials used in engineering applications including metals, ceramics, polymers, and composites. Topics include crystalline and noncrystalline structures, lattices, point defects, and dislocations. Also covers mechanical, thermophysical, and electrochemical characteristics of materials such as hardness, mass diffusion, and electroplating, as well as ferrous and nonferrous metal alloys, the structure and properties of ceramics, fundamentals of polymer science and technology, and synthetic and laminar composites.

MET 3301. Lab for MET 3300. 2 Hours.

Accompanies MET 3300. Experimental activities include sample preparation, microstructure analysis, cooling curves, binary phase diagrams, and experimental determination of thermophysical properties. Experimental themes include optical microscopy, heat treatment of engineering materials, hardening and hardness testing of materials, equilibrium phase diagrams, recrystallization and grain growth, and X-diffraction analysis. Uses modern techniques for materials characterization and relates them to engineering design of hardware.

MET 3400. Engineering Thermodynamics. 3 Hours.

Studies energy interactions among systems and their effect on the physical properties of the systems. Covers the zeroth, first, second, and third laws of thermodynamics in detail and their association with the concepts; definitions; and use of heat, work, mechanical energy, internal energy, enthalpy, and entropy in the analysis, design, and operation of engineering systems and devices commonly used to convert energy and deliver or consume power. Covers the evaluation and interpretation of thermodynamic properties of pure substances and ideal gases via thermodynamic tables, equations of state, or contemporary software. Examines thermodynamic principles behind the functioning and performance of familiar engineering devices such as gas and steam turbines, internal combustion engines, heat exchangers, pumps, compressors, refrigerators, and heat pumps.

MET 3401. Lab for MET 3400. 2 Hours.

Accompanies MET 3400. Experimental activity includes observation, investigation, and quantification of thermodynamic properties of pure substances, boundary work, isothermal compression of gases, energy balances in steady-flow devices such as heat exchangers and throttling devices, thermal efficiencies of heat engines, and coefficients of performance of heat pumps or refrigeration units.

MET 3500. Theory of Engineering Measurements and Data Analysis. 3 Hours.

Covers fundamental theory of engineering measurements as an integral part of the design, control, and operation of advanced engineering systems. This is a multidisciplinary course that uses concepts and principles from various subjects of the curriculum, such as calculus, differential equations, solid and fluid mechanics, stress analysis, electricity, thermodynamics, and heat transfer. Studies characteristics of measurement systems and the theory of underlying phenomena behind the operation of instruments designed to sense and furnish magnitudes of physical quantities. Also covers in detail statistical concepts and techniques to collect and analyze experimental data. Topics include theory of error and uncertainty, statistical confidence and hypothesis testing, standards of measure, dynamic response of measuring systems, transfer functions, signal conditioning, digitizing, and fundamentals of computerized data acquisition.

MET 3501. Lab for MET 3500. 2 Hours.

Accompanies MET 3500. Covers proper design and planning of engineering experimentation; correct characterization and use of instruments to measure typical engineering variables; and application of statistical concepts to collect, analyze, and validate experimental data. Emphasizes the need for reliable measurements in design and control of engineering systems.

MET 3600. Heat Transfer Engineering. 3 Hours.

Studies the concepts, principles, and mathematical and numerical procedures of analysis in the modes of heat transfer—conduction, convection, and radiation. The study of conduction includes 1D and 2D steady-state heat transfer in solids and transient analysis of lumped parameter systems. The study of convection covers heat transfer in internal and external fluid flows and the application of concepts and techniques for analysis and design of heat exchangers such as the LMTD and the NTU methods. Topics of radiation include irradiation, radiosity, spectral distribution, and radiation exchange between black and gray surfaces. Emphasizes use of mathematical and numerical techniques for problem solving in order to apply heat transfer theory to practical analysis and design of advanced engineering systems.

MET 3601. Lab for MET 3600. 2 Hours.

Accompanies MET 3600. Experimental activities involve observation and investigation of the conduction, convection, and radiation mechanisms and experimental quantification of rates of heat transfer. Concentrates particularly on experimental quantification of performance and effectiveness of heat exchangers and the influence of the geometric characteristics of components and thermophysical properties of materials used to manufacture them.

MET 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MET 4100. Mechanical Engineering Systems Design. 3 Hours.

Covers the fundamental principles of mechanical design including details of the engineering design process, design factors, creativity, optimization, safety, and value engineering. Discusses properties and selection of common engineering materials used in design and manufacturing of mechanical components and machines. Focuses on analysis and design of typical machine elements that operate under mechanical loads and stresses, including shafts, gears, bearings, belt and chain drives, clutches, brakes, fasteners, springs, torsion bars, power screws, linear actuators, and joints. Integrates computer usage for efficient and rapid design, formulae evaluation, mathematical simulation, design selection and optimization, and virtual prototyping. Discusses additional elements of engineering design such as cost analysis, robustness, quality improvement, and environmental concerns.

MET 4300. Alternative and Renewable Energy Technology. 3 Hours.

Explores the principles and current technological status of conventional and nonconventional alternative, but not necessarily renewable, energy conversion systems and strictly renewable energy conversion systems for power generation. Discusses the world's energy usage and the current and projected fractions satisfied by alternative and renewable systems in comparison to fossil fuel power-generation systems. Studies in-depth the concept of exergy, the quantification of exergy destruction, and the thermodynamic maximum power that can be extracted from a natural resource with emphasis on renewable resources. Covers fundamental analysis and design of alternative conventional systems, such as hydroelectric and nuclear power plants, as well as renewable energy conversion systems, including wind turbines, solar thermodynamic plants, solar photovoltaic units, and geothermal power plants.

MET 4950. Seminar. 1-4 Hours.

Offers an in-depth study of selected topics.

MET 4955. Project. 1-4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student's major field. May be repeated without limit.

MET 4983. Topics. 1-4 Hours.

Covers special topics in mechanical engineering technology. May be repeated without limit.

MET 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MET 4991. Research. 1-4 Hours.

Offers students an opportunity to conduct research under faculty supervision.

MET 4992. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic.

MET 4993. Independent Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic.

MET 4994. Internship. 1-4 Hours.

Provides students with an opportunity for internship work.

MET 4995. Practicum. 1-4 Hours.

Provides eligible students with an opportunity for practical experience.

MET 4996. Experiential Education Directed Study. 1-4 Hours.

Draws upon the student's approved experiential activity and integrates it with study in the academic major.

Media - Cinema Studies (CINE)

Search CINE Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=CINE>)

CINE 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

Media and Screen Studies (MSCR)

Search MSCR Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=MSCR>)

MSCR 1000. Media and Screen Studies at Northeastern. 1 Hour.

Intended for freshmen media and screen studies majors and combined majors. Introduces students to the liberal arts in general. Offers students an opportunity to become familiar with media and screen studies as a major discipline; to develop the academic skills necessary to succeed (analytical ability and critical thinking); to become grounded in the culture and values of the university community (including advising); and to develop interpersonal skills—in short, to become familiar with all the skills needed to become a successful university student.

MSCR 1100. Film 101. 4 Hours.

Focuses on the ways in which cinematic language and representations have developed since the late-nineteenth century, how representations of human difference vary in distinct cultural contexts, and how particular filmmakers and historical/national movements have challenged certain representations and ideologies. This range of representations and discourses includes blackface performance and other racist tropes, ethnographic studies of indigenous people as “exotic” curiosities, films noir that demonize independent women, postwar Italian neorealism’s revolutionary focus on the plight of the poor, films by and about marginalized ethnicities in the U.S. and the global south, banned films that highlight the condition of women in post-revolution Iran, and contemporary Hollywood’s treatment of homosexuality and masculinity.

MSCR 1150. TV 101. 4 Hours.

Provides an overview of television studies for nonmajors. Covers different ways to think about how to watch TV and the effect of changing technology and industry practices on television.

MSCR 1220. Media, Culture, and Society. 4 Hours.

Introduces the study of media, including print, radio, film, television, and digital/computer products. Explores the ideological, industrial, political, and social contexts that impact everyday engagements with media. To accomplish this, students examine how media products are developed, how technological changes impact the production and consumption of media, how political processes are influenced by media, how people interpret and interact with media content, and how media influence cultural practices and daily life.

MSCR 1230. Introduction to Film Production. 4 Hours.

Offers an introduction to production that blends theory and practice of film/video production through an examination of exemplary works, aesthetic strategies, production techniques, and the dynamic relationship between media makers, subjects, viewers, and technology. Offers students an opportunity to gain fundamental moving-image fluency using widely accessible media production tools including camcorders, mobile phones, and digital single-lens-reflex cameras.

MSCR 1320. Media and Social Change. 4 Hours.

Explores media’s role in movements for social, economic, and cultural change. Specifically examines how people use media technologies to organize themselves and communicate their message to wider audiences in order to achieve social change. As a way to develop and improve ethical reasoning, students are asked to think about the accountability of media institutions and actions of groups and individuals who use media technologies and tactics in the name of social change.

MSCR 1420. Media History. 4 Hours.

Examines the historical relationships between media, culture, and society with a focus on the role of media technologies as tools of communication. Emphasizes the broad social and cultural conditions that shape media and the ways in which people experience culture and understand meaning. Introduces the concept of mediation to analyze how different forms of communication have emerged in different historical moments. Critically examines past interactions between media and culture, and also examines the emergence of historically specific conceptions of audience, identity, content, industry, information, perception, and so forth.

MSCR 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MSCR 2160. Narrative Filmmaking. 4 Hours.

Introduces narrative filmmaking without synch sound. Offers students an opportunity to create several short projects without dialogue. The successful student leaves the course with a portfolio of work, a basic knowledge of video cameras, and one editing software program (either Avid or Final Cut Pro). Focuses on storytelling through visuals. .

MSCR 2220. Understanding Media. 4 Hours.

Designed to give students a foundation in the theories and methods of analysis in cultural and media studies. Positioned between the introductory MSCR classes and the higher-level theory classes. Offers students an opportunity to learn the how and why of media and cultural studies, focusing on the foundational assumptions, theories, and methods of the discipline.

MSCR 2300. Television: Text and Context. 4 Hours.

Introduces students to critical television studies. Topics include visual language (use of image, music, graphics, editing, and sound); narrative structure; and genre. Specific critical approaches include semiotics, narrative and genre analysis, feminist analysis, and ideological analysis of representation.

MSCR 2302. Advertising and Promotional Culture. 4 Hours.

Investigates advertising and promotional culture by closely studying its history, industry, and means of communication. Examines print, television and internet advertisements, and campaigns.

MSCR 2325. Global Media. 4 Hours.

Covers global dynamics of media and media systems. Specifically seeks to introduce students to the nuances of globalization and cultural performance through media structures. Introduces a wide variety of topics that fall in the intersection between globalization and media and the ways in which they operate socially and culturally. The course focuses broadly on understanding—in both theoretical and practical ways—how and why global media function as they do and how they contribute to knowledge formation and social justice within various cultural contexts.

MSCR 2336. American Film and Culture. 4 Hours.

Surveys the rise of American film from the late nineteenth century to the present. Examines key films, directors, major themes, and film forms and techniques. Includes lectures, screenings, and discussions. Students who do not meet course prerequisites may seek permission of instructor.

MSCR 2400. Hip-Hop in and as Media. 4 Hours.

Explores hip-hop’s capacity to communicate particular images, ideals, and values that represent various social factions at different historical moments. Hip-hop has evolved significantly since its inception over 40 years ago in the South Bronx. Most often understood as a musical genre, hip-hop’s cultural complexity encompasses musical expression, art forms including dance and graffiti/graphic design, new terminology, innovative entrepreneurialism, and myriad other elements that continue to influence popular culture more widely. Analyzes issues of authenticity and genre; modes of representation in rap lyricism; representation via hip-hop literature, press, films, and videos; technologies, media production, and contexts of reception; issues of differences and dissonance across generations; the communication of spatiality through hip-hop; and hip-hop as a transnational/global conduit of meaning and affiliation.

MSCR 2505. Digital Feminisms. 4 Hours.

Explores the unique ways that feminist activism and theory are impacted by the increasing digital nature of our world. From hashtags to Tumblr, feminists are using digital tools and platforms to aid in the pursuit of social justice. Offers students an opportunity to develop a timeline that traces feminists' engagement with the Internet, new media, and technological innovations from the late seventies to the present. Examines the strengths and challenges that the digital world creates for feminist engagement. MSCR 2505 and WMNS 2505 are cross-listed.

MSCR 2600. Cloud, Closet, (Drop)Box. 4 Hours.

Explores the multiple and complicated ways in which our lives and ways of thinking are impacted by what things we decide to keep and how we organize access to them, i.e., storage. Using readings, podcasts, short films, and TV shows, the course uses the idea of storage to explore the Cloud and other contemporary media "containers" and what the future of storage holds as we try to find space and time to store and retrieve our data, memories, clothes, food, and more. Exploring these containers raises important questions and concerns about the social consequences of buying things (accumulation and consumption) and a general cultural anxiety about information overload, as well as issues related to gender, class, the economy, the environment, organization, and knowledge.

MSCR 2895. Film Analysis. 4 Hours.

Introduces the languages, aesthetics, and cultures of film. Topics include film genre, film history, and film theory; basic elements (e.g., shot construction and sound editing); narrative cinema, nonnarrative or experimental work, and documentaries; and the marketing and distribution of film.

MSCR 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MSCR 2991. Research in Media and Screen Studies. 1-4 Hours.

Offers an opportunity to conduct introductory-level research or creative endeavors under faculty supervision.

MSCR 3210. Special Topics in Media and Screen Studies. 4 Hours.

Addresses issues in communication and media as well as developments in the production of television and video. Course content may vary from year to year. Students who do not meet course prerequisites may seek permission of instructor. May be repeated up to four times.

MSCR 3389. Screenwriting. 4 Hours.

Approaches the unique narrative form of the dramatic short film, with the goal of having students produce a short film screenplay (under twenty minutes in length) which could eventually be shot. Takes students through the storytelling process, from conception to visualization, dramatization, characterization, and dialogue, ending in a project which should reflect the student's own personal voice and unique vision. Offers students an opportunity to work on many writing exercises involving free association, visualizations, and character explorations, and to evaluate and critique each other's work in a workshop setting.

MSCR 3392. Gender and Film. 4 Hours.

Examines the representation of gender in film. Uses concepts and research from film and media studies to investigate the influences and consequences of gender representations in film. WMNS 3392 and MSCR 3392 are cross-listed.

MSCR 3420. Digital Media Culture. 4 Hours.

Investigates social and cultural dynamics emerging parallel to the spread of digital technologies, from the 1960s to the present. Analyzes the impact of technologies (such as computers, mobile phones, and video games) on media products and practices (such as remix culture, social media, and surveillance). Offers students an opportunity to develop the skills that are necessary to critically examine and write about digital media content and the technologies necessary for their consumption.

MSCR 3422. Media Audiences. 4 Hours.

Explores how mass media audiences interpret and actively use media messages and products as listeners, readers, and consumers. Examines the different stages of ethnographic research, audience meanings and interpretations, pleasure and fandom, the role of media in everyday life, and the use of ethnographic research methods in communication studies. Students who do not meet course prerequisites may seek permission of instructor.

MSCR 3426. Popular Music as Media Form. 4 Hours.

Analyzes the social forces, technological forms, and cultural influences that have contributed to the development of U.S. popular music, from the era of early recording and Tin Pan Alley composition to the present. Studies popular music as a facet of commercial media, as an art form, as an indicator and amplifier of social and political priorities, and as a medium through which cultural identities are expressed and articulated. Students who do not meet course prerequisites may seek permission of instructor.

MSCR 3435. Media Industries. 4 Hours.

Offers an overview of media industries studies. Uses a critically informed approach to media industries that offers students an opportunity to learn to identify and analyze the variety of companies that collaborate to produce, distribute, and market media texts. Explores different approaches to studying the life cycle of media, considering such factors as ownership, regulation, marketing, branding, and the impact of new technologies. Students who do not meet course prerequisites may seek permission of instructor.

MSCR 3437. Media and Identity. 4 Hours.

Examines representations of identity (race, gender, sexuality, and class) in the media, investigates their influences, and considers their repercussions. The class especially focuses on understanding identity as a construction, rather than as inherently "natural." Broadly, we discuss the relationship between identity and media representations; more specifically, we look at cultural texts, sites, and practices where the existing racial categories mix, merge, and/or rub up against each other in ways that problematize the naturalness of essentialized identities. Students who do not meet course prerequisites may seek permission of instructor.

MSCR 3446. Documentary Production. 4 Hours.

Focuses on single-camera video production in service of crafting documentary stories. Offers students an opportunity to learn nonfiction storytelling by examining documentary history and theory as well as participating in screenings, workshops, and hands-on projects designed to prepare them to take an idea and develop it into a final five-to-seven-minute final documentary short. Requires supplemental technical assignments for students with no previous production experience.

MSCR 3600. Film Theory. 4 Hours.

Explores the movement from modernist concern with the art object to postmodern concerns with subjectivity and spectatorship, race, and gender. Requires a paper using formalist analysis and later revision using cultural analysis, psychoanalysis, philosophy of perception, race studies. Also offers students an opportunity to learn research methods in cinema studies and perform a metacritical review of their own work and to present their findings from film journals, databases, Web sites, blogs. Presents the relation of perception to reality; levels of representational realness; reception theory; digitalization in its relation to movement and meaning. Seeks to enable students to recognize structures and problems for analysis in a film and to apply appropriate theoretical models to analyze these structures.

MSCR 3920. Topics in Film Studies. 4 Hours.

Focuses on a specific issue and topic in film studies. Course content varies from semester to semester.

MSCR 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MSCR 4208. TV History. 4 Hours.

Explores U.S. network television in the "precable" era, which ranges from 1949 to the 1980s. Studies television programming through its historical, cultural, and industrial contexts. The media studies component of the class considers topics such as aesthetics, narrative, genre, and representation.

MSCR 4602. Media and Democracy. 4 Hours.

Introduces the role of the media in democratic societies. Explores a number of important questions, including what is democracy? What types of information do citizens of a democracy need in order to participate in the governance of their lives? In our increasingly digital world, where do political discussions happen? Are the media responsible for keeping the public informed? Who constitutes the "public"? Are we citizens? Consumers? Producers? Who decides? In order to address these questions, students have the opportunity to become conversant in a variety of modern and contemporary theoretical and critical perspectives on the relationship between the media, democracy, and what has come to be known as the public sphere. Students who do not meet course prerequisites may seek permission of instructor.

MSCR 4623. Theories of Media and Culture. 4 Hours.

Overviews key conceptual approaches that have developed for the study of the media. Investigates theories that address the role of media in culture and focuses on how cultural studies can inform our reading of both media and culture.

MSCR 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MSCR 4992. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

MSCR 4993. Independent Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

MSCR 4994. Internship. 4 Hours.

Offers students an opportunity for internship work. May be repeated without limit.

Modern Languages - CPS (LNG)

Search LNG Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=LNG>)

LNG 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

Music (MUSC)

Search MUSC Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=MUSC>)

MUSC 1000. Music at Northeastern. 1 Hour.

Intended for freshmen in the College of Arts, Media and Design. Introduces freshmen to the liberal arts in general. Offers students an opportunity to become familiar with their major; to develop the academic skills necessary to succeed (analytical ability and critical thinking); grounding in the culture and values of the university community; and to develop interpersonal skills—in short, to become familiar with all skills needed to become a successful university student.

MUSC 1001. Music in Everyday Life. 4 Hours.

Dedicated to exploring, expanding, and exploding traditional meanings of what music is; of what it means to be a composer, performer, and audience member; and of what it means to listen. The overarching goal is to provide students with the tools and opportunities necessary for determining for themselves what place music holds in everyday life.

MUSC 1106. Women in Music. 4 Hours.

Examines the multifaceted role of women in music from the Renaissance to the present. Discusses the fact that for centuries women have been active and influential patrons, composers, teachers, conductors, and performers in Europe and the United States. Examines their contributions to classical and popular music and to jazz, with emphasis on such widely varying figures as Elizabeth Jacquet de la Guerre, Fanny Mendelssohn Hensel, Clara Schumann, Amy Beach, Germaine Tailleferre, Billie Holiday, Carla Bley, Ruth Crawford Seeger, Pauline Oliveros, Sarah Caldwell, Antonia Brico, and Nadia Boulanger.

MUSC 1111. Rock Music. 4 Hours.

Examines the development of rock-and-roll and its relationship to blues, rhythm and blues, country, folk, and other styles of music. Considers themes such as the role of rock as youth music, the reflections of social realities in rock songs, the relationship of rock to the recording industry and the mass media, and the changing styles of rock. Emphasizes listening skills.

MUSC 1112. Jazz. 4 Hours.

Examines the evolution of the creative improvisational musical styles commonly called jazz, from its African-American roots to its status as one of America's classical musics and an internationally valued art form. Explores the contributions of African and European musical traditions and African-American spirituals, work songs, and blues. Examines major contributors and stylistic development and change through selected audio and audio-visual presentations. Also considers the sociocultural dynamics that have affected musical evolution and acceptance.

MUSC 1113. Film Music. 4 Hours.

Emphasizes the various ways that music is used in film, including music depicted on-screen and musical scores. Music is a crucial element of meaning in film, yet its presence is easy to ignore. Offers students an opportunity to learn basic approaches to the analysis of music and sound in film, to develop the ability to think critically about film, and to become knowledgeable about key historical developments in film music and sound. No musical background is necessary.

MUSC 1115. Debussy and the Music of Paris. 4 Hours.

Recognizes that Claude Debussy, impressionist in sound, composed music that marked a turning point toward modern trends. Covers much of his music for piano, orchestra, and voice, including *Suite Pour le Piano*, *Suite Bergamasque*, *Images* (for piano and orchestra), *Nocturnes*, *La Mer*, and *Pelleas et Melisande*. Discusses the music of Satie, Ravel, and Fauré as it relates to that of Debussy.

MUSC 1116. Beethoven. 4 Hours.

Analyzes the complex personality and art of Beethoven, his relation to the turbulent times in which he lived, and his role in classical and romantic music.

MUSC 1118. Music Therapy 1. 4 Hours.

Examines the application of music as a therapeutic vehicle to release suppressed emotions, to encourage self-expression in psychiatric patients, and to treat a wide variety of disorders. Examines music therapy, in a modern approach to health services, as a supplement to other treatments.

MUSC 1119. Fundamentals of Western Music Theory. 4 Hours.

Introduces students with little or no musical experience to all the major and minor key signatures and the following scales: major, natural minor, harmonic minor, and melodic minor. Topics include how to read music in treble clef, bass clef, and various C-clefs; how to identify and construct intervals, triads, and seventh chords; how melody and harmony work together to create a piece of music; roman numeral analyses; and various small forms. Short excerpts are analyzed, and students are required to write musical compositions.

MUSC 1129. Music of the Middle East. 4 Hours.

Presents an introduction to the music of selected Near Eastern and Arab cultures (such as Persian in the East and Ethiopic and Berber in Africa). Includes the cantillation styles and practices of various chants of the Hebrew, Christian, and Islamic traditions.

MUSC 1131. Music of Latin America and the Caribbean. 4 Hours.

Introduces students to the diverse music of Latin America and the Caribbean. Students read and write about the cross-fertilization of indigenous, European, and African influences in the music that have created unique hybrid musical genres. Cultural theories used in class frame the conceptual, behavioral, and musical aspects of performance in a number of contrasting music cultures. Students discuss and write about features of the music cultures under study and investigate how music constructs meaning for listeners. Offers students an opportunity to gain an understanding of the important connection of music to its accompanying dance—which shapes the music's tempo, rhythmic structure, and form—and to develop critical listening skills.

MUSC 1134. Guitar Class. 4 Hours.

Provides an introduction to the fundamentals of classical guitar playing for those with or without prior knowledge of the guitar. Covers music reading and theory. Requires students to perform alone and in ensemble with other members of the class. Augments the syllabus by live performances from outside professional and student classical guitarists. Bases final grades on several written examinations and student performance.

MUSC 1136. What's Playing at Symphony?. 4 Hours.

Offers students an opportunity to attend several performances of the Boston Symphony Orchestra (BSO) at Symphony Hall. Discusses each piece of music from a variety of perspectives, including the history of a given composer and his or her relationship to music history and the history of a given composition and its relevance to the symphonic repertoire. Analyzes program pieces in order to provide a deeper appreciation for their musical construction; however, no musical background is required to participate in this course—it is designed for nonmusic majors and music majors alike. Requires students to purchase BSO College Cards (for a nominal fee) for the current BSO concert season.

MUSC 1141. Wired for Sound. 4 Hours.

Explores the use of electronics in music of various styles and genres from a historical perspective, beginning in the early twentieth century and moving to the present. Examines the methods and means of electronic sound production. Throughout history, technological innovations have influenced music. Starting in the early twentieth century, electricity and, later, electronics, became a key motivating force in music, both in composing and performing and even in listening. Covers the social and cultural conditions under which electric sound was able to evolve.

MUSC 1142. Pop, Jazz, and Rock Singing. 4 Hours.

Focuses on singing techniques used in pop, rock, and jazz. Techniques taught, discussed, and applied in class include breathing, tone and vowel production, singing with power without strain, developing range, improvising, and creating one's own style. Offers students an opportunity to apply these techniques in class, learning through vocal demonstrations in class and through the study of recordings. Singers/songwriters are encouraged to enroll. All levels of singers are welcome; students who enroll should already have the ability to sing generally in tune.

MUSC 1144. Music and Technology: Stone Age to Digital Age. 4 Hours.

Surveys music and technology from the Paleolithic Age to the present day. Examines the origins and impact of diverse musical instruments, with attention to connections between musical and technological developments; the reasons instruments are accepted, modified or abandoned; and debates about the effects of new technologies on music. Considers such forces as standardization, institutionalization and commodification, as well as experimentation and hacker practices. By studying the sociocultural history of such instruments as the violin, piano, electric guitar, and synthesizer, offers students an opportunity to gain an understanding of the interplay between technological change and enduring human needs for music.

MUSC 1201. Music Theory 1. 4 Hours.

Introduces melodic and harmonic practices in tonal music with additional work in chord and melody construction. Develops ear training and sight-singing skills.

MUSC 1202. Music Theory 2. 4 Hours.

Continues MUSC 1201. Focuses on harmonic practices in tonal music. Examines the role and function of harmony through analysis of musical examples and composition of four-voice chorales. Introduces study of advanced harmony. Further develops ear training and sight-singing skills.

MUSC 1205. Piano Class 1. 4 Hours.

Provides introductory-level study of piano designed for students with or without previous experience. Combines skills in reading music with improvisation and functional piano. Introduces some basic theory to help clarify the structure of class repertoire. Allows students to progress at their own pace. Determines grades by the amount of repertoire mastered during the semester.

MUSC 1901. Music Lessons 1. 1 Hour.

Offers private instruction in voice or in an instrument. Arranges weekly lessons on a half-hour basis. Contact the music department for arrangements. Requires lab fee. May be repeated without limit.

MUSC 1902. Music Lessons 2. 1 Hour.

Offers private instruction in voice or in an instrument. Arranges weekly lessons on a half-hour basis. Contact the music department for arrangements. Requires lab fee. May be repeated without limit.

MUSC 1903. Composition Lessons. 1 Hour.

Offers private instruction in music composition. Contact the music department for arrangements. Requires lab fee. May be repeated without limit.

MUSC 1904. Chorus. 1 Hour.

Allows students to participate as performers in one or more ensembles under the direction of a faculty conductor. *Prereq: Audition or permission of instructor.* May be repeated without limit.

MUSC 1905. Concert Band. 1 Hour.

Allows students to participate as performers in one or more ensembles under the direction of a faculty conductor. May be repeated without limit.

MUSC 1906. Orchestra. 1 Hour.

Allows students to participate as performers in one or more ensembles under the direction of a faculty conductor. *Prereq: Audition or permission of instructor.* May be repeated without limit.

MUSC 1907. Wind Ensemble. 1 Hour.

Allows students to participate as performers in one or more ensembles under the direction of a faculty conductor. *Prereq: Audition or permission of instructor.* May be repeated without limit.

MUSC 1911. Jazz Ensemble. 1 Hour.

Designed to serve both music majors and nonmajors, this is a performance/theory/history offering of the varied styles and techniques of performance in the jazz tradition of African-American music. Students are drawn from all segments of the University. Repertory is taken from the standard jazz literature as well as investigations of new works. Improvisational and interpretational technique are the core content of the course. Both the NU Jazz Ensemble and the NU Jazz Combo are represented together in this course. *Prereq: Audition or permission of instructor.* May be repeated without limit.

MUSC 1912. Rock Ensemble. 1 Hour.

Allows students to participate as performers in one or more ensembles under the direction of a faculty conductor. May be repeated without limit.

MUSC 1913. Blues/Rock Ensemble. 1 Hour.

Allows students to participate as performers in one or more ensembles under the direction of a faculty conductor. *Prereq: Audition or permission of instructor.* May be repeated without limit.

MUSC 1914. Create Your Own Music. 1 Hour.

Allows students to participate as performers in one or more ensembles under the direction of a faculty conductor. May be repeated without limit.

MUSC 1915. Chamber Ensemble. 1 Hour.

Allows students to participate as performers in one or more ensembles under the direction of a faculty conductor. *Prereq: Audition or permission of instructor.* May be repeated without limit.

MUSC 1916. Contemporary Music Ensemble. 1 Hour.

Offers students an opportunity to participate as performers in an ensemble under the direction of a faculty conductor. Under faculty supervision, students have an opportunity to identify repertory, including original compositions by members of the ensemble. *Prereq: Audition or permission of instructor.* May be repeated without limit.

MUSC 1917. Jazz Choir and Combo. 1 Hour.

Designed to give students who sing jazz and blues the opportunity to rehearse and perform in a small vocal group. Offers students an opportunity to work on singing in harmony and be featured in solos. The group is also accompanied by a student jazz combo. Members of the combo may register for the course for credit. Requires audition. May be repeated without limit.

MUSC 1918. World Music Ensemble. 1 Hour.

Explores music-making traditions from selected world cultures through performance on percussion, voice, and other instruments. No previous music-making experience required. May be repeated up to eight times.

MUSC 1919. Fusion Ensemble. 1 Hour.

Offers students an opportunity to participate as performers in one or more ensembles under the direction of a faculty conductor. Focuses on instrumental rock, blues, funk, and jazz repertoire. *Prereq: Audition or permission of instructor.* May be repeated up to eight times.

MUSC 1920. Pep Band. 1 Hour.

Offers students an opportunity to participate as performers in one or more ensembles under the direction of a faculty supervisor. The pep band performs at sporting events and other university functions. May be repeated up to eight times.

MUSC 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MUSC 2101. Black Popular Music. 4 Hours.

Surveys, investigates, and analyzes black popular music from the end of the 19th century to the present. Through critical listening habits and analytical thinking skills, offers students an opportunity to explore black popular culture as a means of expression, communication, and collective identity, attending to issues of representation, identity, values, and aesthetics through a wide range of interdisciplinary sources and methodologies. Emphasizes intersections of creativity, technology, and performance, along with the impact of music industry, audience reception, and cultural politics. Expects students to complete daily exercises and weekly discussion forums in which they must apply critical thinking to synthesize material, complete comparative analyses, relate individual lessons to key course themes, and connect the curriculum to their own experiences and musical listening practices.

MUSC 2107. Introduction to Opera. 4 Hours.

Offers an historical, social, political, economic, and artistic overview of the evolution of opera from its beginnings to the present day. Examines basic musical concepts (harmony, melody, and orchestration), structures of opera (aria, ensemble, and recitative), vocal categories and schools, and the relationship between literature, history, and librettos. Offers close study of selected operas in various styles (bel canto, verismo, and so on) by Mozart, Rossini, Verdi, Puccini, Tchaikovsky, Wagner, and others.

MUSC 2111. Algebra and Geometry of Music. 4 Hours.

Engages mathematical thinking in music with regard to its symbolic (how we represent music using numbers and signs); sonic (how mathematical thinking might create insights into musical sound); and grammatical (the logic by which music proceeds from one time to the next) expressions. Music and mathematics both contain objects that exhibit similar properties, such as circularity, similarity, objecthood, spatial dimensionality, dynamics, and processuality. Draws upon various branches of mathematics, including number theory, set theory, algebra, geometry, and statistics. Such representations highlight fundamental musical principles invoked in the process of improvisation, performance, and composition. As such, musical listening is a key component of the course. Ability to read musical notation or musical experience preferred.

MUSC 2130. Music of Asia. 4 Hours.

Introduces the musical heritage of a variety of music cultures in Southeast, Far East, and Central Asia, highlighting the importance of music as a human activity and a creative expressive form. Exposure to aesthetic preferences different from the West expands students' notions of what sounds pleasing, pleasurable, or proper. Offers students an opportunity to learn cultural theories that frame the conceptual, behavioral, and musical aspects of performance in a number of contrasting music cultures. Students discuss and write about features of the music cultures under study, investigate how music constructs meaning for listeners, and develop critical listening skills. Learning about local and global forces that shape music engages students to argue for the positive or negative effects each have on processes of musical change.

MUSC 2150. Making a Musical: Analysis, Craft, and Creation. 4 Hours.

Explores how great musicals are constructed and what tools are needed, focusing on how effective lyrics are built; how songs function in musicals; and how book writers, lyricists, and composers create new works and adapt existing works from other media to the musical theater stage. Offers students an opportunity to transform analytical techniques and discoveries into creative strategies, building short musicals in collaborative teams. Students need not be musicians to participate in this class. Aspiring actors, composers, lyricists, authors of all styles, technical theater artists and designers, and all those with a curiosity about the history of musicals and how musicals are made are strongly encouraged to enroll.

MUSC 2208. Jazz Improvisation. 4 Hours.

Focuses on repertory as well as performance. Examines the great improvisational artists in American music, such as Charlie Parker, Miles Davis, and John Coltrane. Approaches analysis from a theoretical as well as a practical perspective. Explores the use of rhythm, chords, scales, and modes in the creative improvisation process.

MUSC 2209. Conducting. 4 Hours.

Provides instruction in the basic gestures used in conducting vocal and instrumental ensembles. Topics include beat patterns, conveying phrasing and articulation, cueing, controlling tempo and dynamics, score study, and rehearsal techniques. Provides an opportunity for students to constitute a laboratory ensemble for regular practicum.

MUSC 2210. Introduction to Songwriting. 4 Hours.

Offers an opportunity to learn to construct songs with forward motion and memorable "hooks." Topics include time-proven song forms, melody writing, harmonic tools, lyric writing, collaboration, and production techniques. Emphasizes the craft of writing songs for use in film and television.

MUSC 2211. Advanced Songwriting. 4 Hours.

Builds on the skills covered in MUSC 2210. Seeks to advance the student's songwriting toolbox via a combination of analysis/transcription, writing, production, critiquing, and analysis. In order to maximize the amount of professional opportunities afforded to the songwriters, this course is highly collaborative in order to model the writing processes most commonly used in the industry. Students who do not meet course prerequisites may seek permission of instructor.

MUSC 2310. Popular Music Since 1945. 4 Hours.

Surveys the evolution of popular music styles in the United States, from the end of World War II to the present day. Examines popular music's development and transformation, highlighting interactions with a wide array of factors including ethnic and gender identities, music business practices, race relations, social and political movements, and technological innovations. Offers students an opportunity to gain a broad overview of the field of popular music studies, its theoretical perspectives and methodologies, and its research sources and materials.

MUSC 2312. Historical Traditions: Classical. 4 Hours.

Provides an overview of eighteenth-, nineteenth-, and early twentieth-century Western music in cultural and stylistic contexts. Covers some of the best-known figures in classical music: Bach, Mozart, Beethoven, Wagner, and Stravinsky. Considers why and how the great tradition of tonal music defines classical music even today. Uses scores to help understand the different ways music can be written and the different aesthetic definitions of beauty, pleasure, and meaning in sound.

MUSC 2313. Historical Traditions: World. 4 Hours.

Studies music from around the globe. Analyzes the different meanings music holds and the cultural preferences for sound that distinguish cultures and subcultures. Students read and write about cultural theories that guide them in linking the conceptual, behavioral, and musical aspects of performance in a number of contrasting music cultures. Investigates how music constructs meaning for listeners. Offers students an opportunity to develop critical listening skills, learn about local and global forces that shape music, and to argue for the positive or negative effects each have on processes of musical change. Expects students to complete a final research paper, applying cultural theories and integrating data about musical sound, behavior, and concepts in their writing.

MUSC 2317. Punk Rock. 4 Hours.

Explores punk rock as a music genre and a lifestyle, an attitude and a philosophy, a political orientation and a commodified fashion. Everyone's perspective on punk is different, but it also has rules and boundaries. Although it emerged in the 1970s as a reaction against very specific social, cultural, and musical moments in the United States and the United Kingdom, punk has become larger than itself in the intervening decades, spawning sub-subcultures and subgenres that would be unrecognizable to its originators. Addresses punk's long narrative: protopunk genres including garage rock and glam rock; punk's origins in New York City and London; its transformation into postpunk, hardcore, anarcho-punk, and straightedge; and its legacy outside the United States/United Kingdom nexus and in genres such as riot grrrl, grunge, and pop-punk.

MUSC 2320. 40,000 Years of Music Technology. 4 Hours.

Surveys the relationship between music and technology from the Paleolithic Age to the present. Examines the origins and impact of diverse musical instruments, with attention to connections between musical and technological developments; the reasons instruments are accepted, modified, or abandoned; and debates about the effects of new technologies on music. Considers such forces as standardization, institutionalization, and commodification, as well as experimentation, hacker, and DIY cultures. Asks whether music technologies are "just tools" or rather carry with them ethical values and ramifications. By studying the sociocultural history of such instruments as the violin, piano, electric guitar and synthesizer, offers students an opportunity to gain an understanding of the interplay between technological change and the enduring human need for music.

MUSC 2330. Musical Communities of Boston. 4 Hours.

Combines ethnomusicology and experiential learning by exploring the diverse communities of Boston and their music. Since 17th-century encounters between the Wampanoag Nation and English Puritans, Boston has been characterized by intercultural contact and exchange. Discusses the history and legacies of such encounters, as well as present-day issues of diversity and belonging in Boston. Focuses on how communities reinforce their own cultural bonds through music and discusses alliances formed through shared experiences of diasporic, exilic, refugee, immigrant, and minority status. Through interdisciplinary, ethnographic analysis and practice, offers students an opportunity to explore how these inherently intersectional social dynamics—which engage issues of race, gender, class, ethnicity, etc.—play out through collective and individual musical practices.

MUSC 2340. Divas, DJs, and Double Standards. 4 Hours.

Examines the significance of gender to the experience of and access to participation in music making, listening, the music industries, and cultural recognition. Surveys how gender differences have been constructed, enacted, and contested in historical and contemporary musical cultures and develops critical lenses for analyzing musical representations of gender difference and their social impact. Considers how gender intersects with racial and sexual identities in music and its institutional structures. Uses case studies drawn from a variety of contexts, such as classical (Bizet's "Carmen"), popular (Beyoncé), film ("Star Wars"), and avant-garde (Yoko Ono).

MUSC 2350. Acoustics and Psychoacoustics of Music. 4 Hours.

Introduces students from a variety of disciplines to the fundamentals of sonic production, transmission, and reception. Topics include impedance, refraction and diffraction, wave mechanics, frequency spectrum, and resonance. Applies core concepts to the understanding of the acoustics of musical instruments and loudspeakers. Explores basic auditory psychophysics. Offers students an opportunity to investigate real-life applications in the domains of music, sonic art, sound design, instrumental design, and recording.

MUSC 2351. Music, Sound, and the Screen. 4 Hours.

Examines the function of music and sound design in contemporary visual media: how they are used in relation to images, and how they work with images to generate meaning and shape experience. Topics include film, television, video games, and the internet; and intermedial forms such as title sequences, trailers, music videos, and commercials.

MUSC 2540. Special Topics in Music. 4 Hours.

Focuses on various topics related to music. May be repeated without limit.

MUSC 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MUSC 2991. Research in Music. 1-4 Hours.

Offers an opportunity to conduct introductory-level research or creative endeavors under faculty supervision.

MUSC 3337. Writing about Music. 4 Hours.

Provides an overview of various types of musical journalism including criticism, reviews, feature articles, program notes, promotional material, and so on. Offers students significant opportunity to develop their own skills in writing, editing, research, and interview techniques as they apply to writing about music and the music industry.

MUSC 3352. Sounding Human. 4 Hours.

Explores how people have used music to answer the question of what it means to be human and how boundaries between the human and nonhuman (animal, machine, angel, alien, etc.) have been inscribed, dissolved, and reconfigured by means of music. Examines historically how certain musical traits have served as signifiers of humanity, while others have signified nonhumanity. Studies musicians who deliberately present themselves or their work as nonhuman as a means to critique limited conceptions of mankind. Develops historical, critical, and ethical perspectives on what it means to be human by focusing on contexts where music has played a role in testing and contesting conventional wisdom (including colonial encounters, technological changes, scientific studies, and science fiction).

MUSC 3353. Music and the Racial Imagination. 4 Hours.

Addresses the history of the concept of race, taken as a cultural construct and a lived reality, long used to justify social, economic, and political inequality. Examines the relationship between musical sound and processes of racialization, addressing this relationship through a series of select historical and contemporary case studies, alongside grounding texts drawn from critical race studies, gender and sexuality studies, and ethnomusicology and popular music studies. Explores how the construction and everyday lived experience of race influenced music production, performance, reception, and analysis and how categories of race have been represented and questioned through the sonic and embodied acts of performers.

MUSC 3410. Recital 1. 1 Hour.

Offers preparation for and performance of a minirecital (twenty to thirty minutes of music) under the guidance of the student's primary instrumental or vocal instructor. Minirecitals are usually shared by more than one student. Students take MUSC 3410 in place of MUSC 4992.

MUSC 3470. War and Music. 4 Hours.

Offers an interdisciplinary and comparative exploration of the diverse ways in which composers, artists, novelists, poets, and dramatists have depicted the excitement, glory, agony, and sacrifice of war both at the dawn of modern gunpowder-based warfare in the seventeenth and eighteenth centuries, and as the full impacts of "industrialized killing" became visible in the twentieth. Drawing on artistic and literary artifacts and the massive cultural outpourings that the slaughter and destruction of the two World Wars of the twentieth century elicited, students will investigate how artists' interactions with the experience and meaning(s) of war have developed and changed in the modern world and how those changes have affected our own understanding of its impact and significance.

MUSC 3540. Special Topics in Music Analysis. 4 Hours.

Focuses on advanced topics in theory and analysis. Topics vary with each offering. May be repeated without limit.

MUSC 3541. Music Analysis Seminar. 4 Hours.

Exposes students to advanced methods of musical analysis. Focuses on techniques for analyzing large musical forms from the baroque period to the present day.

MUSC 3560. Topics in Music since 1900. 4 Hours.

Offers an intensive overview of music from 1900 to the present day. Covers the works of influential figures of the 20th and 21st centuries and draws on a variety of repertoires, including American and European "classical" music, jazz, and the music of non-Western cultures. Includes analysis of scores as well as thorough investigations into the social milieus from which the music emerged.

MUSC 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MUSC 4622. Recital 2. 1 Hour.

Offers preparation for and performance of a senior recital (forty to sixty minutes of music) under the guidance of the student's primary instrumental or vocal instructor.

MUSC 4970. Junior/Senior Honors Project 1. 4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student's major field. Combined with Junior/Senior Project 2 or college-defined equivalent for 8-credit honors project. May be repeated without limit.

MUSC 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MUSC 4992. Directed Study. 1-4 Hours.

Focuses on independent work in a selected area of music under the direction of a member of the department. Enrollment is limited to qualified students by special arrangement with the supervising faculty member and with the approval of the department chair. May be repeated without limit.

MUSC 4993. Independent Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

MUSC 5540. Special Topics in Music. 3,4 Hours.

Focuses on various topics related to music. May be repeated up to two times.

Music - CPS (MUS)

Search MUS Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=MUS>)

MUS 1100. Sound Health: Music and Relaxation. 3 Hours.

Offers students an opportunity to gain a heightened awareness of the power of music to effect physical and emotional change and to examine the effects of music on the body, mind, and spirit. Explores awareness of sound and the physiological changes caused by music. Covers sound pollution, the effects of vibrations on the body, guided imagery, and music and meditation.

MUS 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MUS 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MUS 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MUS 4955. Project. 1-4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student's major field. May be repeated without limit.

MUS 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MUS 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

Music - CPS Specialty (MSIC)

Search MSIC Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=MSIC>)

MSIC 1050. Music of the U.S.A.. 4 Hours.

Examines American music from the time of Puritan psalm singing to the present. Covers a wide variety of music including concert music, traditional folk music, jazz, and contemporary styles.

Music Industry (MUSI)

Search MUSI Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=MUSI>)

MUSI 1204. Analyzing Popular Genres. 4 Hours.

Continues MUSI 1203. Examines the role and function of various musical elements by analyzing examples from popular music. Examines structure, lyrics, and instrumentation in popular music. Offers students an opportunity to further develop ear training and sight-singing skills.

MUSI 1230. Introduction to Music Industry. 4 Hours.

Examines business-related areas of the music industry. Topics include music publishing, copyright, the function of performing rights organizations (ASCAP and BMI), talent agents, artist management, concert promotion, and royalties and contracts.

MUSI 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MUSI 2231. Music Licensing for Media. 4 Hours.

Examines a variety of music usages in film, advertisements, TV shows, and other media types or venues that require music licensing. Offers students an opportunity to examine licenses and agreements in an effort to enable them to customize boilerplate forms to reflect accurately the needed licenses with any and all customized terms. Stresses teamwork, defining roles within a team, and assertiveness in an effort to enable students to function at their highest level for the demanding team-based final project. The final project stresses resourcefulness, meeting deadlines, creative excellence, along with open and sustained communication between the production side and the creative side.

MUSI 2232. Music Recording 1. 4 Hours.

Introduces the history and practice of recording music. Covers recording apparatus; microphones; monophonic, stereophonic, and digital theory and techniques; field recording; studio terminology; basic sound theory; and development of rudimentary editing skills. Also examines the role of the producer vs. that of the technician, preparation for recording sessions, and basic legal regulations regarding copyrights and compensation.

MUSI 2234. Festivals. 4 Hours.

Examines the multiple ways in which festivals affect musical life. Analyzes festivals both as music communities concentrated into limited temporal and geographic frames as well as social and cultural institutions situated within particular historical and cultural contexts. Studies what a festival does; what we can learn from the history of music festivals; how festivals have impacted social, cultural, economic, and aesthetic hierarchies; and what festival organizers consider when making artistic, financial, and administrative decisions. By the end of the semester, successful students should have a comprehensive understanding of both the business and the cultural contexts of music festivals, which they should be able to demonstrate through individual written, multimodal creative, and group assignments.

MUSI 2235. Copyright in the Creative Industries. 4 Hours.

Explores the balance of interests at the heart of copyright law, including enhancing the public interest, supporting innovation, and protecting private property rights. Offers students an opportunity to gain an appreciation of the significance of copyright in the structure, operation, and customs of the creative industries. Focuses on the unique character of music-related copyright issues and addresses the music industries' outsized impact on the development of copyright policy in the United States.

MUSI 2330. Performing Arts Administration. 4 Hours.

Introduces music management including the structure of nonprofit organizations (such as arts service organizations, arts centers, symphony orchestras, chamber orchestras, ensembles, opera companies, and university arts programs) and the structure of for-profit enterprises. Examines financial management, funding, and audience development.

MUSI 2331. Music Recording 2. 4 Hours.

Offers students the opportunity to learn additional skills in the recording process, such as material marketing and distribution, contracts and negotiations, and establishing distribution channels. Includes hands-on studio production of record-quality material.

MUSI 2332. Music Publishing and Royalties. 4 Hours.

Focuses on music publishing, which plays a pivotal role in the music industry. Not only does this field generate billions of dollars worldwide in revenue, but it has become an essential part of the recording, live performance, and merchandising sectors of the music industry. Examines the concepts and current issues of music publishing as it pertains to recording, film, television, print, and other media. Topics include licensing, royalty collection, and the art of negotiating music copyrights.

MUSI 2341. Music Supervision 1. 4 Hours.

Covers the field of music supervision, which has become an in-demand field due to the increased use of songs in TV shows, films, live events, advertisements, websites, and other forums. Discusses the whole process, from choosing the perfect song/lyric to strategies for securing licensing with artists and publishers. Offers students a hands-on opportunity to make music selections fit a variety of media and also to structure licensing/contract deals for composers, publishers, and record companies. Final project involves networking with Green Line Records and external rights holders to license and place music into a series of scenes and advertisements.

MUSI 2540. Special Topics in Music Industry. 1-4 Hours.

Focuses on various topics related to the music industry. May be repeated without limit.

MUSI 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MUSI 2991. Research in Music Industry. 1-4 Hours.

Offers an opportunity to conduct introductory-level research or creative endeavors under faculty supervision.

MUSI 3332. Artist Management. 4 Hours.

Provides an in-depth investigation of the field of musical artist management. Explores the artist-manager relationship, the management contract, artist evaluation, image formulation, the artist's development team, achieving a recording contract, merchandising, endorsements, sponsorships, touring, and financial management.

MUSI 3333. The Record Industry. 4 Hours.

Examines the domestic and international record industry. Topics include industry structure, business and legal affairs, the recording contract, royalties, manufacturing, distribution, promotion, publicity, advertising, licensing, and piracy. Offers students the opportunity to explore major record labels and independent labels. Addresses the past, present, and future.

MUSI 3334. Music Products Industry. 4 Hours.

Provides a thorough examination of business organization, marketing, distribution, and sales techniques in the diverse field of the music products industry. Investigates market sectors such as musical instruments; professional, semiprofessional, and home audio equipment; the recording industry; and print music.

MUSI 3335. Copyright Law for Musicians. 4 Hours.

Explores the unique character of music-related copyright issues. Investigates common law copyright; statutory copyright; ownership, duration, and transfer of copyright; fair use; works for hire; infringements and remedies; public domain works; and international copyright. Also examines related legal aspects of the music industry.

MUSI 3338. Music Industry Marketing and Promotion. 4 Hours.

Provides a thorough examination of the principles and applications of marketing and promotion within the music industry. Students explore how music companies successfully conduct product, pricing, distribution, and communication management. Approaches music marketing issues using readings, specific music marketing case studies, lectures, guest speakers, and projects.

MUSI 3340. Concert Promotion and Venue Management. 4 Hours.

Provides an in-depth exploration of the principles and practices of concert promotion and venue management. Focuses on areas such as concert promotion, venue advertising, talent buying, contractual requirements, insurance, government regulation, American Society of Composers, Authors, and Publishers (ASCAP)/BMI licenses, personnel management, and concert production and administration.

MUSI 3341. Music Recording 3—Mixing and Mastering. 4 Hours.

Covers specific topics relating to the final stages in music recording—mixing and mastering. Discusses criteria for making decisions about levels, equalization, dynamics, time-based effects, and spatial positioning. In-depth listening and analysis are designed to augment hands-on practice using both students' current recordings and professional recordings from the past forty years.

MUSI 3351. Music and Social Justice. 4 Hours.

Introduces theories of ethics, morality, and equality and strategies to advance social justice—to ensure equality and human dignity for all people—through music. Explores the music industry as both a microcosm of society and amplifier of our collective ethics. On stage, on the record, and through direct action, musicians worldwide use their art and renown to serve social movements. Many also face equality and equity challenges within the music industry. As future professionals, students may either challenge or reinforce the injustices they encounter in their professional and personal lives. Through critical discourse on professional ethics in the music business and service-learning projects requiring direct community engagement, seeks to empower students to make a lifelong commitment to ethical decision making and advancing social justice.

MUSI 3401. Hip Hop in the Music Industry. 4 Hours.

Focuses on black popular music as art, activism, and commodity from the post-Civil Rights era to today. Studies the immediate musical, historical, cultural, and industry-based precedents for rap music, which emerged in opposition to the music industry—and many other institutions that perpetuated the inequalities against which early hip-hop artists were protesting. The contemporary moment provides a unique opportunity for refocusing on the origins of hip-hop and black protest music as they relate to the industry's embrace and commodification of certain aspects of hip-hop culture. Explores the dynamic tensions between rap music as aesthetic object, countercultural expression, social commentary, and industry commodity, engaging with current expressions of all of these in the Boston area.

MUSI 3540. Special Topics in Music Industry. 4 Hours.

Focuses on various topics related to the music industry. May be repeated up to two times.

MUSI 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MUSI 4530. Music Entrepreneurship. 4 Hours.

Designed to provide students with the knowledge, skills, and abilities necessary to plan, finance, develop, and operate a new music venture. Topics include attributes of music entrepreneurs and entrepreneurial careers, evaluating opportunities, writing business plans, financing the venture, and long-term management and planning.

MUSI 4601. Seminar in Music Industry. 4 Hours.

Presents a capstone course for music industry students. Offers advanced students the opportunity to explore contemporary events and issues in the music industry. Allows students to reflect upon, distill, and apply knowledge accumulated in prior courses and previous experiential learning. This reflection and application occurs through substantial writing assignments and classroom discussion. Fulfills the college's experiential education requirement for music industry majors.

MUSI 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MUSI 4992. Directed Study. 1-4 Hours.

Focuses on independent work in a selected area of music under the direction of a member of the department. Enrollment is limited to qualified students by special arrangement with the supervising faculty member and with the approval of the department chair. May be repeated without limit.

MUSI 4993. Independent Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

MUSI 5540. Special Topics in Music Industry. 3,4 Hours.

Focuses on various topics related to the music industry. May be repeated up to two times.

MUSI 5900. Ethnography in Creative Industries. 4 Hours.

Offers students an opportunity to work together on a class project with a partner organization, conduct individual ethnographic projects, and experiment with different forms of documenting and presenting ethnographic research. Ethnography includes participant/observation and other qualitative methods. Ethnographic research provides insights into institutions and organizations within creative industries—their particular corporate cultures, structures, priorities, market emphases, divisions of labor, etc. Ethnographic data informs corporate strategy and contributes to marketplace research. For creative producers—actors, architects, artists, dancers, designers, musicians, writers—ethnography can inform creative practice, enriching the artworks that form the core of creative industries. Studies what we learn from ethnography, what purposes ethnographic research is best suited for, how ethnography contributes to strategic decision making, and how ethnography enriches creative practice and art making.

MUSI 6000. Management of Music Organizations. 3 Hours.

Examines approaches used to manage and oversee various music organizations, including managing change, decision making, negotiation and presentation skills, and assessing management style. Successful music industry leaders must be well grounded in traditional management knowledge and practices, yet at the same time appreciate the unique aspects of the creative industries.

MUSI 6100. Music Industry Research Methodology. 3 Hours.

Offers students an opportunity to develop and enhance their research skills. Success as a music industry manager often hinges on the ability to find solutions effectively and efficiently. Many business mistakes can be directly traced to inaccurate information, inappropriate data, or invalid interpretation. All of these are due to inappropriate research. In an increasingly diversified music industry, managers must be functional in both qualitative and quantitative research methods and data analysis and must develop sensitivity to the target market or subjects of interest. This course is designed to help students understand how good research enables managers to make informed decisions. Requires students to complete written research reports.

MUSI 6200. Financial Management in the Music Industry. 3 Hours.

Examines financial reporting and decision making in the music industry. Offers students an opportunity to become proficient in analyzing financial statements to predict the future performance and growth of a firm.

MUSI 6300. Intellectual Property for Music Management. 3 Hours.

Focuses on the regulatory frameworks and converging media law. Topics include contracts, licensing, standards, and best practices in intellectual property both at a national and international level.

MUSI 6400. Marketing Strategies in the Music Industry. 3 Hours.

Examines the role of strategic planning in developing effective marketing programs that enhance the overall performance of a music organization. Specific topics include consumer behavior, market segmentation, targeting, customer equity, brand equity, brand positioning, marketing research, product policy, pricing strategy, distribution channels, marketing communications, global branding, new product development, and social marketing.

MUSI 6540. Special Topics in Music Industry Leadership. 1-4 Hours.

Focuses on various topics related to the music industry. May be repeated up to 11 times for up to 12 total credits.

MUSI 6700. Advanced Licensing Techniques for Music Management. 2-4 Hours.

Identifies and explores advanced licensing strategies, techniques, and transactions for various intellectual properties, including music publishing, sound recordings, trademarks/service marks, and likeness/publicity rights. Examines complex or hybrid licenses that cover more than one aspect of IP in the same license and approaches, strategies, and tactics (both successful and unsuccessful) that have been applied to licensing. Offers students an opportunity to develop a dynamic and effective licensing methodology and practice.

MUSI 6800. Music and Mobile Technologies. 3 Hours.

Examines the mobile music landscape and the major underlying technical, legal, economic, and creative principles in play. The music mobile space is a hotbed of innovation, new content, and novel monetization approaches. The technology, telecommunications, and creative sectors are undergoing rapid changes at the point of their intersection, and this is particularly true for the music industry. Examines this arena from the points of view of artists, businesses, and consumers.

MUSI 6964. Co-op Work Experience. 0 Hours.

Offers eligible students an opportunity for work experience.

MUSI 7976. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on chosen topics. May be repeated without limit.

MUSI 7980. Capstone. 4 Hours.

Offers students an opportunity to integrate their course work, knowledge, and experiences into a capstone project. Offers students an opportunity to work in partnership with local, state, or national leaders to produce an operational music company. This is a faculty-guided project for students completing course work in music industry leadership studies.

Music Performance - NEC (MPNC)

Search MPNC Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=MPNC>)

MPNC 1102. Music Instruction. 2 Hours.

Offers private classical and jazz instruction at all levels by qualified, experienced faculty. Includes instruction in voice; most instruments, including classical guitar; composition; conducting; jazz arranging; music theory; music sight-reading; orchestration; and music technology. May be repeated up to 10 times.

MPNC 1103. Music Instruction. 3 Hours.

Offers private classical and jazz instruction at all levels by qualified, experienced faculty. Includes instruction in voice; most instruments, including classical guitar; composition; conducting; jazz arranging; music theory; music sight-reading; orchestration; and music technology. May be repeated up to 10 times.

MPNC 1104. Music Instruction. 4 Hours.

Offers private classical and jazz instruction at all levels by qualified, experienced faculty. Includes instruction in voice; most instruments, including classical guitar; composition; conducting; jazz arranging; music theory; music sight-reading; orchestration; and music technology. May be repeated up to 10 times.

MPNC 1201. Contemporary Music Production and Technology 1. 1 Hour.

Covers the essential topics a musician should consider when exploring the use of computers and technology related to the music experience. Examines musical styles and forms, the history of electronic music, musical elements, and the fundamentals of music technology. Topics include multitrack recording; sequencing; music notation; home studios; computer and MIDI applications; sampling; microphones; physics of sound; sound reinforcement; virtual instruments; podcasting; and music for film, TV, multimedia, and video games. Offers hands-on experience in the music lab and an opportunity to be the artist, composer, producer, and recording engineer with a final product produced as an online electronic portfolio. No previous music technology experience necessary.

MPNC 1301. Build Your Voice: Art/Skillful Singing. 1 Hour.

Introduces singers of all levels to the fundamental mechanisms of the singing voice, which influence posture and stability, pitch and vibrato, timbre and diction, stage movement and expression. Offers students an opportunity to develop each aspect of vocal performance to increase overall confidence. Students apply their knowledge by preparing songs of their choice (art songs, musical theatre, opera, jazz, Irish ballads, or contemporary) that may be performed in class and coached by the instructor in a supportive environment.

MPNC 1310. Body Mechanics and Awareness for Singers. 1.5 Hour.

Explores key concepts related to singers' needs in vocal production via two mind-body modalities: yoga and the Alexander Technique. Includes presentations on the anatomy of the larynx and the breathing mechanisms; exploration of muscle coordination and strengthening of postural muscles; a yoga singer series developed by Catt; and Alexander Technique principles on coordination and integration. Explores the mind-body modalities both in their unique ways and also in an integrated approach in order to provide building blocks and vocabulary on how the body works and to help participants identify and clear habitual tensions.

MPNC 1313. Alexander Technique for Musicians: Freedom, Ease, and Poise in Singing and Playing. 1 Hour.

Offers students an opportunity to learn the Alexander principles and apply them to performance. Focuses on coordinating breathing, movement, and postural support to demonstrate tools to improve the quality sound and find ease and freedom from unnecessary bodily tensions in practice and performance. For over 100 years, actors, musicians, dancers, athletes, and others have used the Alexander Technique, a mind-body practical, educational method to deal with unnecessary body tensions, to maintain poise and presence and to find ease and natural coordination of movement while making music.

MPNC 1401. Jazz Ear Training 1. 1 Hour.

Functions as an aural counterpart to MPNC 1411. Emphasizes simple interval recognition, basic jazz rhythmical rudiments, aural identification of beginning jazz harmony, simple transcription, and vocal and instrumental imitation. Offers students an opportunity to obtain basic aural recognition skills using jazz musical vocabulary. Includes singing (no previous experience is necessary) and playing of instruments.

MPNC 1411. Jazz Theory 1. 1.5 Hour.

Introduces the harmonic and analytic vocabulary used by jazz musicians for compositional and improvisational development. Emphasizes understanding common technical terms and also learning to quickly apply theoretical constructs to playing and/or singing in a performance setting. Uses recordings of well-known jazz pieces to demonstrate theory concepts. Topics include chord construction, key signatures, diatonic modes and chord scales, basic extended jazz harmony, guide tones, and voice leading, as found in standard jazz chord progressions.

MPNC 1421. Finale Chart Writing. 1 Hour.

Focuses on basic instruction in Finale notation software. Designed for the student who desires to learn computer notation software and to make clear-looking printed music for rehearsals and performance. Offers students an opportunity to learn how to make professional charts based on the concept of developing empathy for the reader. In-class projects include lead sheets (melodies and chords); two-line scores (enhanced lead sheets); rhythm section writing (drums, bass, guitar, and keyboards); writing for vocals; changing keys; writing for horns; concert and transposed scores; part preparation; and through-composed (completely notated) scores. Also covers using Finale to make audio files as a tool for individual vocal or instrumental practice and composition.

MPNC 1451. Jazz History 1. 1 Hour.

Offers the first half of a comprehensive overview of the evolution of American jazz from its roots in African folk song and ritual through the present day. Covers related topics such as crossover, third stream, fusion, and jazz-influenced classical music. Emphasizes listening and class discussion, with possible live in-class performances.

MPNC 1501. Introduction to Music-in-Education. 2 Hours.

Offers an overview of the diverse and evolving roles of music and musicians in the field of music-in-education (MIE). Introduces the artist-teacher-scholar framework and relevant readings on the teaching of arts, the artistry of teaching, and the scholarship of teaching as a way to explore the differentiation and synthesis of these three perspectives in preparation for a role as a music educator. Researches the role of music as a catalyst for learning in other subject areas and social-emotional development. Offers students an opportunity to create and maintain their MIE digital portfolios.

MPNC 1612. Group Piano Class. 1 Hour.

Introduces keyboard to beginners. Offers students an opportunity to learn note-reading and rhythm skills and to develop technique to play repertoire at their own skill level. No prior keyboard experience is required. For students who have had experience playing piano or have participated in a previous session, the course seeks, through personalized instruction, to help boost technique and progress to a more advanced level of repertoire. Designed to accommodate varying beginning skill levels and to be customized for returning and continuing students.

MPNC 1621. The Art of Musical Sight-Reading. 2-4 Hours.

Designed especially for singers or instrumentalists who know basic notation but open to all who wish to better understand the languages of music and how to read them. Offers students an opportunity to develop skills at reading musical notation in ways that reach for higher structures of musical meaning. Explores music of different historical periods and of different composers in an effort to develop capabilities in understanding how musical languages work and how they may be read. Practice at home is expected of those who wish to improve their reading fluidity. There is group reading and opportunities for individual reading work in class for those who wish it.

MPNC 1622. The Art of Practice and Performance. 1 Hour.

Offers students an opportunity to become optimal teachers to themselves and to identify practice skills that promote deep learning. Introduces physiological and cognitive techniques that help manage performance anxiety. Presents methods that help free students to express their feelings, stories, and themselves with their audience. This is an interactive workshop; students should bring their instruments.

MPNC 1623. Developing Perfect Pitch 1. 1 Hour.

Based upon the unique ear-training system discovered and designed by Alla Elana Cohen. This system was created to help professional and amateur musicians improve and refine their ear with the ultimate goal of acquiring perfect pitch. The practice of the exercises in this course, along with dedication and patience, seeks to help realize the ear's highest level of virtuosity. Class meetings consist of specific auditory exercises designed to help improve the student's ability to perceive and recognize individual pitches, not only on the piano but on any instrument.

MPNC 1631. The Accidental Music Teacher: From Musical Artist to Creative Educator. 1.5 Hour.

Designed for musicians seeking a practical foundation as artists/educators. As a musical artist, pursuing studies or focusing on your career, you may at some point find yourself standing in front of a classroom or teaching in a music studio—you are the "accidental music teacher." Examines resources, methods, strategies, and approaches applied in music education. Explores current teaching methodologies. Examines a variety of topics and issues, including assessment procedures, institutional guidelines and educational standards, and maintaining creative integrity as music educators. Course work includes a statement defining a personal philosophical and methodological approach to music education. Students design an individualized music curriculum by incorporating current methodologies and resources.

MPNC 1642. Sight-Singing for Singers. 1 Hour.

Offers singers who understand staff notation, can easily sing basic rhythms, and can easily find pitches on the keyboard an opportunity to develop their sight-singing skills. Offers regular drills in recognizing and singing all intervals. Seeks to establish fluency with all key signatures and sight-sing accuracy in all major and minor keys.

MPNC 1712. Baroque Ensemble. 1 Hour.

Specializes in composers such as Monteverdi, Schütz, Bach, and others. Offers an opportunity for musical families to sing, play, and perform together. May be repeated up to 10 times.

MPNC 1713. NEC Voices: A New Choral Experience. 1.5 Hour.

Seeks to uniquely serve the needs of both advanced and beginning singers, with opportunities for each to take their skills to the next level. Focuses on excellence in singing, on vocal artistry, and on music's unique ability to reflect the human experience. May be repeated up to 10 times.

MPNC 1714. Renaissance Ensemble. 1 Hour.

Offers students an opportunity to perform music of the Renaissance—the largest and perhaps the greatest period of vocal and instrumental chamber music. Since each part has its own melody in the polyphonic web, the repertory is very satisfying for performers. This performance class includes a wide range of madrigals, instrumental music, and dance music. Includes work with some of the Renaissance improvisation manuals, such as treatises by Ortiz and Ganassi. Open to all advanced and professional vocalists and instrumentalists. May be repeated up to 10 times.

MPNC 1716. Contemporary Improvisation Ensemble: Walking between Worlds. 1.5 Hour.

Explores music and improvisation from many genres, eras, and cultures. Offers students an opportunity to create their versions as they learn from the sources. Pieces are chosen based on the interests of students and may include original compositions by participants as well as works stemming from folk genres, pop music, jazz, and classical music. Culminates in a performance showcasing the work that students have done. All instruments and voices are welcome. May be repeated up to 10 times.

MPNC 1721. Guitar Ensemble 1. 1 Hour.

Offers an opportunity to study, prepare, and perform music for guitar trio or quartet and to play literature from all stylistic periods. Emphasizes developing good ensemble skills—dialogue, critical listening, nonverbal communication, and timing. When possible, other instruments may play a guest role. Takes a progressive approach toward the development of sight-reading skills, though the primary goal is on prepared music and assignments. Designed for early intermediate players who can read some music but are not fluent at sight-reading. May be repeated up to 10 times.

MPNC 1731. Jazz Ensemble. 1.5 Hour.

Offers jazz ensembles at all levels. Designed for instrumentalists and vocalists who wish to work with a complete rhythm section. Emphasizes the exploration of various jazz styles and improvisation techniques. Encourages performances of student compositions. May be repeated up to 10 times.

MPNC 1741. Chamber Music Ensemble. 1 Hour.

Offers chamber music ensembles at intermediate and advanced levels encompassing the following areas: strings, woodwinds, piano, voice, brass, guitar, and mixed ensembles. Coached by the department chair and faculty. Explores the great repertoire in detail, combining the discipline of the highest standard of playing with an understanding of the music. Offers students an opportunity to learn how to play their best, getting past the limitations of purely technical considerations. May be repeated up to 10 times.

MPNC 1742. Chamber Music Duo. 1 Hour.

Offers chamber music duos at intermediate and advanced levels encompassing the following areas: strings, woodwinds, piano, voice, brass, guitar, and mixed ensembles. Coached by the department chair and faculty. Explores the great repertoire in detail, combining the discipline of the highest standard of playing with an understanding of the music. Offers students an opportunity to learn how to play their best, getting past the limitations of purely technical considerations. May be repeated up to 10 times.

MPNC 1751. Vocal Chamber Music. 1.5 Hour.

Introduces three centuries of literature for solo vocal ensemble (music for two or more solo voices and piano or instruments). Tailored to the interests and abilities of the participants. Includes ensemble singing, ear training, diction, and stage presence. Concludes with a concert. Literature is drawn from the works of Brahms, Haydn, Schubert, Mendelssohn, Schumann, Fauré, Donizetti, Rossini, Dvořák, Britten, Purcell, Foster, and others. May be repeated up to 10 times.

MPNC 1771. Improvisation and Composition Ensemble. 1.5 Hour.

Offers a laboratory for experiments and games in which students explore new ways of creating music and interacting with other musicians. Offers students an opportunity to develop skills to understand current ideas about composition and improvisation and to be able to apply some of them in a group setup. Seeks to give ensemble members the ability to make connections between music and other artistic expressions. Includes experiments with visual art, poetry, and dance as main sources for new pieces. The ensemble is designed for students who have musical experience as well as those who have never played before. All instruments and voices are welcome. May be repeated once.

MPNC 1781. Medieval Folk Roots Ensemble. 1.5 Hour.

Explores a body of songs that have slipped in and out of oral and written traditions over the centuries—medieval cantigas; Gregorian chant; troubere songs and villancicos; folk songs; and works of Machado, Villa-Lobos, Dvorak, Canteloube, and recent composers. Offers students an opportunity to play with melodies and modes as they look at how songs travel through time and across cultures and create their own songs and arrangements to add to the tradition. May be repeated once.

MPNC 1801. Introduction to Composition 1. 1 Hour.

Encourages beginning composition students to realize their musical conceptions. Introduces basic concepts such as pitch and scale organization, meter, rhythm, interval, chord, tone color, motive, phrase, melody, and texture. Covers rudiments of counterpoint, harmony, instrumentation, and standard forms. Emphasizes the balance between repetition and contrast. Specific exercises are given, but students are also encouraged to write freely and to develop a style of their own.

MPNC 1802. Contemporary Improvisation: Skill Building. 2-4 Hours.

Seeks to ground students with a strong foundation in ear training, theory, rhythm, keyboard, performance, and improvisation skills. Also seeks to develop and hone these skills through vocal and instrumental work, both on students' main instruments and at the keyboard, as well as through notated exercises. All work is practically applied, offering students an opportunity to instantly connect new skills with their own musical goals. May be repeated up to four times.

MPNC 1803. Contemporary Improvisation: Music of the World—The African Diaspora. 1.5 Hour.

Examines works by a diverse group of performers, composers, and improvisers across cultures and genres throughout history. Offers students an opportunity to analyze their different approaches and influences and to create their own works based on those techniques. Possible artists/genres may include Igor Stravinsky, Claude Debussy, Charles Ives, Billie Holiday, Roscoe Holcomb, Esma Redzepova, Ornette Coleman, Appalachian and Eastern European folk music, and many others. This course is part of a four-course sequence ("Music of the World").

MPNC 1901. Art and Soul of Cinema: An Appreciation of Film Music. 1.5 Hour.

Explores the various functions of music in film. Describes the various roles of those involved in producing a film and how they each relate to the composer and the musical score. Examines the evolution of film music from 1895 to the present. Discusses functions of film scoring and the operational aspects of the film music industry along with interviews of music editors, orchestrators, film music agents, studio musicians, music copyists, music contractors, and others within the business. Studies composers using video and audio excerpts, representative scores, biography, and a listing of the composer's recognizable compositional style. Designed for moviegoers, composers, and film music enthusiasts.

MPNC 1911. Latin American Classical Traditions 1. 1 Hour.

Covers chamber music, concertos, operas, ballets, art songs, choral, and instrumental music by Latin American composers. The history of Latin American art music stretches back more than 500 years and is extremely rich and varied. Studies how the rhythms, melodies, and harmonies were transformed in this continent to shape new music by composers such as Heitor Villa-Lobos, Ginastera, Lecuona, Guastavino, Sojo, and many others. Includes the countries of Argentina, Brazil, Mexico, Venezuela, Chile, Peru, Puerto Rico, and Cuba and examines the origin and development of each nation's musical identity.

MPNC 2401. Jazz Ear Training 2. 1 Hour.

Continues concepts introduced in MPNC 1401 and functions as an aural counterpart to MPNC 2411. Emphasizes simple interval recognition, basic jazz rhythmical rudiments, aural identification of beginning jazz harmony, simple transcription, and vocal and instrumental imitation. Offers students an opportunity to obtain basic aural recognition skills using jazz musical vocabulary. Includes singing (no previous experience is necessary) and playing of instruments.

MPNC 2411. Jazz Theory 2. 1.5 Hour.

Continues exploring the topics introduced in MPNC 1411 with further discussion of harmonic and analytic vocabulary used by jazz musicians for compositional and improvisational development. Emphasizes understanding common technical terms and also learning to quickly apply theoretical constructs to playing and/or singing in a performance setting. Uses recordings of well-known jazz pieces to demonstrate theory concepts. Topics include chord construction, key signatures, diatonic modes and chord scales, basic extended jazz harmony, guide tones, and voice leading, as found in standard jazz chord progressions.

MPNC 2431. Jazz Composition and Analysis. 1.5 Hour.

Focuses on various techniques and methods of composing—such as motivic development, rhythmic manipulation, and reharmonization—as well as on the structure of form and phrase. Exercises and assignments stem from an in-depth analysis of important jazz compositions and recordings.

MPNC 2451. Jazz History 2. 1 Hour.

Offers the second half of a comprehensive overview of the evolution of American jazz from its roots in African folk song and ritual through the present day. Covers related topics such as crossover, third stream, fusion, and jazz-influenced classical music. Emphasizes listening and class discussion, with possible live in-class performances.

MPNC 2511. Music-in-Education Seminar. 2 Hours.

Explores readings and presentations focused on the various ways that music functions as a medium and/or model for learning in other subject areas and how it affects social-emotional development. Offers students an opportunity to use this seminar to propose new guided internships, to present and reflect on their work in current guided internship courses, or to work on their requirements for the final music-in-education concentration cumulative portfolio and exit interview.

MPNC 2512. Models for Teaching and Learning for Music-in-Education. 2 Hours.

Challenges students to investigate important contrasting models of learning and to explore their application to teaching and learning in (and through) music. Serves as a preparation for guided internships, curriculum development, assessment, and further study of the developmental psychology of music. Portfolio assignments focus on readings, observations, sample curricula that support each student's evolving rationale, and application of general models of teaching and learning to music.

MPNC 2525. Art and Science of Assessing Music Learning. 2 Hours.

Explores historical and current practices in music learning assessment methods, from preschool to K-12 to postsecondary contexts, including published studies conducted at New England Conservatory. Examines implications of current research and practices designed to measure the extent to which music training affects general learning and human development. Topics include recent developments in assessing music and neurological development, research on music's role in early literacy, and long-term studies on the relationship between music and social development. Challenges students to apply their knowledge of recent findings in research literature to teaching and learning in music.

MPNC 2526. Music, Brain Development, and Learning. 2 Hours.

Examines implications of current research indicating that music training affects general learning and human development. Topics include recent developments in brain imaging, research on music's role in early literacy, and long-term studies on the relationship between music and social development. Challenges students to apply their knowledge of recent findings in research literature to teaching and learning in music.

MPNC 2547. Cross-Cultural Alternatives for Music-in-Education. 2 Hours.

Explores approaches to music making and music learning that derive from ancient resonances of oral traditions and contemporary research in music and cognition.

MPNC 2548. Teaching and Learning with Music Technology. 2 Hours.

Covers the fundamental tools of current music technology and the common practices and strategies typically employed by teachers using these tools. Introduces the music technologies most commonly found in educational settings and explores them in a hands-on music technology lab setting. Examines electronic musical instruments, notation software, sequencing software, recording software, and technology-assisted learning software. Working through the nine National Association for Music Education (MENC) standards for music education, offers students an opportunity to actively apply a wide range of technology-based teaching strategies and to develop and demonstrate a multilesson curricular sequence that they believe is most relevant to their future teaching contexts and students.

MPNC 2556. Improvisation in Music Education. 2 Hours.

Explores venues for employing traditional and contemporary improvisation techniques and methods for all instruments in the general music classroom ensemble or in private lessons. Emphasizes multiple cultural perspectives on percussion and vocal teaching and learning and attention to social-emotional aspects of drum circle facilitation. Also explores interdisciplinary aspects of improvisation with attention to language arts, mathematics, history, and science. Introduces techniques for teaching improvisation, with an emphasis on "playing by ear," ornamentation, and learning through call-and-response exercises. Explores the cultural, historical, and educational methods of teaching improvisation in schools through readings, research, observation, and discussion.

MPNC 2561. String Pedagogy. 2 Hours.

Explores approaches and methods in the education of string players. Includes the historical development of techniques, important pedagogical writings, and guest lecturers who are experts in this topic.

MPNC 2571. Performing Artists in Schools. 2 Hours.

Discusses aspects of assessing the educational impact of musical performance through readings and by design and implementation of assessments in school settings. Models for education-based performance outreach build on the past work of music-in-education students, young audiences, and the *From The Top* radio show. Offers students an opportunity to learn to present high-quality programs that meet specific educational goals and objectives.

MPNC 2601. Music Production for Media. 1 Hour.

Continues the concepts studied and applied in MPNC 1201. Focuses in-depth on the music composition and multimedia applications of MIDI systems and digital audio workstations such as Pro Tools and Digital Performer as well as multitrack recording systems and techniques, sound design, and software-based synthesis/music production programs such as Reason. Covers fundamentals of theory and technical process for music in film, multimedia, corporate video, and TV commercials, in addition to multimedia Web authoring and video editing. Offers students an opportunity to gain further hands-on experience in the music lab and to be the artist, composer, producer, and recording engineer with a final product produced as an online electronic portfolio.

MPNC 2612. Piano Pedagogy. 2 Hours.

Examines methods, concept series, teaching materials, and literature from elementary through upper-intermediate levels. Views comparative educational philosophies and psychologies as related to piano teaching. Features guest lecturers in special areas of concentration. Introduces Dalcroze Eurhythmics and group piano teaching. Includes lectures, discussion, performance, and reading and research assignments.

MPNC 2623. Developing Perfect Pitch 2. 1 Hour.

Offers a continuation of the concepts studied in MPNC 1623. Offers students who practice with dedication and patience the exercises contained in this course an opportunity to realize the ear's highest level of virtuosity. Class meetings consist of specific auditory exercises designed to help improve the student's ability to perceive and recognize individual pitches, not only on the piano but also with any instrument.

MPNC 2624. Advanced Perfect Pitch. 1 Hour.

Offers a continuation of the concepts studied in MPNC 1623 and MPNC 2623. Offers students who practice with dedication and patience the exercises contained in this course an opportunity to realize the ear's highest level of virtuosity. The course material consists of Alla Cohen's book *Perfect Pitch for You*. Class meetings consist of specific auditory exercises designed to help improve the student's ability to perceive and recognize individual pitches, not only on the piano but on any instrument.

MPNC 2644. Bach Arias for Singers and Instrumentalists. 1 Hour.

Explores the works of Johann Sebastian Bach through performance and study. Uses coaching; rehearsals; presentations by the instructor, guests, and students; listening; reading; and writing assignments to offer students an opportunity to gain confidence in performance practice. In a master class format, studies issues of Baroque style, ornamentation, language, and performance practice, with an emphasis on developing ensemble skills culminating in a performance at the end of the semester. Open to all singers, all strings and wind players (oboe, flute, recorder, bassoon, trumpet), and keyboard players who have an interest in organ and/or harpsichord. Singers must be familiar with singing German.

MPNC 2801. Introduction to Composition 2. 1 Hour.

Reviews topics from MPNC 1801. Explores chromatic and nontriadic harmony, contrapuntal techniques such as double and triple invertibility, larger forms, and various twentieth-century developments. Offers intermediate composition students an opportunity to realize their musical conceptions. Specific exercises are given, but students are also encouraged to write freely and to develop a style of their own. Compositions are performed in class when possible.

MPNC 2911. Latin American Classical Traditions 2. 1 Hour.

Analyzes the repertoire that constitutes the Latin American art music canon. The history of Latin American art music stretches back more than 500 years and is extremely rich and varied. Covers chamber music, concertos, operas, ballets, art songs, choral, and instrumental music by Latin American composers including Heitor Villa-Lobos, Alberto Ginastera, Ernesto Lecuona, and Vicente Emilio Sojo, among many others.

MPNC 3401. Jazz Ear Training 3. 1 Hour.

Offers a continuation and expansion of MPNC 2401. Offers students an opportunity to learn how to sing jazz voice leading lines, identify extended jazz harmony, imitate complex rhythmic figures, transcribe complex melodies and solos, and imitate singers and instrumentalists. Includes singing and playing of instruments. Portable recorders are required.

MPNC 3411. Jazz Theory 3. 1.5 Hour.

Offers a continuation and expansion of the analytic principles and jazz vocabulary introduced in MPNC 2411. Topics include "modern" harmonic movement, modal hierarchies, chord substitutions, alternate modes, compound chords, chromaticism, and improvisational pacing of theoretical concepts. Uses recordings of well-known jazz pieces to demonstrate theory concepts. Encourages students to spend much time analyzing compositions and improvisations by jazz masters and composing.

MPNC 3431. Jazz Arranging. 1.5 Hour.

Studies how to compose and arrange parts for a small jazz ensemble. Topics covered include jazz notation for both rhythmic and melodic instruments; ranges and basic timbres of woodwind and brass instruments; technical limitations of instruments; and writing introductions, interludes, background figures, and endings. Offers in-class demonstrations by professional musicians. Portable cassette recorders are required.

MPNC 3611. Piano Interpretation/Performance Seminar. 1 Hour.

Designed for intermediate- to advanced-level performers. Offers participants an opportunity to deepen their musical understanding and to provide an artistic context to their repertoire. Covers technical, stylistic, and conceptual issues, as well as practice techniques, performance preparation, and learning to "own the stage." Conducted in the format of a master class. Some coaching sessions may be conducted by distinguished guest artists. Culminates in a public concert by all active participants. May be repeated up to 10 times.

MPNC 3631. 18th-Century Tonal Counterpoint. 2-4 Hours.

Studies the basic elements of canon and fugue and the tonal harmony that gives direction and articulation to these types of polyphony. Draws representative examples from J. S. Bach's Musical Offering, Goldberg Variations, and The Well-Tempered Clavier, Book 1.

MPNC 3633. Modal Counterpoint. 2-4 Hours.

Studies sixteenth-century species counterpoint in two voices and introduces eighteenth-century counterpoint, canon, and fugue in three voices. Emphasizes representative musical examples by Palestrina and Bach.

MPNC 3641. Dramatic Coaching of Songs and Arias. 1 Hour.

Offers singers an opportunity to enhance their vocal performing power with dramatic coaching. Seeks to prepare singers for performances in recitals, opera, and auditions. Uses techniques of subtexting, inner monologue, semistaging, and musical and dramatic analysis to demonstrate the ability to create unique interpretations with energy, concentration, and dramatic impact.

MPNC 3642. Opera Ensemble Skills. 1 Hour.

Offers singers intensive training in the component skills required for successful performance as an ensemble singer-actor in opera and musical theatre, including role and musical preparation, musical and dramatic analyses, proscenium stage and acting techniques, dialogue, and recitative reading. All instruction takes place through hands-on preparation and performance of ensemble scenes from opera and musical theatre. This course's ensemble acting focus complements the individual focus of MPNC 3641. MPNC 3641 and MPNC 3642 may be taken separately or together.

MPNC 3643. Vocal Repertoire: Coaching and Performance. 1.5 Hour.

Offers singers and pianists an opportunity to perform selected pieces from the vocal repertoire each week in a supportive and noncompetitive class setting. The instructor coaches the performers on aspects of the literature that pertain to both vocalists and pianists, including diction, musical style, interpretation, presentation, relationship of the piano accompaniment to the vocal setting, and historical context of the repertoire. Concludes with a concert.

MPNC 3644. Musical Theatre Workshop. 1.5 Hour.

Focuses on the preparation and performance of works from musical theatre—from Gilbert and Sullivan through Stephen Sondheim, right up to the modern Broadway stage. Repertoire includes solos, duets, trios, and ensemble pieces. Explores essential concepts of voice production, stage presentation and movement, and character development through in-class coaching and rehearsal. Includes careful technical training in achieving authentic belt quality while ensuring vocal health for students performing this literature. The course culminates in a public performance. Students should be able to read music and to learn their parts outside of class time. Decisions relating to repertoire selections and the final performance are at the instructor's discretion.

MPNC 3801. Composition Seminar 1. 1.5 Hour.

Offers project-based work with the goal of creating intensive collaborations between composers and conservatory performers. Projects are focused on composing for specific instrumental combinations, differing from semester to semester. Offers students an opportunity to study orchestration and scores of repertory pieces to help them develop their craft for writing for the selected performer combination. The class is predominantly run like a group composition lesson where students present ongoing work for the chosen ensemble to each other. At various times throughout the semester, meetings are held with performers who critique works in progress. Culminates in a final performance and recording of finished work.

MPNC 3802. Composition Seminar 2. 1.5 Hour.

Continues MPNC 3801.

MPNC 4401. Jazz Ear Training 4. 1 Hour.

Offers a continuation of concepts introduced in MPNC 3401. Includes further study of how to sing jazz voice leading lines, identify extended jazz harmony, imitate complex rhythmic figures, transcribe complex melodies and solos, and imitate singers and instrumentalists. Includes singing and playing of instruments. Portable recorders are required.

MPNC 4411. Jazz Theory 4. 1.5 Hour.

Offers a continuation of concepts introduced in MPNC 3411. Includes further discussion and analysis of “modern” harmonic movement, modal hierarchies, chord substitutions, alternate modes, compound chords, chromaticism, and improvisational pacing of theoretical concepts. Uses recordings of well-known jazz pieces to demonstrate theory concepts. Encourages students to spend much time analyzing compositions and improvisations by jazz masters and composing.

MPNC 4581. Music-in-Education Guided Internship. 2 Hours.

Offers students an opportunity to complete a guided internship. Students are supervised by the music-in-education department chair and music-in-education coordinator. Important to the success of the internship, and its possible application to state licensure, is the range and quality of documentation of the internship activities as specified in the internship plan. Internships may focus on many topics, such as studio instruction, preschool education, vocal and general music instruction, student improvisation and composition in schools, music integration in schools, music for special needs students, orchestral and wind ensemble conducting, music literacy instruction, conducting improvisation ensembles, opera performance and creating opera residencies, arranging and composing for school ensembles, arts learning organization, and administration internships.

MPNC 4591. Music-in-Education Portfolio. 0 Hours.

Offers students an opportunity to complete their portfolio with supervision by the music-in-education coordinator. Students are required to register for this course when they have designed, and intend to complete, a guided internship.

Music Technology (MUST)

Search MUST Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=MUST>)

MUST 1220. Introduction to Music Technology. 4 Hours.

Provides students with instruction in the use of a computer for composing original music. Topics include MIDI sequencing, digital audio processing, and sound synthesis. Students use music hardware and software to complete a variety of projects.

MUST 1301. Introduction to Composition. 4 Hours.

Designed as the first step in the education of a student composer. The art and craft of composing music is grounded in knowledge of fundamental concepts and hands-on experience. Offers students an opportunity to acquire competence in the notation and layout of a score; develop basic compositional skills (control of melody, harmony, rhythm); and obtain a wide and deep knowledge of the musical repertory.

MUST 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MUST 2320. Sound Design. 4 Hours.

Instructs students in the art of producing and designing musical accompaniments for a variety of media including film, TV commercials, industrial video, animation, games, theatre, and radio drama. Focuses on abstract thinking regarding sound theory and practice and includes hands-on skills. Restricted to music majors and combined majors; all other students require permission of instructor.

MUST 2431. Computer Music Fundamentals. 4 Hours.

Focuses on the creation and implementation of standard time-domain audio synthesis routines and effects, as well as standard frequency-domain processing routines. MaxMSP is the principal programming environment used in the course. Begins with programming protocols, as well as data structures and storage, and list processing in the MaxMSP environment before moving on to standard synthesis and audio processing routines. Examines how the techniques learned in the course can be applied using a variety of synthesis and spectral processing software applications that are standard in the field.

MUST 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MUST 3540. Special Topics in Music Technology. 1-4 Hours.

Focuses on topics related to current trends in the area of music technology. Topics vary with each offering. May be repeated without limit.

MUST 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MUST 4520. Interactive Music Programming. 4 Hours.

Focuses on three high-end skills: advanced software-based synthesis and production, abstract reasoning and computer programming, and performing live with electronic instruments in an interactive human-computer environment. Utilizes the MAX programming language, enhanced with MSP, a set of extensions to the MAX graphical programming environment that provides for real-time synthesis and signal processing with a PowerPC Mac OS computer.

MUST 4610. Composition for Electronic Instruments. 4 Hours.

Instructs students in the composition of original music for electronic and computer-based instrumentation. Students create music to accompany video, animation, and film, and study suitable methods for creating original music for the Internet. Also surveys examples of music written for similar contexts.

MUST 4611. Music Technology Capstone/Senior Recital. 4 Hours.

Instructs students in the preparation and presentation of their senior recital. Fulfills the college’s experiential education requirement for music technology concentrators.

MUST 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

MUST 5540. Special Topics in Music Technology. 3,4 Hours.

Focuses on various topics related to music technology. May be repeated up to two times.

Nanomedicine (NNMD)

Search NNMD Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=NNMD>)

NNMD 4991. Research. 4 Hours.

Offers an opportunity to conduct research under faculty supervision.

NNMD 5270. Introduction to Nanomedicine. 3 Hours.

Provides an overview of the distinctive features of nanotechnology and its applications in medicine. Examines cutting-edge research in disease screening, diagnosis, treatment, and prevention. Includes active participation of students through in-depth discussions about clinical and emerging technologies. Taught by Northeastern faculty and guest speakers. .

NNMD 5272. Nanomedicine Seminar 1. 1 Hour.

Presents scientific findings and innovations in the field of nanomedicine by leading researchers and clinicians, with a focus on emerging technologies for public health. Offers students an opportunity to learn about unmet needs and career opportunities in nanomedicine. May be repeated without limit.

NNMD 5274. Nanomedicine Seminar 2. 1 Hour.

Presents scientific findings and innovations in the field of nanomedicine by leading researchers and clinicians, with a focus on emerging technologies for public health. Offers students an opportunity to learn about unmet needs and career opportunities in nanomedicine. May be repeated without limit.

NNMD 5370. Nanomedicine Research Techniques. 4 Hours.

Offers an in-depth look at laboratory methods and tools for studying nanomaterials used in biology and medicine. Includes hands-on sessions with experts in nanoparticle synthesis, electron microscopy, optical microscopy, magnetic resonance imaging, high-performance liquid chromatography, in vitro measurements of nanoparticle bioactivity and cytotoxicity, and in vivo measurements of treatment efficacy.

NNMD 5470. Nano/Biomedical Commercialization: Concept to Market. 3 Hours.

Offers a comprehensive overview of the commercialization process for nano- and biomedical technologies. Discusses the key elements of a successful business plan, including scientific innovation, market assessment, customer discovery, intellectual property protection, business modeling, and value extraction. Also covers regulatory processes and market-specific strategies for raising capital. Offers students an opportunity to gain entrepreneurship skills through the creation of a team business proposal. Students have opportunities to interact with guest entrepreneurs.

NNMD 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

NNMD 6984. Research. 4 Hours.

Offers an opportunity to conduct research under faculty supervision.

Navy ROTC (NAVY)

Search NAVY Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=NAVY>)

NAVY 1001. Naval Science Laboratory. 0 Hours.

Focuses on either drill instruction or practical work to complement classroom instruction. Must be taken in each class semester by all NROTC nursing students.

NAVY 1101. Introduction to Naval Science. 2 Hours.

Presents a general introduction to the naval profession and the concepts of sea power. Emphasizes the mission, organization, and warfare components of the United States Navy and Marine Corps. Includes an overview of officer and enlisted ranks and rates, training and education, and career patterns. Also covers naval courtesy and customs, military justice, leadership, and nomenclature. Exposes the student to the professional competencies required to become a naval officer.

NAVY 4101. Naval Operations and Seamanship. 3 Hours.

Offers a capstone course for senior midshipmen in advanced navigation, communications, naval operations, and naval warfare. Offers students an opportunity to learn through simulation in a computer classroom.

NAVY 4501. Leadership and Management. 2 Hours.

Studies at an advanced level organizational behavior and management in the context of the naval organization. Topics include the management functions of planning, organizing, and controlling; individual and group behavior in organization; and motivation and leadership. Explores major behavioral theories in detail. Investigates practical applications by the use of experiential exercises, case studies, and lab discussions. Develops other topics including decision making, communication, responsibility, authority, and accountability.

Network Science (NETS)

Search NETS Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=NETS>)

NETS 7341. Network Economics. 4 Hours.

Covers seminal works in the economics of information and networks, including Akerlof, Arrow, Spence, Stiglitz, and von Hayek. Proceeds through concepts of information, its value, and measurement; search and choice under uncertainty; signaling, screening, and how rational actors use information for private advantage; strategy-given network effects; two-sided (or multisided) network effects, organizational information processing, learning, and social networks; and other micro- and macroeconomic effects such as matching markets. Although primarily a theory course, it may be of interest to any student applying information economics and network economics in academic, commercial, or government policy contexts. Expects students to produce a major paper suitable for publication or inclusion in a thesis. Requires prior completion of graduate coursework in microeconomics and mathematics at the level of introductory calculus and statistics.

NETS 7350. Bayesian and Network Statistics. 4 Hours.

Introduces advanced quantitative methods including maximum likelihood, hierarchical models, sampling, and network modeling. Offers students an opportunity to learn to estimate and develop models from the probabilistic and Bayesian perspective and pursue their own research project, focusing on the methodological challenges. Reviews probability and examines maximum likelihood methods for estimating regression models with continuous and categorical dependent variables. Examines a variety of procedures for sampling from posterior distributions, including grid, quadratic, Gibbs, and Metropolis sampling. Applies these methods to hierarchical modeling and other simple probabilistic models, then takes a closer look at the statistical modeling of networks as it has been developed in the social sciences, beginning with the exponential random graph model (ERGM) and finishing with the temporal SIENA model.

NETS 7976. Directed Study. 1-4 Hours.

Offers independent work under the direction of a member of the program on a chosen topic. Course content depends on instructor. May be repeated without limit.

NETS 7983. Topics. 4 Hours.

Covers various topics in network science. May be repeated up to two times for up to 12 total credits.

NETS 8941. Network Science Literature Review Seminar. 2 Hours.

Critically evaluates recent articles in the academic literature surrounding topics and applied research in network science. May be repeated up to three times.

NETS 8984. Research. 1-4 Hours.

Offers advanced students an opportunity to work with an individual instructor on a topic related to current research. Instructor and student negotiate a written agreement as to what topic(s) are covered and what written or laboratory work forms the basis for the grade. Viewed as a lead-in to dissertation research. May be repeated without limit.

NETS 9000. PhD Candidacy Achieved. 0 Hours.

Indicates successful completion of the doctoral comprehensive exam.

NETS 9990. Dissertation. 0 Hours.

Offers experimental and theoretical work for PhD candidates. Requires written dissertation and final oral exam. May be repeated once.

NETS 9996. Dissertation Continuation. 0 Hours.

Offers experimental and theoretical work for PhD candidates. Requires written dissertation and final oral exam. May be repeated without limit.

Nonprofit Management - CPS (NPM)

Search NPM Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=NPM>)

NPM 6100. Strategic Management for the Nonprofit Sector. 3 Hours.

Introduces the nature and major trends of the nonprofit sector, both in the United States and internationally. Aims to deepen student understanding of the nature of the nonprofit world and its organizations by looking at the intersection between managerial practices and policy decisions. Offers students an opportunity to identify and interpret key issues and challenges of sustainability experienced by stakeholders of the nonprofit world and to consider their implications for managerial practice. .

NPM 6110. Legal and Governance Issues in Nonprofit Organizations. 3 Hours.

Examines the U.S. federal and state laws under which nonprofit organizations operate and considers their effect on the establishment and operation of nonprofit organizations. Offers students an opportunity to learn about incorporation and tax-exempt status, general liability, regulatory compliance/reporting, and contracts. Emphasizes the roles, responsibilities, processes, and powers of boards of directors.

NPM 6120. Financial Management for Nonprofit Organizations. 3 Hours.

Introduces students to the major financial management concepts and techniques required for effective management of nonprofit organizations. Managing one's budget well is an essential skill for the nonprofit manager because the organization's core mission cannot be served if the financial health of the organization is in jeopardy. Offers students an opportunity to learn about nonprofit accounting, budget management, revenue forecasting, financial statements and reports, tax issues, grant compliance, internal expenditure control, audits, cash flow management, long-term financial planning, endowment management, and capital financing.

NPM 6125. Promoting Nonprofit Organizations. 3 Hours.

Explores the uses of traditional and nontraditional ways to promote nonprofits to an array of actual and potential audiences for a variety of purposes. All nonprofit organizations at some point must be visible to the public in order to fulfill their missions; nonprofit managers must know how to promote their organizations to current and potential supporters, the broader public, and the mass media. Topics include program and organizational branding, targeting respective audiences, and preparing materials for greatest effect.

NPM 6130. Fundraising and Development for Nonprofit Organizations. 3 Hours.

Examines sources of funding and strategies for development planning, including donor profiles, proposals and case statements, foundation and corporate philanthropy, government grant and contract programs, special events, marketing and public relations functions, direct mail and membership campaigns, planned giving, major gifts, and capital campaigns. Fundraising and development are essential skills for managers because nonprofit organizations depend upon individual, government, and foundation resources to fulfill their mission.

NPM 6140. Grant and Report Writing. 3 Hours.

Introduces grants and grant proposal writing. Knowledge of the grant writing cycle allows nonprofit professionals to use their time productively. Topics include effective research, creating a plan for the program, elements of a good proposal, components of the proposal package, and strategies for getting a proposal read by a foundation or corporation. Offers students an opportunity to research an RFP or identify a foundation, write a grant proposal, and ready it for submission to a funding source.

NPM 6150. Human Resources Management in Nonprofit Organizations. 3 Hours.

Examines methods of developing, supervising, motivating, and recognizing volunteers and staff; communicating effectively within an organization; staff-volunteer relations; and stress, conflict, and crisis management. Managers in nonprofit organizations face the challenge of working with both paid and unpaid stakeholders in the organization's future. Explores HRM topics such as legal employment issues, recruiting and hiring practices, diversity in the workplace, compensation and benefits, performance appraisal, and discipline.

NPM 6210. Social Value Investing and Effective Partnerships. 3 Hours.

Explores cross-sector partnerships as an effective way to build social impact and serve the greater good. Research has proven that government alone cannot address the major societal challenges; new kinds of collaboration have emerged between the public and private sectors. Leaders from nonprofit organizations are engaging in implementing new approaches that require innovation, inclusivity, shared value, and sustainable solutions. Specifically examines the reasons parties come together, the collaborative approach in which they build their agreements, and the measurement of their social impact.

NPM 6220. Donor Research and Management. 3 Hours.

Offers students an opportunity to obtain the tools to research new donor linkage as well as current donor interest and capacity. Seeks to increase students' understanding of donor movement, from identification through annual support, both significant and legacy giving. Examines donor engagement best practices and the importance of articulating excellent charitable gift stewardship.

NPM 6230. Measuring Social Impact. 3 Hours.

Introduces students to global standards and practical tools for measuring the social impact of a nonprofit organization. Offers students an opportunity to learn how to plan and control for short-term outcomes and long-term goals and to understand how to connect the goals to quantifiable metrics that support a sustainable decision-making system. Students experience data analysis as a way to support the organization's operations and mission and ultimately create social impact.

NPM 6240. Innovation and Scaling for Impact. 3 Hours.

Builds on the fundamentals of fundraising and development by focusing on the annual fund, the foundation of an integrated development program. Examines the annual cycle for generating critical operating support to fulfill the nonprofit's mission. Students have the opportunity to learn the methods for identifying new donors, cultivation strategies, solicitation methods best practices, and continued donor engagement toward repeat and increased gifts.

NPM 6310. Social and Sustainable Entrepreneurship. 3 Hours.

Seeks to introduce students to the meaning of social entrepreneurship. Exposes students to the social entrepreneurship term that has come to be applied to the activities of grassroots activists, NGOs, policymakers, international institutions, and corporations, among others, which addresses a range of social issues in innovative and creative ways. Offers students an opportunity to learn how to address complex sustainability challenges using experiential problem-based learning, current research, and best practices connected to social/sustainable enterprises. Topics include the design of social and sustainable enterprises, frameworks for problem solving and planning, analysis of social and environmental impact, and private-public partnerships.

NPM 6320. New Ventures in Social Entrepreneurship. 3 Hours.

Focuses on entrepreneurial ideas that generate social impact. Offers students an opportunity to explore social entrepreneurship and test ideas for social innovation in a rigorous and supportive environment. Covers how to generate an innovative business idea, how to address social issues and have an impact, and how to develop an action plan and consequently measure for results. Offers insights on communication, business plans, and presentation skills.

NPM 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

NPM 6980. Capstone. 3 Hours.

Integrates theory, practice, case studies, and experiential learning with operational and organizational concepts including, but not limited to, nonprofit law, financial management, human resource management, fund-raising and development, promotions, and grant writing. Aims to synthesize learning in a practical manner. Offers students an opportunity to prepare for working in or volunteering at a nonprofit organization. Presents an interrelationship of student learning and real-world practice through a series of pedagogical paradigms.

Nursing (NRSG)

Search NRSG Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=NRSG>)

NRSG 1000. College: An Introduction. 1 Hour.

Provides an introduction to the University, college, and health professions to enhance students' understanding of self and the decisions they make academically and socially as members of the University's diverse, multicultural community. Group activities and individual assignments along with active participation in a learning community help students adjust to life on an urban campus, develop a better understanding of the learning process, acquire essential academic skills, and make connections with the faculty and students in the college.

NRSG 1205. Wellness. 4 Hours.

Explores the concept of wellness and examines behaviors and lifestyle choices that lead to a high level of physical, emotional, and spiritual well-being. Topics include health risk, behavioral change, lifestyle analysis, the life cycle, and stress management through self-analysis.

NRSG 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

NRSG 2000. Professional Development for Co-op. 1 Hour.

Introduces the Bouvé Cooperative Education Program. Offers students an opportunity to develop job-search and career-management skills. Students perform assessments of their workplace skills, interests, and values and discuss how they impact personal career decisions. Offers students an opportunity to prepare a professional-style résumé, learn proper interviewing techniques, and gain an understanding of the opportunities available to them for co-op. Introduces career paths, choices, and career decision making. Familiarizes students with workplace issues relative to their field of study and presents the MyNEU COOL database in the job-search and referral process. Presents and discusses co-op policies, procedures, and expectations of the Bouvé Cooperative Education Program and co-op employers.

NRSG 2001. Foundations of Professional Nursing Practice. 2 Hours.

Introduces students to professional nursing practice. Offers students an opportunity to envision how nurses can shape the future of the profession while developing personal strategies for success. Students explore essential tools that professional nurses employ to meet healthcare delivery challenges and begin their journey toward establishing their professional identities as caregivers, scholars, and leaders.

NRSG 2150. Ethical Healthcare: Genetics and Genomics. 4 Hours.

Presents an overview of bioethics and, more specifically, the application of ethics including the implication of genetics/genomics in healthcare across the life span. Students apply the Code of Ethics for Nurses to case studies that address dilemmas in multiple settings with a diverse patient population. Considers issues related to biomedical, clinical, genetic/genomic, social, and legal aspects and integrates such considerations into ethical decision making. Offers students an opportunity to work as a team and be encouraged to respect alternative viewpoints to address realistic ethical dilemmas encountered in contemporary healthcare. Appropriate and relevant for all students interested in expanding their view and appreciation of health dilemmas.

NRSG 2210. Influences on Health and Illness: A Nursing Perspective. 3 Hours.

Offers a context within which students have an opportunity to begin to understand, develop, and nurture a professional nursing identity. Through situated learning within a model of whole-person care, the student may utilize clinical imagination and reasoning to explore culturally mediated behaviors and meanings that are ascribed to health and illness experiences across the life span. Empirical, personal, ethical, and aesthetic ways of knowing create a framework for personal reflection and reflexivity. Integrated learning strategies guide the beginner's study of communication and relationships with patients, families, and providers. Guiding course principles include foundations of the nursing profession, nursing self-care and well-being, compassionate care, social justice, and quality and safety.

NRSG 2220. Health Assessment and Fundamental Nursing Skills. 3 Hours.

Introduces the concepts of wellness and caring utilizing the nursing process as the framework for nursing practice. Outlines the ethnic, cultural, psychosocial, and developmental gender-specific and physical aspects of health in the context of client-centered care. Discusses the formulation of nursing diagnoses to describe client problems. Offers the learner an opportunity to acquire a range of beginning assessment techniques and nursing skills that support appropriate nursing care planning and interventions for clients. Explores nurses' engagement with therapeutic communication.

NRSG 2221. Lab for NRSG 2220. 1 Hour.

Designed to provide the foundation for students' mastery of beginning assessment techniques and nursing skills for future application in clinical settings and the delivery of safe care of clients. Develops assessment and intervention skills by supervised practice and student demonstration in the nursing laboratory. Provides additional opportunities for students to enhance their skills to provide quality care, to communicate effectively, and to develop critical thinking through simulated case studies.

NRSG 2312. Pathophysiology. 4 Hours.

Reviews human physiology related to oxygenation, nutrition, elimination, protective mechanisms, neurological function, endocrine function, and skin integrity. Explores how the human body uses its adaptive powers to maintain a steady state and how alterations affect normal processes. Examines disease process and implications for nursing practice.

NRSG 2350. Integrated Pathophysiology and Pharmaceutical Interventions for Nursing Practice. 6 Hours.

Provides the fundamentals of pharmacology and pathophysiology for nursing students. Focuses on the disruption of physiological processes that produce disease states and the use of drugs to prevent or ameliorate these disruptions. Discusses pathophysiologic concepts from a systems approach and includes alterations in cellular growth and proliferation and immune, cardiovascular, respiratory, gastrointestinal, genitourinary, integumentary, musculoskeletal, reproductive, neurological, hematologic, sensory, and endocrine function. Presents major drug classifications used to treat common medical disorders. Examines the indications, mechanism of action, drug metabolism, and adverse effects. Discusses the application of pharmacologic therapies as well as relevant nonpharmacologic interventions. Also considers the influence of genetics, environmental factors, and life span considerations.

NRSG 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

NRSG 2991. Research in Nursing. 1-4 Hours.

Offers an opportunity to conduct introductory-level research or creative endeavors under faculty supervision.

NRSG 3302. Nursing with Women and Families. 3 Hours.

Emphasizes the promotion of health for childbearing women and their families. The nursing process provides the framework for students to assess and therapeutically intervene in promoting healthy childbearing and health during the life span. Self-care and empowerment are an integral focus in examining women's health from a developmental perspective. Examines the nursing role of the professional nurse in the context of concepts of human development of individual, family, and community. Discusses the effects of cultural, social, economic, and ethical influences and the impact of healthcare technology.

NRSG 3303. Clinical for NRSG 3302. 2 Hours.

Focuses on applying the theories, principles, and concepts studied in NRSG 3302 to providing nursing care for women and their families with a focus on the childbearing family.

NRSG 3320. Nursing Care of Adults 1. 4 Hours.

Focuses on the care of adults experiencing common health problems. Builds on the conceptual foundation learned in sciences, nursing practice, physical assessment, pharmacology, nutrition, and growth and development. Emphasizes the acute care of adults and application of the nursing process. Explores expanding concepts of health and illness, including management of patients transitioning from acute care to the home or rehabilitation settings.

NRSG 3321. Clinical for NRSG 3320. 2 Hours.

Emphasizes clinical skills that focus on the application of knowledge learned in NRSG 3320.

NRSG 3323. Advanced Assessment and Interventions. 1 Hour.

Focuses on principles and concepts that support nursing assessment and the performance of advanced nursing skills in the adult patient. Health assessment, nursing interventions, and communication techniques that support clinical decision making are discussed within the nursing process framework. Emphasis is placed on critical analysis of the appropriateness of, and accurate performance of nursing interventions to ensure the provision of safe quality care. The delivery of culturally competent care and the professional development of the nurse as an inter-professional team member are discussed.

NRSG 3324. Lab for NRSG 3323. 1 Hour.

Introduces the student to the practice and application of advanced nursing skills, health assessment, and communication techniques. The course offers the opportunity to develop and master advanced assessment and intervention skills by supervised practice and demonstration. Participation in simulated patient care experiences allows the student to engage in clinical reasoning based on patient interaction and assessment that leads to the identification of appropriate nursing interventions.

NRSG 3400. Nursing and the Promotion of Mental Health. 3 Hours.

Focuses on primary, secondary, and tertiary prevention as it relates to individuals with mental health issues. Incorporates principles of communication, with particular focus on individuals with altered patterns of communication. Helps students provide nursing care to individuals, families, and groups with a variety of mental health and mental illness-related issues. Provides students information about the spectrum of mental illnesses and about factors that predispose people to developing mental health problems. Critical thinking skills are employed to explore the legal and ethical issues of providing nursing care for mentally ill persons. Use of psychotropic drugs is integrated throughout the course as it applies to specific psychiatric illnesses. In patient and community settings are utilized as learning arenas to assist students to meet the course objectives.

NRSG 3401. Clinical for NRSG 3400. 2 Hours.

Focuses on applying the theories, principles, and concepts learned in NRSG 3400 in providing psychiatric mental health (PMH) nursing care.

NRSG 3420. Nursing Care of Adults 2. 4 Hours.

Focuses on the care of adults and their families experiencing complex physiological insults across the lifespan. Builds on the conceptual foundation established in NRSG 3320. Offers students an opportunity to improve their organizational skills through the expanding complexity of patient acuity levels and workloads in an advanced health care setting. Emphasis is on complex decision and critical thinking through collaboration and the use of evidence-based practices in high acuity and critical care settings. Seeks to help the student to conceptualize care of the ill patient from admission to discharge and beyond, as a means of holistic practice that demonstrates knowledge of prevention, promotion, maintenance, and restoration of the clients with complex health problems.

NRSG 3421. Clinical for NRSG 3420. 2 Hours.

Focuses on applying the theories, principles, and concepts covered in NRSG 3420 in providing nursing care to adults in increasingly complex situations. Builds upon clinical skills established in NRSG 3321.

NRSG 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

NRSG 4502. Nursing Care of the Child. 4 Hours.

Builds on developmental and family theory. Focuses on the principles of nursing care of children experiencing acute and/or complex, chronic health problems and their families. The complex health issues are analyzed within the context of the individual, family, and community. Offers students an opportunity to explore evidenced-based practices within the framework of the nursing process. The therapeutic role is addressed in partnership with the family and resources available within a collaborative and interdisciplinary environment.

NRSG 4503. Clinical for NRSG 4502. 2 Hours.

Focuses on applying the theories, principles, and concepts learned in NRSG 4502 in providing nursing care for acutely and/or chronically ill children and their families in a pediatric clinical setting.

NRSG 4604. Public Health Community Nursing. 3 Hours.

Introduces population-focused nursing and applies the nursing process to the community as client. Examines evidence-based health-promotion strategies in a variety of community settings. Addresses core functions and essential services of public health, and introduces epidemiological and economic concepts and models. Emphasizes the involvement of the community/public health nurse in ethical issues and health policy, focusing on vulnerable populations in giving cultural and linguistic-competent care. Examines community-based strategies and interprofessional collaboration to care for underserved populations in both urban and suburban communities. Emphasizes the community/public health nurse as a population-focused care provider, case manager, deliverer of quality nursing care, care coordinator, critical thinker, liaison between agencies, and nursing researcher.

NRSG 4605. Clinical for NRSG 4604. 2 Hours.

Seeks to facilitate the student's socialization to population-focused nursing and to plan care for the community as client. Emphasizes the application of knowledge when addressing core functions and essential services of public health, epidemiology, and economic concepts and models. Students engage in cultural and linguistic-appropriate health assessment, health promotion, and illness-prevention strategies in a variety of community settings. This may include acting as a community/public health nurse for ethical issues, health policy, coordination of care, interprofessional collaboration, liaison between agencies, and facilitation of healthcare research. Examines and evaluates types of community-based strategies used to serve underserved and vulnerable populations to ensure quality care for those living in both urban and suburban communities.

NRSG 4610. Managing and Leading in Healthcare. 4 Hours.

Introduces various theoretical frameworks that support principles of leadership and management in nursing in all types of organizational settings. Emphasizes developing, enhancing, and demonstrating leadership skills, competencies, and aptitudes. Exposes students to practical situations in the management of current and practical patient care in diverse healthcare settings. Integrates organizational structure; methods of nursing care delivery; comparison of management and nursing processes; decision making; change; communication skills; interprofessional collaboration; team building; ethical considerations; interpersonal skills of effective nursing leadership and management; and organizational issues related to the quality of client, family, and personal outcomes.

NRSG 4620. Innovations in Nursing Practice. 4 Hours.

Designed to hone students' professional development in preparation for a broader scope of nursing practice through formation of a greater understanding of the social and societal issues as impacted by cultural, political, and economic forces that affect and influence the delivery of nursing care. Locally and globally, the healthcare system is undergoing an evolution that demands a broadening of the scope of nursing practice and the preparation of registered nurses to meet the challenges of the future. Greater emphasis is being placed on patient-centered care, interdisciplinary collaboration, and healthcare promotion across the life span in the midst of an ever-changing and complex healthcare system.

NRSG 4970. Junior/Senior Honors Project 1. 4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student's major field. Combined with Junior/Senior Project 2 or college-defined equivalent for 8-credit honors project. May be repeated without limit.

NRSG 4971. Junior/Senior Honors Project 2. 4 Hours.

Focuses on second semester of in-depth project in which a student conducts research or produces a product related to the student's major field. May be repeated without limit.

NRSG 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

NRSG 4991. Research. 4 Hours.

Offers an opportunity to conduct research under faculty supervision.

NRSG 4992. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

NRSG 4993. Independent Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

NRSG 4995. Comprehensive Nursing Practicum. 3 Hours.

Prepares students to synthesize nursing knowledge, skills, and experience and facilitate their transition to professional nursing practice and case management of clients with health problems. Assists students to demonstrate leadership and collaborative skills in working with other members of the health-care team through a weekly precepted relationship with a RN. Includes clinical learning experiences within hospital and community settings. Classwork includes a review of professional domains in all previous clinical courses in the nursing curriculum to prepare students for licensure. .

NRSG 4996. Clinical for NRSG 4995. 2 Hours.

Offers students an opportunity to synthesize nursing knowledge, skills, and experience and facilitate their transition to professional nursing practice and case management of clients with health problems. Designed to assist students to demonstrate leadership and collaborative skills in working with other members of the healthcare team through a weekly precepted relationship with an RN. Includes clinical learning experiences within hospital and community settings.

NRSG 5000. Advanced Perspectives in Wellness. 4 Hours.

Offers students an opportunity to explore wellness through both theoretical and experiential pathways. Introduces theories and models of holism, wellness, stress, health promotion, health belief, and change as operational frameworks by which the student has an opportunity to reflect upon personal history, health and risk-taking behaviors, and lifestyle choices that influence health and well-being. Studies the art and science of self-care through both the emic and etic perspectives. Course topics include holistic lifestyle and health analysis, behavioral change, decision making, and stress/stress reduction. Embodied learning methodologies inform course delivery.

NRSG 5100. Professional Development and Scientific Basis. 3 Hours.

Serves as a transitional course for the purposes of socialization and transformation of the student to the roles and scope of practice of baccalaureate generalist nurse. Employs principles of adult learning and critical thinking to assist the student in establishing the foundational skills required for scholarly communication, investigation, and study. Examines the historical and contemporary nursing theories related to the physiological, sociological, and cultural perspectives of professional practice, focusing on the four central concepts of professional nursing: person, health, environment, and nursing. Introduces the use of evidence-based practice to drive professional practice. Offers students an opportunity to develop a portfolio based on his or her personal and unique vision of professional nursing practice.

NRSG 5101. Computer and Nursing Informatics. 3 Hours.

Focuses on information and knowledge development concepts, data processing, and use of micro-, mini-, and mainframe computers in nursing practice. Introduces technologies used in nursing practice, such as hospital and nursing information system applications and decision support systems. Discusses the impact of computers and informatics on the future direction of nursing practice. Includes demonstration of computer-aided instruction, physiological monitoring devices, and applications of various software packages related to nursing practice, and the opportunity to practice computer skills.

NRSG 5117. Advanced Pharmacology. 2 Hours.

Focuses on principles of pharmacology and the major drug classifications in relation to the treatment of health problems across the life span. Examines the effects of selected medications on pathophysiology and psychopathology. Emphasizes dose response, side effects/drug interactions, route of administration, and place in clinical therapy.

NRSG 5118. Healthcare System and Professional Role Development. 3 Hours.

Examines the role of the advanced practice nurse within the context of today's healthcare system. Focuses discussion on dimensions of the advanced practice nursing role, including intra/interdisciplinary collaboration, consultation, leadership, diversity, and accountability for quality care. Examines the healthcare system with special focus on social, political, economic, ethical, regulatory, research, and legal trends. Students are expected to evaluate the interaction between healthcare system issues and advanced practice role dimensions.

NRSG 5120. Statistics for Health Science. 3 Hours.

Focuses on applying formal reasoning to understand the underlying principles of statistics; how to select and conduct statistical tests; and how to interpret and use the results of data analysis in relation to research questions and research hypotheses.

NRSG 5121. Epidemiology and Population Health. 3 Hours.

Examines the theoretical basis for identification and analysis of the distribution and determinants of health problems at community, national, and international population levels. Considers health disparities that exist among specific populations and the role of government in setting policies for health promotion and disease prevention. Covers three topical areas: basic principles and population measures of epidemiology; epidemiologic study methods; and application of epidemiologic tools in interdisciplinary settings. Complements planned topics with current examples of population health issues. The goal is to understand the principles and practice of monitoring population health. Skills acquired assist advanced practice nurses, other clinicians, or administrators in critically evaluating new epidemiologic literature and in using the basic tools of epidemiology to assess population health and develop strategies for monitoring health improvement.

NRSG 5126. Pathophysiology for Advanced Practice. 3 Hours.

Covers content that provides current understanding of major disease processes across the life span. Builds on the knowledge of anatomy, physiology, biochemistry, microbiology, and immunology. Focuses on physiologic dysfunction; physiologic adaptation in maintaining the internal environment; and feedback mechanisms at the cellular, organ, and systems level. Seeks to provide students with a way of thinking about disease for each body system. Provides a comprehensive study of underlying concepts common to major pathophysiologic processes of the body, including specific diseases affecting the cardiovascular, endocrine, gastrointestinal, hematological, immunological, nervous, pulmonary, and renal systems.

NRSG 5127. Scientific Inquiry and Epidemiological Concepts. 3 Hours.

Emphasizes methods of scientific inquiry and epidemiological concepts relative to individual and population health. Addresses multiculturalism concepts relative to health and illness. Stresses theoretical frameworks, methods of inquiry, and appropriate use of selected statistical analyses. Offers students an opportunity to analyze data to improve healthcare delivery for individuals and populations. Examines threats to internal and external validity. Emphasizes critical appraisal of literature as evidence as a basis for translation into practice. Explores strategies and tools for retrieval, compilation, critical appraisal, and application of empirical and practice-based information. Restricted to USAGPAN students only.

NRSG 5170. Statistics in Nursing. 2 Hours.

Part of the USAGPAN program. This course provides students the opportunity to understand biostatistics and their application in scientific research. Students conduct a systematic inquiry relative to an identified anesthesia problem, conduct a research study, and apply the appropriate statistical measurement to analyze the data. In addition, the statistical foundation obtained from this course will enable students to critically analyze scientific literature. Restricted to USAGPAN students only.

NRSG 5174. Clinical Anatomy and Physiology 2 for Nurse Anesthesia. 5 Hours.

Part of the USAGPAN program. This course provides students the opportunity to build upon their knowledge of the anatomy and physiology of the endocrine, respiratory, and renal systems with particular reference to anesthesia, respiratory, and acute care management. Students engage in critical thinking regarding the effects of anesthesia on the normal physiological processes of the respiratory, endocrine, and renal systems. Restricted to USAGPAN students only.

NRS 5182. Physical Examination and Differential Diagnosis. 4 Hours.

Part of the USAGPAN program. This course provides students the opportunity to refine and specialize their assessment skills with an emphasis on assessing for the presence and quantifying the severity of problems with significant implications for anesthesia care. Particular attention is paid to the importance of consulting appropriately for preoperative optimization and the development of plans for anesthesia care that minimize anesthesia related risk. Restricted to USAGPAN students only.

NRS 5184. Biochemistry for Nurse Anesthesia. 4 Hours.

Part of the USAGPAN program. A graduate level course which provides the student an opportunity to correlate biochemical principles as they apply to the physiology, pathophysiology, and pharmacology of anesthesia nursing. Major topics covered include: (1) structure and function of DNA, RNA and proteins; (2) basic medical genetics; (3) protein structure and function; (4) common metabolic pathways of carbohydrates, lipids, and amino acids; and (5) special topics including clinical chemistry. Lectures are supplemented by case studies and clinical correlate presentations related to anesthesia. Restricted to USAGPAN students only.

NRS 5976. Directed Study. 1-4 Hours.

Allows student to develop an individualized plan to attain specific knowledge and skills related to professional goals. May consist of library study and reading, individual instruction, research, practicum, or other appropriate activity as approved by instructor and academic adviser. May be repeated without limit.

NRS 6115. Health Assessment. 3 Hours.

Focuses on human physiology and the development of advanced health assessment knowledge and skills related to performing regional and comprehensive examinations of the client across the life span. Includes variables among cultural groups. Students synthesize knowledge from nursing, physical, social, and health sciences as they analyze data collected in the assessment process. Focuses on interviewing skills and systematic performance, analysis and documentation of health assessment process. Differentiation of normal and abnormal findings is emphasized utilizing critical thinking. Introduces the student to diagnostic reasoning within the scope of practice of the nurse in the advanced practice role. *Nursing degree students only.*

NRS 6116. Advanced Health Assessment of the Neonate and Infant. 3 Hours.

Focuses on human physiology and the development of advanced health assessment skills to build a knowledge base with which to perform a thorough assessment and examination of the neonate and infant. Offers students an opportunity to learn to evaluate family history through chart review and direct interviewing to gain knowledge of the neonate and to anticipate certain findings based on information gained through a thorough assessment and physical examination. Emphasizes identifying normal from abnormal findings through critical thinking, introducing the student to diagnostic reasoning, which is the basis of the advanced practice nurse role.

NRS 6220. Nursing Management: Acute Episodic Illness. 3 Hours.

Addresses the assessment, preventive, and health maintenance theories of healthcare utilized by the acute-care advanced practice nurse. Includes common problems causing episodic and acute illnesses and the advanced nursing management skills needed to address them and implement initial management skills. Uses current theories and research from nursing and the physical and behavioral sciences as a basis for clinical decision making, with an emphasis on critical thinking and diagnostic reasoning. The nursing process and life cycle are integral frameworks used to structure the delivery of course content. Restricted to students in selected nursing programs or with permission of instructor.

NRS 6221. Nursing Management: Critical and Chronic Illness. 3 Hours.

Emphasizes the acquisition of theoretical knowledge essential to understanding the common life-threatening and chronic, long-term pathophysiological problems, differential diagnosis, and related advanced nursing care of critically and chronically ill individuals and families. Addresses common problems causing critical, life-threatening illnesses, the chronic sequelae from these problems, and the advanced nursing management skills needed to address them. Uses current theories and research from nursing and the physical and behavioral sciences as a basis for clinical decision making, with an emphasis on critical thinking and diagnostic reasoning. The nursing process and life cycle are integral frameworks used to structure the delivery of course content. Restricted to students in selected nursing programs or with permission of instructor.

NRS 6222. Pharmacology of Adults and Older Adults. 2 Hours.

Covers age-related changes in pharmacokinetics and pharmacodynamics and the prescription, administration, and monitoring of medications for older adults. Includes a detailed discussion of the most common drugs and classes of drugs prescribed for the elderly, as well as the signs and symptoms of drug toxicity particular to older adults. Investigates the impact of race/ethnicity on prescribing practices. Also discusses medication history guidelines for older adults, age-related considerations in prescribing for the elderly, and methods to support drug compliance and prevent inappropriate drug use and adverse drug reactions. Examines over-the-counter drug use among older adults. Emphasis is on the problem of polypharmacy for the older adult and the prevention, recognition, and treatment of drug interactions among older adults.

NRS 6230. Nursing Management: Critically Ill Neonatal 1. 3 Hours.

Focuses on the acquisition of knowledge about complex physiological concepts essential to the care of the critically ill neonate. Begins with the actual and potential alterations in fetal/neonatal well-being, adaptation to extrauterine life, and factors that interfere with adaptation to extrauterine life. Also emphasizes the acquisition of theoretical knowledge essential to understanding the neonate's response to life-threatening problems. Discusses neonatal pathophysiologic disorders in terms of the nursing process and management of the neonate and their families. Uses current theories and research from nursing, biomedical, physical, and behavioral sciences as a basis for clinical decision making. The nursing process and developmental theory are frameworks utilized to structure the delivery of course content.

NRS 6231. Nursing Management: Critically Ill Neonatal 2. 3 Hours.

Continues NRS 6230. Covers the acquisition of theoretical knowledge essential to understanding the neonate's response to life-threatening problems. Discusses neonatal pathophysiologic disorders in terms of the nursing process and management of the neonate and their families. Uses current theories and research from nursing, biomedical, physical, and behavioral sciences as a basis for clinical decision making. The nursing process and developmental theory are frameworks utilized to structure the delivery of course content.

NRS 6232. Neonatal Pharmacology. 2 Hours.

Focuses on building upon basic knowledge in pharmacology and providing content essential for nurses in the expanded role. Examines the principles of pharmacology and major drug classifications as they relate to the causes and treatment of health and illness problems affecting critically ill neonates.

NRSG 6241. Acute-Care Concepts in Nursing Practice. 3 Hours.

Focuses on the analysis and application of core physiological, behavioral, environmental, and psychosocial concepts essential for advanced nursing care of acute and critically ill individuals. Topics include the utility and clinical implications of monitoring technology available in the acute-care setting, the acute-care environment and its impact on patient and family systems, and the concepts of stress, grief, and coping. Also addresses the advanced nursing management of the multiple trauma patient and the related physiologic and clinical concepts. Opportunity is provided for exploration and development of concepts unique to each student's area of concentration within the acute-care specialization. Restricted to students in selected nursing programs or with permission of instructor.

NRSG 6249. Health Promotion of Adult/Older Adult. 3 Hours.

Focuses on the assessment, preventative, and health maintenance and promotion theories utilized by advanced practice nurses. Includes the impact of political, psychological, sociological, and physiological factors on the healthcare continua of the adolescent/adult/older adult. Explores self-modeling of health behaviors and institution of primary and secondary preventative strategies in the home, community, workplace, and primary care facility. Discusses and utilizes theoretical and strategic approaches to behavior change necessary for health promotion.

NRSG 6253. Primary Care of Adult/Older Adult Health Problems. 4 Hours.

Building upon NRSG 6252, seeks to further develop the intellectual and attitudinal competencies necessary for successful performance as a primary healthcare provider. Focuses on assessment, diagnosis, and management of adolescents/adults/older adults with minor acute and stabilized chronic illness in the community and long-term care facility. Emphasizes the nurse practitioner role functions of collaborative interdisciplinary management, consultation, and referral skills.

NRSG 6254. Primary Care of Adult/Older Adult Complex Patients. 4 Hours.

Focuses on the assessment and intervention of adults/older adults with complex multisystem health problems/diseases in primary care and long-term care settings. Utilizes knowledge from pathophysiology, pharmacology, and psychosocial sciences to increase knowledge and skill of the advanced practice nurse in the care of adults/older adults with complex problems. Teaches students about the role and expertise of advanced practice nurses and other professionals in diverse settings.

NRSG 6256. Family Nurse Practitioner Practicum 2. 3 Hours.

Seeks to provide clinical learning experiences in the delivery and coordination of comprehensive pediatric care, including, but not limited to, well-child care, episodic care, chronic care, and urgent care. Focuses on performing a comprehensive health assessment of the child and family within the urban community utilizing an evidence-based and culturally competent approach. Emphasizes health promotion, health maintenance, and protection, as well as identification of children and families at risk. Requires students to practice in the clinical setting a minimum of twenty hours per week.

NRSG 6257. Family Nurse Practitioner Practicum 3. 3 Hours.

Seeks to provide clinical learning experiences in the coordination and delivery of care to infants, children, adolescents, and young adults, and their families, within the context of their culture and urban community. Continued clinical practice experiences across settings and continuum of care offer an opportunity to develop knowledge, attitudinal competencies, and skills in the delivery of care to children, with a focus on acute and chronic health issues. Offers students an opportunity to learn to assess, diagnose, and manage chronic conditions and acute illnesses commonly encountered in childhood, adolescence, and young adulthood and to build on a foundation of practice behaviors in health assessment, health promotion, and disease prevention. Emphasizes urban health. Requires students to practice in the clinical setting a minimum of twenty hours per week.

NRSG 6262. Pediatric Pharmacology. 2 Hours.

Focuses on the principles of pharmacology and the major drug classifications in relation to the treatment of health problems during childhood and adolescence. Examines the effects of selected medications on pathophysiology and psychopathology. Discusses the implication of practice.

NRSG 6264. Care of Well Child/Adolescent Health Promotion. 4 Hours.

Focuses on the health assessment on newborns, well children, adolescents, and their families within a community. Discusses issues most pertinent to the various ages of the well child within a community-based primary care framework of anticipatory guidance and health promotion. Emphasizes the utilization of a comprehensive approach to preventative healthcare by examining the impact of psychological, sociological, developmental, behavioral, cultural, and physiological factors on the child's health status within the family and community. Includes routine healthcare maintenance, screening, developmental issues, genetic implications, family dynamics, confidentiality, self-care, and common health concerns encountered in primary care settings.

NRSG 6265. Care of Child/Adolescent Health Problems. 4 Hours.

Builds upon the knowledge and skills gained in NRSG 6264. Seeks to further develop within the student the intellectual and attitudinal competencies necessary to successfully perform as a primary healthcare provider. Focuses on acute and chronic health problems seen in infants through young adults, Encompasses assessment, diagnosis, and management of children with acute and stabilized chronic illness, genetic and reproductive health issues, nutritional concerns, dermatology, sports and activity-related injuries, and perinatal care. Considers family, cultural, and community context. Emphasizes the nurse practitioner role, including the development of consultation and referral skills.

NRSG 6267. Care of the Critically Ill Child. 4 Hours.

Using a combined didactic and clinical approach, examines the specific issues in the care of children with critical conditions. Designed to provide students with the knowledge and skills necessary to meet the unique needs of fragile children, including urban children who are at risk for poor health outcomes. Offers students clinical experience caring for these children.

NRSRG 6275. Urban Families at Risk: A Primary Care Approach. 4 Hours.

Integrates academic and clinical learning into a unique collaborative experience, which affords students the opportunity to explore emerging trends and patterns of healthcare practices in the urban setting. Urban healthcare poses multiple challenges to nurses, including the need to master new skills and competencies and to understand the complex needs of these communities. Primary care providers need to be aware of the social and environmental context of children and their families. Examines the broad issues in the primary healthcare of identified, underrepresented urban groups: lesbians, women and children with HIV, homeless and abused women and children. Mentors students in both the classroom and clinical settings to explore current issues inherent in caring for underserved populations in urban settings through utilization of innovative strategies.

NRSRG 6281. Dimensions of Clinical Practice. 3 Hours.

Focuses on psychodiagnostic history taking, mental status evaluation, psychodynamic treatment formulations, and designs of psychiatric treatment contracts for various aged clients. Studies the major forms of psychopathology, clinical theory, and the use of the DSM IV-R to make decisions for clients across the life span. Emphasizes supportive and insight-oriented approaches in dynamic therapy, and addresses prevention and treatment approaches for populations at risk. Identifies outcome indicators and describes goal-setting strategies.

NRSRG 6282. Clinical Psychopharmacology. 3 Hours.

Provides comprehensive overview of major classes of psychotropic medications and the related psychiatric disorders associated with medication prescription. Emphasizes clinical nursing decision making related to choice of medication, differential diagnosis and drug interactions, safe monitoring with attention to side effects, and integration of medication management into a treatment regimen for various patient populations.

NRSRG 6283. Psychobiological Bases of Mental Disorders. 3 Hours.

Focuses on major psychiatric disorders across the life span as identified in the DSM IV manual. Studies the central and autonomic nervous systems, stress-response syndrome, neurotransmitter activity, and neuroendocrine immune interactions. Reviews the biological base of mental disorders, and addresses the use of biological interventions in symptom reduction. Also reviews the psychiatric complications of physical illness and common physical disorders to rule out psychiatric conditions. Emphasizes the integration of biological with psychosocial approaches to treatment of mental disorders.

NRSRG 6286. Contemporary Psychotherapies—Theory and Practice. 3 Hours.

Introduces the theory and practice of various forms of psychotherapy. Discusses theory and techniques associated with each therapy with regard to theoretical underpinnings, therapeutic action, techniques, relationship between therapist and patient, and application to different diagnostic populations. Uses lecture and seminar format to present material and case data to illustrate different psychotherapeutic perspectives.

NRSRG 6287. Child and Adolescent Psychopharmacology. 2 Hours.

Provides a comprehensive overview of major classes of psychotropic medications for pediatric populations. Relates psychiatric disorders associated with medication prescription, differential diagnosis and drug interactions, safe monitoring with attention to side effects, and integration of medication management into a treatment regimen for various patient populations. Uses clinical cases to illustrate complex issues related to prescribing psychiatric medications for children.

NRSRG 6288. Geriatric and Aging Adult Psychopharmacology. 2 Hours.

Offers a comprehensive overview of psychiatric disorders and the biopsychosocial issues associated with medication prescription, differential diagnosis, drug interactions, and safe monitoring with attention to side effects for geriatric and aging adult populations. Also offers a comprehensive overview of major classes of psychotropic medications and integration of medication management into a treatment regimen for geriatric and aging adult clients. Uses clinical cases to illustrate complex issues related to prescribing psychiatric medications for the geriatric population.

NRSRG 6300. Healthcare Finance and Marketing. 3 Hours.

Covers healthcare economics and the financial and marketing functions and responsibilities of healthcare leaders. Emphasizes the decision-making process involved in assuring financial management and management of the exchange process between an organization and its "publics" by which both parties satisfy their needs and wants (marketing). Focuses on the integration of clinical and business aspects of healthcare into decision making for the advanced practice nurse leader.

NRSRG 6301. Human Resources and Operations. 3 Hours.

Studies the essential practice of human resource management within healthcare organizations with a focus on leading and managing a professional nursing workforce. Quality healthcare is dependent on the availability and retention of adequate numbers of sufficiently educated and competent nurses and nonprofessional healthcare personnel. Examines the strategic management of a professional nursing and nonnursing healthcare workforce from many perspectives, including theoretical concepts relevant to human resource management in complex systems; legal and regulatory considerations; trends in nursing workforce supply/demand and composition; professional practice and participatory governance models; workplace diversity; collective bargaining; healthy work environment; and relational skill development, including conflict management. Discusses implications for nurse leaders within varying levels in the organization/system.

NRSRG 6302. Health Policy and Law. 3 Hours.

Examines health policy and health laws by advanced practice nurses from the perspective of issues pertinent to public health, populations, communities, their healthcare, and its coordination. Reviews and criticizes court decisions, legislation, federal, and state regulatory activities relevant to healthcare and health policy initiatives. Discusses the concept of continuous quality improvement through the development of standards of care and evaluation outcomes. Explores healthcare as a vital part of a national care agenda. Concepts are presented for application through the manager-as-developer model, which includes influence, vision, two-way communication, autonomy, team building, and development.

NRSRG 6306. Health Informatics. 3 Hours.

Seeks to prepare students to use information systems and technology to support and improve patient care and healthcare systems. Examines the meta-structures (data, information, knowledge, and wisdom), concepts and tools of nursing, and healthcare informatics. Focuses on information literacy, including a critical examination of both electronic patient health information and provider decision support resources. Covers ethical and legal issues, including privacy and security, related to electronic systems. Database concepts, including data mining, warehousing, electronic data collection, and aggregation for research and patient care, are important components of this course. Examines the role of the nurse as a change agent during health information technology implementation. Students who do not meet course prerequisites may seek permission of instructor.

NRSG 6307. Operational Informatics in Healthcare Organizations. 3 Hours.

Expands on NRSG 6306. Covers theoretical, empirical, and practical knowledge and skills for effective strategic and operational informatics nursing leadership. Specific topics address systemwide change management and leadership particular to information technology; the interpretation and application of key metrics for evaluating health information systems (HIS); and the selection, assessment, design, building, testing, implementation, evaluation, and promotion of evolving HIS within healthcare organizations (HCOs). Finally, examines the strategic role of executive nursing leadership within HCOs and emerging informatics needs in analytics and reporting to evaluate health outcomes. Students who do not meet course prerequisites may seek permission of instructor.

NRSG 6308. Healthcare Management. 3 Hours.

Offers students an opportunity to prepare for their future roles as managers within a healthcare delivery system. Examines the founding principles and dynamics of healthcare management and the healthcare system. Explores the basic concepts and skills in administration. Analyzes management issues that distinguish health services organizations from other types of organizations and strategies for dealing with these issues. Restricted to USAGPAN students only.

NRSG 6310. Nurse/Healthcare Entrepreneur. 3 Hours.

Provides graduate students with the theoretical foundation to do business planning. This process is examined from a nurse/healthcare entrepreneur perspective. Identifies strategies for achieving business goals in nursing/healthcare. Emphasis is on actualizing a winning business plan in nursing/healthcare through step-by-step approach with a strong focus on marketing, planning, and financial analysis.

NRSG 6320. Role/Practice Issues in Nurse Anesthesia. 3 Hours.

Focuses on the development and current trends in nurse anesthesia practice, education, and research. Includes the historical, legal, legislative, and professional role issues associated with advanced practice anesthesia nursing. Emphasizes professional responsibilities, ethical issues, diversity, cultural competency, quality assurance, continuing education, and professional involvement.

NRSG 6321. Conceptual Basis of Nurse Anesthesia Practice 1. 3 Hours.

Covers fundamental knowledge and skills for entry into advanced practice anesthesia nursing. Includes assessment, essential techniques, monitoring and equipment, pharmacologic interventions, and safe practice across the life span.

NRSG 6322. Conceptual Basis of Nurse Anesthesia Practice 2. 3 Hours.

Continues NRSG 6321 with in-depth knowledge and skills of highly specialized problems and conditions requiring anesthesia or surgical interventions. Includes assessment, techniques, planning, and pharmacologic intervention for patients with disorders of the cardiovascular and pulmonary systems across the life span.

NRSG 6324. Chemistry and Physics in Anesthesia. 3 Hours.

Reviews organic functional group chemistry and introduces the principles of medicinal chemistry; provides a foundation for the in-depth study of drugs, including intravenous agents and anesthetic adjuncts. Focuses discussions on physics and technology in anesthesia practice, gas laws, biotransformation of anesthetics, pharmacology of anesthetics and adjuncts, and recent development in general anesthetic agents.

NRSG 6325. Pharmacotherapeutics in Anesthesia and Critical Care Nursing. 2 Hours.

Concentrates on the mechanisms of action common to many pharmacotherapeutic agents. Helps to increase students' understanding of general principles of drug actions, interactions, and side effects, especially related to the administration of anesthesia. Includes content of dose-effect relationship, pharmacokinetics, drug allergy, pharmacogenetics, and teratogenic side effects. Consists of lectures, discussions, assignments, and examinations. Requires a presentation of a short paper on a selected topic.

NRSG 6333. Conceptual Basis of Nurse Anesthesia Practice 3. 3 Hours.

Covers in-depth knowledge and skills of highly specialized problems and conditions requiring anesthesia or surgical interventions. Includes assessment, techniques; planning; and pharmacologic intervention for patients with disorders of the nervous, endocrine, renal, and hepatic systems across the life span.

NRSG 6336. Advanced Concepts in Nurse Anesthesia Practice. 3 Hours.

Covers in-depth knowledge and skills of highly specialized problems and conditions requiring anesthesia or surgical interventions. Includes assessment, techniques, planning, and pharmacologic intervention for regional anesthesia, pain management, care of obstetrical patients, transplantation surgery, and patients with catastrophic condition.

NRSG 6341. Teaching Nursing: The Art and Science. 3 Hours.

Explores various learning theories and their application to practice disciplines. Emphasis is on efforts to enhance critical thinking and problem solving, with assessment of technological aids for learning. Examines teaching modalities as they are related to increasing levels of complexity of information, and offers an introduction to the assessment of teaching effectiveness.

NRSG 6344. Healthcare Quality Improvement. 3 Hours.

Focuses on critical issues related to healthcare quality improvement (QI) and nursing leadership to promote safe, timely, effective, efficient, equitable, and patient-centered care and services. Examines the science of improvement from many perspectives including current national reports, trends, and initiatives; standards, culture of safety, patient and staff safety; QI models, measurement, methods, and monitoring of care outcomes; use of healthcare informatics in the QI process; QI projects; and leadership and change related to development and implementation of quality improvement. Students are expected to work with a team to apply knowledge in a quality-improvement project based on a current healthcare problem.

NRSG 6371. Pharmacology for Nurse Anesthesia 2. 4 Hours.

Offers the second course in a two-part series. Focuses on drugs used in anesthesia with particular reference to dosage, mechanism of action, characteristic drug effects, factors modifying drug effects, toxicity, and indications and contraindications for use. Restricted to USAGPAN students only.

NRSG 6372. Professional Aspects of Nurse Anesthesia Practice. 3 Hours.

Part of the USAGPAN program. This course focuses on nurse anesthesia practice in a variety of practice settings. A study of the history of anesthesia and nurse anesthesia practice and the relationship of that practice in the development and growth of the American Association of Nurse Anesthetists. The legal aspects of practice will be explored. The various functional roles of the nurse anesthetist related to administration, education, research and consultation with an orientation to administration and the teaching /learning process, and research will be explored. This course will enable the student to acquire knowledge, understanding, and appreciation for the historical aspects of anesthesia, to be aware of the legal ramifications concerning the administration of anesthesia, and understand the current issues affecting the nurse anesthetist's role in administration, education, and research. Restricted to USAGPAN students only.

NRSG 6375. Fundamentals of Nurse Anesthesia Practice 1. 9 Hours.

Seeks to integrate nursing science with biophysical sciences to prepare nurses for the highest level of advanced nursing practice in the specialty of anesthesia. Offers students an opportunity to learn the basic principles governing the practice of anesthesia, including physical principles, anesthesia gas delivery systems, preparation for administration of anesthesia, intraoperative management of anesthesia, regional anesthesia, biomedical monitoring, and GETA simulation. Introduces the formulation of anesthetic care plans, anesthetic techniques, prevention of patient complications, procedures and equipment requirements, monitoring, record keeping, and care of equipment. Restricted to USAGPAN students only.

NRSG 6379. Fundamentals of Nurse Anesthesia Practice 2. 9 Hours.

Continues NRSG 6375. Covers a broad range of anesthesia nursing interventions. Concentrates on the theoretical basis and rationale for specific anesthetic management actions, offering students an opportunity to learn advanced principles governing anesthesia practice. Modules cover several categories of patients and types of surgical cases, including cardiovascular, pulmonary, endocrine, central nervous system, neuromuscular disorders, pediatrics, obstetrics, trauma/austere environments, and subspecialties. Introduces students to the development of individualized anesthetic care plans, anesthetic techniques, monitoring, perioperative pain management, prevention of patient complications, surgical and anesthesia procedures and equipment requirements, and record keeping. Lectures focus on advanced health/physical assessment, physiology, pathophysiology, and the scientific underpinnings of evidence-based anesthesia practice. Restricted to USAGPAN students only.

NRSG 6390. Family Care of the Adult/Older Adult Patient. 4 Hours.

Focuses on the assessment, diagnosis, and management of minor acute and stabilized chronic conditions in the adult and older adult populations in the community and long-term-care facilities. Explores theories of health promotion and health maintenance. Discusses the impact of political, psychological, sociological, and physiological factors as they impact the care of the adult and older adult. Emphasizes the role of the advanced-practice nurse practitioner as a member of collaborative teams, consultant, and model of health behaviors.

NRSG 6391. Practicum for NRSG 6390. 4 Hours.

Offers a clinical practicum focusing on the adult and older adult with risk for premature morbidity and mortality and family centered health promotion. Emphasizes the care of the adult with complex multisystem health problems and conditions. Explores care of individuals in acute- and long-term-care settings.

NRSG 6392. Family Theory. 2 Hours.

Focuses on the assessment and management of the changing family structure across the life span of the family. Emphasizes the identification of families at risk for premature morbidity and mortality. Presents guiding principles and strategies for assessing the family, various theories of family structure and process, and techniques for engaging and connecting with families. Explores the family as an emotional unit, the individual patient as a member in his or her family of origin, and strategies for applying this knowledge in a clinical setting.

NRSG 6393. Family Care of the Pediatric and Adolescent Patient. 4 Hours.

Focuses on the health assessment of individuals from the newborn stage into young adulthood. Emphasizes the utilization of an evidence-based approach to acute and chronic health conditions. Considers family, cultural, and urban community context and anticipatory guidance and health promotion within a culturally competent framework.

NRSG 6394. Practicum for NRSG 6393. 4 Hours.

Offers a clinical practicum focusing on providing students with clinical learning experiences in the performance of comprehensive health assessments of children and families within the urban community. Using an evidence-based and culturally competent approach, emphasizes health promotion, health maintenance, and protection, as well as identification of children and families at risk. Offers students an opportunity to learn to assess, diagnose, and manage chronic conditions and acute illnesses commonly encountered in childhood, adolescence, and young adulthood. Builds on a foundation of practice behaviors in health assessment, health promotion, and disease prevention with a particular focus on urban health.

NRSG 6395. Healthcare of Women in Family Practice. 2 Hours.

Discusses health assessment, promotion, and care of women through the life span. Emphasizes the perinatal time period.

NRSG 6396. Practicum for NRSG 6395. 4 Hours.

Focuses on the assessment, diagnosis, and management of acute and chronic health conditions of women and families. Emphasizes the care of women during the perinatal and postpartum periods. Explores family health as the family structure changes across its life span. Emphasizes the role of the advanced-practice nurse practitioner as a member of collaborative teams, as a consultant, and as a model of health behaviors.

NRSG 6420. Adult-Gerontology Acute-Care Nursing Practicum 1. 2 Hours.

Focuses on the assessment, preventative, and health-maintenance aspects of acute and episodic healthcare to adults (including older adults). The clinical practice emphasizes the multiple factors affecting the adult patient across the life span. The application of theory to the care of these patients through participation, observation, and research is facilitated by assignment to a clinical preceptor. Weekly seminars focus on an array of issues surrounding the role of the advanced practice nurse. Requires students to practice in the clinical setting a minimum of eight hours per week.

NRSG 6421. Adult-Gerontology Acute-Care Nursing Practicum 2. 4 Hours.

Continues NRSG 6420. Offers students individualized experiences in the role of practitioner, educator, and manager. Facilitated by assignment to a clinical preceptor, students focus on the provision of care to adults (including older adults) experiencing complex, critical, and chronic health problems. Demonstrates how to assess, diagnose, and manage illnesses in the acute-care, chronic, or rehabilitation setting. Uses concurrent weekly seminars to focus on the roles of the advanced practice nurse. Requires students to practice in the clinical setting a minimum of twenty hours per week.

NRSG 6422. Adult-Gerontology Acute-Care Nursing Practicum 3. 4 Hours.

Continues NRSG 6421. Offers students an opportunity to synthesize their previous learning experiences; to plan, deliver, and evaluate advanced nursing care to patients with complex healthcare problems; and to acquire the skills necessary to manage clients in an acute-care setting. Uses concurrent weekly seminars to analyze the impact of the advanced practice role on long-term patient care, interdisciplinary relationships, and healthcare policy. Requires students to practice in the clinical setting a minimum of twenty hours per week.

NRSG 6430. Neonatal Clinical Practicum 1. 4 Hours.

Focuses on the skills necessary for management of the high-risk neonate and family. Students have the opportunity to provide direct care under the supervision of NNP preceptors in the hospital neonatal intensive care unit (NICU), responsible for daily management of a specified caseload of neonates and their families, including therapeutic and diagnostic procedures. Supervised delivery room management of the high-risk neonate is expected, where available. Seeks to familiarize the student with respiratory distress syndrome, transient tachypnea, pneumonia, pulmonary hypertension, congenital heart disease, and patent ductus arteriosus, with appropriate management strategies. Requires students to practice in the clinical setting a minimum of twenty hours per week.

NRSG 6431. Neonatal Clinical Practicum 2. 4 Hours.

Continues NRSG 6430. Offers the second in a series of three courses focusing on the acquisition of clinical skills necessary for patient management of the high-risk neonate and family. Students have the opportunity to provide direct care under the supervision of NNP or neonatologist preceptors in the hospital neonatal intensive care unit (NICU), responsible for daily management of a specified caseload of neonates and their families, including therapeutic and diagnostic procedures. Supervised delivery room management of the high-risk neonate is expected, where available. Seeks to familiarize the student with disease processes commonly encountered in the term and preterm infant populations and appropriate management strategies. Requires students to practice in the clinical setting a minimum of twenty hours per week.

NRSG 6432. Neonatal Clinical Practicum 3. 2 Hours.

Continues NRSG 6431. Offers the final course in the series focusing on the acquisition of clinical skills and expertise necessary for patient management of the high-risk neonate and family. Provides the student with intensified experience in the hospital neonatal intensive care unit (NICU) providing direct care under the supervision of NNP or neonatologist preceptors. The student is responsible for daily management of a specified caseload of neonates and their families. Proficient delivery room management of the high-risk neonate is an expectation. The student should exhibit the ability to function as an independent novice practitioner with preceptor support.

NRSG 6444. Healthcare Systems and Quality Patient Care. 3 Hours.

Offers a theory course emphasizing the use of systems thinking and systems theory as a guide for analyzing and improving healthcare systems. Emphasizes the complex challenges of leading change to achieve quality healthcare for aggregate populations within systems of care. Examines the role of nurses as leaders of the discipline and managers of healthcare services within team-based healthcare structures. Course topics include systems and organizational theory, health systems analysis, transformative leadership concepts, change management theory, outcomes assessment, and teamwork and team-based care delivery concepts and practices.

NRSG 6449. Health Promotion of Adult/Older Adult Practicum. 1 Hour.

Applies knowledge acquired in NRSG 6249. Focuses on the assessment and health promotion of adults/older adults in the primary care settings. Utilizes selected clinical experiences to increase and apply health and risk-assessment skills with adult populations in the community. Also offers students an opportunity to acquire a beginning knowledge of the role of the adult/older adult nurse practitioner in primary care settings.

NRSG 6450. Adult/Older Adult Practicum 1. 4 Hours.

Provides a clinical learning experience that correlates with the content presented in NRSG 6250. Focuses on assessment of the adult life span within a holistic framework. Emphasizes identification of individuals at risk for premature morbidity and mortality, as well as focusing on advanced health assessment techniques and interpretation of abnormal findings on physical examination and developing a client/family health-promoting plan of care within the advanced practice role of the nurse practitioner. Requires students to practice in the clinical setting a minimum of sixteen hours per week.

NRSG 6451. Adult/Older Adult Practicum 2. 4 Hours.

Continues NRSG 6450. Focuses on providing the student with clinical learning experiences in the coordination and delivery of primary healthcare nursing services to adults and their families, with emphasis on underserved populations. Studies how to assess, diagnose, and manage acute and chronic conditions and illnesses commonly encountered in adult populations. Students build on a foundation of practice behaviors in health assessment, health promotion, and disease prevention. Requires students to practice in the clinical setting a minimum of sixteen hours per week.

NRSG 6460. Care of Well Child/Adolescent Health Promotion Practicum. 4 Hours.

Provides the student with clinical learning experiences in the delivery and coordination of primary-care services to well infants, children, adolescents, and young adults and their families. Focuses on performing a comprehensive health assessment of the child and family utilizing a holistic approach. Emphasis is on health promotion, health maintenance, and identification of individuals or families at risk. The utilization of two clinical sites provides the opportunity for the student to evaluate interdisciplinary role responsibilities and clinical practice standards. Weekly seminar discussion fosters critical analysis of clinical experiences and the integration of theory, research, and primary practice. Requires students to practice in the clinical setting a minimum of twenty hours per week.

NRSG 6461. Child/Adolescent Health Problems Practicum. 4 Hours.

Continues NRSG 6460. Focuses on providing the student with clinical learning experiences in the coordination and delivery of primary-care nursing services to infants, children, adolescents, and young adults and their families within the context of their culture and community. Studies how to assess, diagnose, and manage stable chronic conditions and acute episodic illnesses commonly encountered in childhood, adolescence, and young adulthood. Students build on a foundation of practice behaviors in health assessment, health promotion, and disease prevention. Requires students to practice in the clinical setting a minimum of twenty hours per week.

NRSG 6463. Care of the Critically Ill Child Practicum. 4 Hours.

Designed to accompany NRSG 6267, this course focuses on providing the student with clinical learning experiences in the coordination and delivery of critical care to infants, children, adolescents, and young adults and their families within the context of their culture and urban community. The goal of continued clinical practice experiences across settings and continuum of acuity care is to facilitate the development of knowledge and attitudinal competencies and skills in the delivery of care to children with a focus on critical health issues. Requires students to practice in the clinical setting a minimum of twenty hours per week.

NRSG 6480. Psychiatric Practicum across the Life Span 1. 5 Hours.

Provides clinical experience with individuals and families throughout the life span in a psychiatric mental health setting in the advanced practice nursing role. Includes a didactic seminar that focuses on assessment of psychopathology and mental health, psychodiagnostic history taking, mental status evaluation, differential diagnosis, and treatment for various aged diverse clients. Requires students to develop a caseload, and to practice in the clinical setting a minimum of twenty hours per week with an agency preceptor. Integration of theory and practice is emphasized, utilizing the data from the students' clinical placement as they apply to the specific diagnoses presented in clinical work. Also requires students to draft a needs assessment proposal to be completed in NRSG 6481.

NRSG 6481. Psychiatric Practicum across the Life Span 2. 5 Hours.

Continues NRSG 6480. Provides clinical experiences with individuals and families throughout the life span in a mental health setting. Requires students to continue to treat a caseload of clients and to practice a minimum of twenty hours per week with an agency preceptor. The focus is on planning and providing care, utilizing various treatment modalities, applying theoretical frameworks, prevention of psychiatric problems and promotion of mental health, group process, termination issues, and evaluation of clients' progress. Clinical cases provide the basis for discussion in didactic seminar. Requires students to complete the activity proposed in NRSG 6480 to meet an identified need in their community or clinical setting.

NRSG 6510. Nursing Leadership Role Practicum 1. 3 Hours.

Offers students an opportunity to engage in a mentored nurse leadership role within a complex healthcare system. Using the AONE Nursing Leadership Competencies (2006; 2011) as a guiding framework, emphasizes developing all aspects of the leadership role and practice at the micro- and mesosystem levels with an aggregate population focus (long-term community care, school health, acute care, etc.) in a team-based care environment. Focuses on integrating systems thinking and evidence-based leadership practices when collaborating with the preceptor in current organizational and patient care issues. Students reflect on leadership experiences and emerging issues in leading and managing healthcare delivery in diverse, technical, and dynamic environments. Expects students to practice in a clinical setting for eight hours per week.

NRSG 6520. Nursing Leadership Role Practicum 2. 3 Hours.

Continues NRSG 6510. Continuing to work directly with a nursing leader preceptor in a complex health care system, offers students an opportunity for a concentrated experience implementing the multifaceted role of the nurse leader by expanding their focus to include responsibility for the strategic and daily operation of nursing services. Emphasizes strengthening the student's abilities strategically to manage interpersonal relationships effectively and to convene, participate in, and lead healthcare teams. Focuses on relational skill building, such as negotiation, conflict resolution, coaching, and evaluating. Concurrent seminars focus on an array of issues surrounding the role of the nurse leader as well as team-building skills. Expects students to practice in a clinical setting for eight hours per week.

NRSG 6530. Nurse Anesthesia Practicum 1. 2 Hours.

Offers clinical learning opportunities designed to enable the student to develop an anesthesia plan and, with supervision, participate in the implementation of that plan.

NRSG 6534. Nurse Anesthesia Practicum 2. 4 Hours.

Seeks to provide students with the opportunity to apply theoretical concepts in clinical settings. With supervision, students are expected to determine the appropriate sequencing and timing of emergence and postanesthesia management of the patient. Requires students to practice in the clinical setting approximately thirty-six hours per week.

NRSG 6535. Nurse Anesthesia Practicum 3. 4 Hours.

Seeks to provide an in-depth clinical learning experience of advanced nurse anesthesia in specialty areas. Emphasizes increasingly independent integration of scientific principles to clinical practice and evaluation of patient outcomes and professional role development. Requires students to practice in the clinical setting approximately thirty-six hours per week.

NRSG 6540. Advanced Clinical Experiences in Nurse Anesthesia 1. 1 Hour.

Offers initial integration and synthesis course of advanced knowledge and skills for interdisciplinary anesthesia nursing care for complex problems and conditions across the life span. Selected topics and clinical case studies include collaborative decision making, effective communication, and root cause/adverse event analysis. With moderate guidance, students are expected to assume greater responsibility in planning and evaluation of anesthesia care. Requires students to practice in the clinical setting approximately thirty-six hours per week.

NRSG 6541. Advanced Clinical Experiences in Nurse Anesthesia 2. 1 Hour.

Offers second integration and synthesis course of advanced knowledge and skills for interdisciplinary anesthesia nursing care for complex problems and conditions across the life span. Selected topics and clinical case studies include collaborative decision making, effective communication, and root cause/adverse event analysis. With moderate guidance, students are expected to assume greater responsibility in planning and evaluation of anesthesia care. Requires students to practice in the clinical setting approximately thirty-six hours per week.

NRSG 6542. Advanced Clinical Experiences in Nurse Anesthesia 3. 1 Hour.

Offers third and final integration and synthesis course of advanced knowledge and skills for interdisciplinary anesthesia nursing care for complex problems and conditions across the life span. Selected topics and clinical case studies include collaborative decision making, effective communication, and root cause/adverse event analysis. With minimal guidance, students are expected to assume greater responsibility in planning and evaluation of anesthesia care. Requires students to practice in the clinical setting approximately thirty-six hours per week.

NRSG 6580. Nurse Anesthesia Clinical Practicum—Advanced. 0 Hours.

Offers students an opportunity to obtain further supervised clinical experience and to enhance clinical skills. Requires students to practice in the clinical setting a minimum of twenty hours per week. Restricted to USAGPAN students only.

NRSG 6864. Professional Preparation Seminar. 0 Hours.

Seeks to prepare the newly graduated BSN student to take necessary steps for entry into the professional nursing role and workforce prior to beginning master's specialization. Focuses on strategies for the transition from student nurse to professional nurse.

NRSG 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

NRSG 6964. Co-op Work Experience. 0 Hours.

Provides eligible students with an opportunity for work experience. May be repeated without limit.

NRSG 7100. Leadership in Advanced Practice Nursing. 3 Hours.

Seeks to provide a solid foundation for providing leadership. Analyzes the principles of transformational leadership and organizational behavior pertinent to healthcare systems. Seeks to prepare nursing leaders at the practice doctorate level to use critical thinking skills and evidence-based decision making to effect systems and organizational change. Discusses leadership skills and characteristics of leadership styles within the broader framework of interprofessional collaboration and innovations in healthcare delivery. Presents information from a variety of disciplines and perspectives (legal, fiscal, ethical, cultural, and political) for purposes of improving quality of care for patients, populations, and communities in healthcare settings across the continuum of care. Restricted to students enrolled in the Doctorate of Nursing Practice Program only.

NRSG 7104. Foundations in Nursing Research. 3 Hours.

Addresses the development of nursing science with specific emphasis on the importance of developing theory-based research. Includes a broad review of the various types of research studies (e.g., descriptive, causal, and relational); the steps of the research process; and the related analytic strategies and/or issues associated with each type of research study. Also reviews the guidelines for conducting critical literature reviews (i.e., systematic or meta-analyses) and how the results are used to determine the type of research study to employ. Discusses the scientific principles and integrity related to the conduct of responsible research and the means for assuring ethical integrity of research on human subjects.

NRSG 7105. Translating Research Evidence into Practice. 3 Hours.

Offers opportunities for students to examine strategies and tools for retrieval, compilation, critical appraisal, and application of empirical, reflective, and practice-based information to improve quality of care and health outcomes for populations of interest. Uses systematic reviews, case studies emphasizing use of quality improvement methods, clinical guidelines, collaborative interprofessional practice networks, and information technology. Includes program evaluation strategies and interpretation of biostatistical concepts relevant to population-based advanced practice. Offers students an opportunity to explore techniques that support their professional presence and voice as a leader. This course meets the requirements of the following DNP Essentials of Doctoral Education for Advanced Practice Nursing: (1): Scientific Underpinnings for Practice; (3): Clinical Scholarship and Analytical Methods for Evidence-Based (AACN, 2006).

NRSG 7110. Evidence-Based Practice Research Application. 2 Hours.

Offers graduate nursing students an opportunity to work singly or in groups of two with an experienced researcher in an area related to their clinical specialization or other professional interest. The student's individual contribution depends on the stage of the research project and is determined jointly by the student, faculty liaison, and researcher. Evaluation includes the student's individual effort, participation in the collaborative research process, and appraisal of the learning experience as a research assistant. By participating in an established, scientifically significant project, offers students an opportunity to actively experience the "real-life" aspects of conducting research and to be socialized to the role of the researcher.

NRSG 7400. Nurse Anesthesia Clinical Practicum 1. 5 Hours.

Constitutes an introductory doctoral-level clinical anesthesia course that offers the novice student registered nurse anesthetist (SRNA) an opportunity to gain supervised clinical experience in the preparation, administration, and management of anesthesia in patients undergoing surgical procedures or requiring pain management. Offers students an opportunity to begin to incorporate didactic (Phase 1) knowledge into providing anesthesia care of all forms to patients across the life span and to apply American Society of Anesthesiologists (ASA) physical status classification. The students receive extensive mentoring and direction with the goal of becoming safe, novice SRNAs able to accept increased independence and responsibility. Restricted to USAGPAN students only.

NRSG 7403. Nurse Anesthesia Clinical Practicum 2. 5 Hours.

Constitutes an introductory doctoral-level clinical anesthesia course that offers the advanced-beginner student registered nurse anesthetist (SRNA) an opportunity to gain supervised clinical experience in the preparation, administration, and management of anesthesia in patients undergoing surgical procedures. Offers students an opportunity to continue to incorporate didactic (Phase 1) knowledge into providing anesthesia care of all forms to patients across the life span and to apply American Society of Anesthesiologists (ASA) physical status classification. The SRNA continues to receive extensive mentoring and direction and is expected to demonstrate performance consistent with the advanced beginner and not at the level of a novice nursing anesthesia student. Restricted to USAGPAN students only.

NRSG 7406. Nurse Anesthesia Clinical Practicum 3. 5 Hours.

Constitutes an advanced doctoral-level clinical anesthesia course that offers the senior student registered nurse anesthetist (SRNA) an opportunity to gain clinical experience with reduced levels of supervision in the preparation, administration, and management of anesthesia in patients undergoing surgical procedures. Expects students to incorporate the science of anesthesia (i.e., didactic knowledge) and evidence-based practice as found in the anesthesia literature into providing anesthesia care of all forms to patients across the life span and to apply American Society of Anesthesiologists (ASA) physical status classification. The SRNA continues to receive mentoring and direction and is expected to demonstrate performance consistent with the competent anesthesia provider and not at the level of an advanced-beginner nursing anesthesia student. Restricted to USAGPAN students only.

NRSG 7409. Nurse Anesthesia Clinical Practicum 4. 5 Hours.

Constitutes an advanced doctoral-level clinical anesthesia course that offers the senior student registered nurse anesthetist (SRNA) an opportunity to gain clinical experience with minimal supervision in the preparation, administration, and management of anesthesia in patients undergoing surgical procedures. Expects students to incorporate the science of anesthesia (i.e., didactic knowledge) and evidence-based practice as found in the anesthesia literature into providing anesthesia care of all forms to patients of all ages and health status. The SRNA continues to receive mentoring and direction as necessary, is expected to demonstrate performance consistent with the competent-to-proficient anesthesia provider, and have the ability to function independently as a CRNA in a military and/or Department of Defense (DOD) facility or deployed environment. Restricted to USAGPAN students only.

NRS 7412. Nurse Anesthesia Role Development 1. 6 Hours.

Constitutes an introductory doctoral-level course that offers the novice student registered nurse anesthetist (SRNA) an opportunity to continue supervised clinical experience while developing the skills necessary to function as a professional clinician and member of a military/Department of Defense (DOD) healthcare system. Focuses on developing anesthesia providers capable of functioning as the sole anesthesia provider in potentially austere environments. The role of a DOD-certified registered nurse anesthetist requires a high level of leadership, communication and interpersonal skills, collaboration with the surgical team, and unwavering independence. Seeks to facilitate a broad vision of the military surgical mission with a focus on high-quality care, patient outcomes, and improvement of safety through system processes. Restricted to USAGPAN students only.

NRS 7415. Nurse Anesthesia Role Development 2. 6 Hours.

Constitutes an introductory doctoral-level course that offers the novice student registered nurse anesthetist (SRNA) an opportunity to continue supervised clinical experience while developing the skills necessary to function as a professional clinician and member of a military/Department of Defense (DOD) healthcare system. Focuses on developing anesthesia providers capable of functioning as the sole anesthesia provider in potentially austere environments. The role of a DOD-certified registered nurse anesthetist requires a high level of leadership, communication and interpersonal skills, collaboration with the surgical team, and unwavering independence. Seeks to facilitate a broad vision of the military surgical mission with a focus on high-quality care, patient outcomes, and improvement of safety through system processes. Restricted to USAGPAN students only.

NRS 7418. Nurse Anesthesia Role Development 3. 6 Hours.

Constitutes a doctoral-level course that offers the senior student registered nurse anesthetist (SRNA) an opportunity to continue clinical experience while developing the skills necessary to function as a professional clinician and member of a military/Department of Defense (DOD) healthcare system. Focuses on developing anesthesia providers capable of functioning as the sole anesthesia provider in potentially austere environments. The role of a DOD-certified registered nurse anesthetist requires a high level of leadership, communication and interpersonal skills, collaboration with the surgical team, and unwavering independence. Seeks to help refine the professional role of the SRNA and facilitate a broad vision of the military surgical mission with a focus on high-quality care, patient outcomes, and improvement of safety through system processes. Restricted to USAGPAN students only.

NRS 7421. Nurse Anesthesia Role Development 4. 6 Hours.

Constitutes an advanced doctoral-level course that offers the senior student registered nurse anesthetist (SRNA) an opportunity to continue clinical experience while refining the skills necessary to function as a professional clinician and member of a military/Department of Defense (DOD) healthcare system. Focuses on developing anesthesia providers capable of functioning as the sole anesthesia provider in potentially austere environments. Requires a high level of leadership, communication and interpersonal skills, collaboration with the surgical team, and unwavering independence. Seeks to help refine the professional role of the SRNA. Challenges SRNAs to set the example as professional doctoral-level anesthesia students and assist (to the extent possible) in mentoring the junior SRNAs in their professional/clinical roles. Restricted to USAGPAN students only.

NRS 7500. Role/Practice Issues in Nurse Anesthesia. 3 Hours.

Analyzes new developments and current trends in nurse anesthesia practice, education, and research. Includes the historical, legal, legislative, and professional role issues associated with advanced practice anesthesia nursing. Emphasizes professional responsibilities, ethical issues, diversity, cultural competency, quality assurance, continuing education, and professional involvement. Emphasizes the historical events that have impacted the development of both the profession and the organizational structure of the American Association of Nurse Anesthetists (AANA). Discusses professional standards established by the organization. Reviews other agencies, at the federal and state levels, that affect the legal recognition of CRNA practice. Presents an overview of the educational accreditation process and certification.

NRS 7503. Pharmacotherapeutics in Anesthesia and Critical Care Nursing. 3 Hours.

Designed to help the DNP student in anesthesia develop an understanding of the pharmacologic principles and associated application to clinical anesthesia and critical care advanced practice nursing. Reviews the basic principles of the pharmacokinetics and pharmacodynamics of commonly used drugs in anesthesia and critical care. The prescription, administration, and monitoring of medications for the critically ill and patients undergoing anesthesia serves as the organizing framework for the course. Content includes the most common agents and classes of drugs prescribed for the critically ill and patients undergoing anesthesia, the signs and symptoms of drug toxicity, and interventions utilized to resolve adverse drug reactions.

NRS 7506. Applied Chemistry, Physics, and Cardiopulmonary Physiology of Anesthesia. 3 Hours.

Designed to help the DNP student in anesthesia to integrate nursing science with basic biophysical sciences and to prepare for the highest level of advanced nursing practice in the specialty of anesthesia. Offers students an opportunity to correlate biochemical and physics principles as they apply to the physiology, pathophysiology, and pharmacology of anesthesia nursing. Also provides in-depth discussion and integration of the knowledge related to the principles of chemistry, physics, and pharmacology of general anesthesia. Emphasizes the physiological mechanisms related to operation and regulation of the cardiopulmonary system. Discusses physiological information mostly related to anesthesia.

NRS 7509. Advanced Concepts in Nurse Anesthesia Practice. 3 Hours.

Focuses on the pharmacodynamic, pharmacokinetic, and physiologic principles related to the delivery of anesthetics and adjunctive drugs in advanced nurse anesthesia practice. Emphasizes pharmacologic management of patients with complex health problems, including multisystem failure and multidrug therapy. Studies anesthetic management for extensive surgeries performed on adults and children to develop safe intra-operative and perioperative care plans. Covers integration of pharmacological data, anesthesia administration, monitoring technology, and comprehensive advanced nursing care to return patients to their optimal state of health. Includes an overview of pain and regional anesthesia with an emphasis on anesthetic indications, management, and complications. Presents fundamental principles governing obstetrical anesthesia, emphasizing normal physiological changes associated with pregnancy, anesthetic considerations, complications inherent in pregnancy, and approaches to anesthesia.

NRSG 7511. Applied Gross Anatomy and Physiology of Anesthesia. 3 Hours.

Designed to help the DNP student in anesthesia to develop the fundamental knowledge and skills necessary for entry into advanced practice anesthesia nursing. Emphasizes study of the head and neck (multiorgan systems including the nervous system) and the back, including the spinal cord, the thorax (with focus on the respiratory and cardiovascular systems), the abdomen, pelvis, and extremities. Companion laboratory periods, during which students examine the same region in a prosected human cadaver, follow lectures. Presents ultrasound, radiography, computer tomograms (CT scans), and magnetic resonance images (MRIs) of normal and diseased organs in lectures and labs to emphasize the importance of integrating the principles of anatomical knowledge in understanding the human body in health and disease.

NRSG 7520. Conceptual Basis of Nurse Anesthesia Practice 1. 3 Hours.

Aims to help the DNP student in anesthesia to develop the fundamental knowledge and skills necessary for entry into advanced practice anesthesia nursing. Areas of focus include patient assessment, essential anesthesia techniques, monitoring and equipment, pharmacologic interventions, development of case/disease-specific anesthesia management plans, cultural competence, and safe practice across the life span. This is the first course in the nurse anesthesia program conceptual basis of practice clinical series.

NRSG 7523. Conceptual Basis of Nurse Anesthesia Practice 2. 3 Hours.

Aims to help the DNP student in anesthesia to develop foundational skills in the management of highly specialized problems and conditions requiring anesthesia or surgical interventions. Key concepts include patient assessment, evaluation, and differential diagnosis. Offers students an opportunity to demonstrate the ability to plan and implement anesthesia care and pharmacologic interventions for patients with disorders of the cardiovascular and pulmonary systems across the life span. This is the second course in the nurse anesthesia program conceptual basis of practice clinical series.

NRSG 7526. Conceptual Basis of Nurse Anesthesia Practice 3. 3 Hours.

Designed to help the DNP student in anesthesia engage in integration of the knowledge and skills associated with highly specialized problems and conditions requiring anesthesia or surgical interventions. Offers students an opportunity to demonstrate the ability to conduct well-informed discussion concerning physiology and pathophysiology of the nervous, endocrine, renal, and hepatic systems. Key competencies include conducting focused assessment, anesthetic planning, and selection of pharmacologic interventions for patients with disorders of the nervous, endocrine, renal, and hepatic systems across the life span. This is the third course in the nurse anesthesia program conceptual basis of practice clinical series.

NRSG 7530. Nurse Anesthesia Practicum 1. 2 Hours.

Offers the DNP student in anesthesia an opportunity for experiential integration and synthesis of basic knowledge and skills for anesthesia nursing care. Selected topics and clinical case plans reinforce the principles of collaborative decision making, effective communication, cultural sensitivity, use of equipment and techniques, use of evidence, planning for routine and emergent events, and evaluation of various conditions for patients across the life span. Students have an opportunity to demonstrate achievement of entry-level practice skills by the end of the course.

NRSG 7533. Nurse Anesthesia Practicum 2. 4 Hours.

Offers the DNP student in anesthesia an opportunity to apply theoretical concepts and skills obtained in the lab to the clinical setting. With supervision, students create a plan of care for induction, maintenance, emergence, and postanesthesia. Offers students an opportunity to enhance these skills through clinical experiences, lab skills development, and seminar discussions.

NRSG 7536. Nurse Anesthesia Practicum 3. 4 Hours.

Aims to help the DNP student in anesthesia to refine and enhance their growing anesthesia knowledge and skill. Students progress under supervision at clinical sites to more independent management of basic cases and begin exposure to complex and specialty cases. Seminars meet to discuss issues related to complex clinical practice with emphasis on patients with cardiac disease, cardiac anesthesia, management of critically ill patients, glycemic management, blood management, coagulation management, cerebral oximetry, and renal protection.

NRSG 7540. Advanced Clinical Experiences in Nurse Anesthesia 1. 1 Hour.

Aims to help the DNP student in anesthesia to begin development of advanced skills and to integrate comprehensive cumulative knowledge into anesthesia and perioperative care for complex patients having major and specialty surgery across the life span. Focuses on patient-centric care and includes development of an understanding of how nurse anesthetists can deliver high-quality care to improve patient outcomes and the safety environment adherence to individual and systemic safety processes. Students incorporate didactic knowledge into developing anesthesia management plans for patients across the acuity and age continuum. With continual guidance, offers students an opportunity to assume increasing responsibility for more care of increasingly complex patients and surgical procedures.

NRSG 7543. Advanced Clinical Experiences in Nurse Anesthesia 2. 2 Hours.

Mentors students to develop skills in crisis management, patient safety, and independent anesthetic management. The role of the senior SRNA demands demonstration of leadership, interprofessional communication, collaboration, and use of resources in all settings and situations, including crisis events. Students integrate information from prior classroom and clinical experiences into individualized plans of care for all ages and complexity of patients.

NRSG 7546. Advanced Clinical Experiences in Nurse Anesthesia 3. 2 Hours.

Aims to help the DNP student in anesthesia to utilize knowledge and skill gained during increasingly complex clinical experiences to refine the skills necessary to function as an independent professional clinician and member of the healthcare system. Designed to support integration and synthesis of advanced knowledge and skills for interdisciplinary anesthesia nursing care of patients across the life span who have complex health problems and who are undergoing a wide range of surgical procedures. Selected topics and clinical case studies focus on higher-level professional skills, including collaborative decision making, utilization of evidence to inform practice, and effective communication. With minimal guidance, students assume greater responsibility in planning, implementing, and evaluating anesthesia care.

NRSG 7700. The Science of Nursing. 3 Hours.

Introduces basic concepts in philosophy of science and the development of knowledge. Explores the historical development and themes for knowledge building in nursing and healthcare. Offers students an opportunity to analyze different ways of knowing and world views as they relate to the development of programs of research in nursing. Content from this course is applied to each student's area of research interest. The examination of the scientific literature, identification of gaps in knowledge, and the development of research questions are completed to begin the process of developing a research plan.

NRSG 7705. Theoretical and Conceptual Foundations in Nursing Science. 3 Hours.

Examines the nature of nursing science by critically analyzing the current relevance of nursing theories and conceptual models to the advancement of nursing's scientific development. Emphasizes various approaches to concept/theory development, analysis, and synthesis. Expects students to develop skills in concept/theory analysis and synthesis and to apply these skills to a formal analysis of concept relevant to their phenomena of interest. Students who do not meet course prerequisites may seek permission of instructor.

NRSG 7709. Qualitative Research Methods. 3 Hours.

Examines published qualitative research in nursing and related disciplines. Emphasizes major strategies of qualitative inquiry, including ethnography, grounded theory, phenomenology, narrative inquiry, and case study. Offers students an opportunity to begin to develop mastery in critiquing qualitative research, ethical issues, data analysis techniques, and proposal development.

NRSG 7712. Quantitative Research Methods. 3 Hours.

Introduces different types of quantitative research methods as they relate to investigation of phenomena in nursing and healthcare. Begins with a focus on defining research problems, theory testing, and causal inference, then explores a range of research designs and methodologic techniques that are available for empirical research. Quantitative techniques include sampling, data collection, analysis, and interpretation.

NRSG 7715. Measurement in Clinical Research. 3 Hours.

Examines the concepts of measurement, sources of measurement error, control, and instrumentation as they relate to variables in clinical research. Students have an opportunity to explore the procedural aspects of measurement, criterion-referenced and norm-referenced measures, as well as the reliability and validity of measurement techniques. Discusses methods and statistical procedures used in instrument design and testing, such as instrument blueprints, factor analysis, and item response theory. Emphasizes the measurement of variables to evaluate the effectiveness of clinical interventions.

NRSG 7750. Healthcare of Urban Populations. 3 Hours.

Provides students with an opportunity to explore the body of urban health research to identify key themes, conceptual foundations, and contemporary research findings. Examines integration of cultural and community contextual factors that affect the health status of urban populations. These include racial, ethnic, and economic health disparities; influences of the urban physical environment and the urban social environment; and the availability of and access to health and social services. Studies the influence of concepts such as vulnerability, underserved, culture, ethnicity, poverty, discrimination, disparities in healthcare, urbanization, diversity, social determinants of health, environmental justice, and migration on health status.

NRSG 7755. Intervention Research: Development, Implementation, and Evaluation. 3 Hours.

Examines theory-based intervention research for individuals, groups, populations, and systems. Offers an overview of the types of theory-based interventions across the health spectrum. Reviews the development and testing of theory-based interventions. Emphasizes understanding the strengths and challenges of integrating technology across the development, testing, and implementation of a theory-based intervention. Also emphasizes the selection of existing interventions, the process of adaptation, and the valid and reliable execution of the selected theory-based intervention by examining such issues as treatment, fidelity, intervention duration, context, and interventionist expertise. Compares and contrasts intervention research developed for efficacy, effectiveness, and implementation. Restricted to students enrolled in a PhD program or with permission of instructor.

NRSG 7770. Research Colloquium. 1 Hour.

Offers doctoral students an opportunity to explore in-depth key concepts in nursing and healthcare research. Led by a faculty expert, offers students an opportunity to engage in meaningful dialogue and analysis to examine the concept from multiple perspectives. May be repeated up to four times.

NRSG 7920. The Steps to Practice Inquiry: Analyze, Evaluate, Synthesize, and Apply the Evidence. 3 Hours.

Designed as a complement to NRSG 7105 or equivalent. Offers students an opportunity to obtain skills and competencies needed for a practice doctorate—ability to generate new knowledge from practice, evaluate current practice approaches, analyze current knowledge, and adapt/translate knowledge into usable clinical strategies that improve practice and lead to better outcomes.

NRSG 7921. DNP Scholarly Project 1: Design and Ethical Consideration of Practice Application. 3 Hours.

Reflects the culmination of practice inquiry, knowledge, and competencies attained during the Doctorate of Nursing Practice program. In this seminar, students are mentored through the process of evidence-based project development, including formulation of goals and objectives; refinement of project design and implementation strategies; and development of tools and/or forms for data collection, identification of resources (personnel and fiscal), ethical review, and evaluation. Offers students an opportunity to participate in a process of peer consultation and critique in support of project refinement. Requires a minimum total of 250 scholarly practice hours.

NRSG 7922. DNP Scholarly Project 2: Applying Practice Knowledge—Implementation/Outcomes. 3 Hours.

Reflects the culmination of practice inquiry, knowledge, and competencies attained during the Doctorate of Nursing Practice program. In this seminar, students are guided through the process of completing an evidence-based project. Emphasizes the acquisition of reflective practice skills and competencies needed to assess and implement evaluation of evidence and outcomes. Requires a minimum total of 250 scholarly practice hours.

NRSG 7923. DNP Scholarly Project 3: Dissemination of Practice Inquiry. 3 Hours.

Reflects the culmination of practice inquiry, knowledge, and competencies attained during the Doctorate of Nursing Practice program. In this seminar, students are guided through the process of summarizing and disseminating the results of the project. Requires a minimum total of 250 scholarly practice hours.

NRSG 7924. Applied Epidemiology for Advanced Nursing. 3 Hours.

Examines the scientific foundations integral to the competencies outlined in the Essentials of Doctoral Education for Advanced Nursing Practice (2006). Course content and accompanying practice opportunities, grounded in clinical prevention and population health, seek to enable students to analyze epidemiological, biostatistical, occupational, and environmental data in the development, implementation, and evaluation of clinical prevention and population health. Emphasizes current concepts of public health, health promotion, evidence-based recommendations, determinants of health, environmental/occupational health, and cultural diversity and sensitivity needed to guide advanced nursing practice. In addition, emerging knowledge regarding infectious diseases, emergency/disaster preparedness, and intervention frame the exercises and practice opportunities focused on clinical prevention and population health.

NRSG 7925. Health Policy and Advocacy. 3 Hours.

Examines the scientific foundations integral to meeting the competencies outlined in The Essentials of Doctoral Education for Advanced Nursing Practice (2006). Seeks to provide students with the knowledge and opportunity to develop skills and competencies essential to assuming leadership roles in the development of health policy. Contrasts the major contextual factors and policy triggers that influence health policymaking at the various levels. Exercises are aimed at developing skill in the design, implementation, and advocacy for healthcare policy to address issues of social justice and equity in healthcare. Additionally, the course integrates practice experiences with two additional skill sets—the ability to analyze the policy process and the ability to engage in politically competent action.

NRSG 7976. Directed Study. 1-4 Hours.

Allows PhD students to develop an individual plan to attain specific knowledge related to research goals or specific research technique/approach. May consist of library study and reading, preparation of scholarly presentation or publication, mentored research experience, or other appropriate activity as approved by professor and academic advisor. May be repeated without limit.

NRSG 9000. Comprehensive Exam. 0 Hours.

Indicates successful completion of the doctoral comprehensive exam.

NRSG 9845. Dissertation Seminar 1. 3 Hours.

Guides students through the beginning of the research process as they prepare their dissertation proposals, including writing the literature review and outlining the research design for their projects. Students have an opportunity to work with their dissertation advisors both individually and in small groups.

NRSG 9846. Dissertation Seminar 2. 3 Hours.

Provides students with an opportunity to finalize their dissertation proposals and make the necessary arrangements to begin their investigations by completing the design and methods and obtaining Investigative Review Board approval. Students have an opportunity to work with their dissertation advisors both individually and in small groups.

NRSG 9984. Research. 1-4 Hours.

Offers an opportunity to conduct research under faculty supervision. May be repeated without limit.

NRSG 9990. Dissertation. 1 Hour.

Offers research/experimental work for PhD thesis on a full-time basis. Restricted to Doctoral candidacy students only. May be repeated once.

NRSG 9996. Dissertation Continuation. 0 Hours.

Offers continuation of PhD dissertation research. May be repeated up to 15 times.

Nutrition - CPS (NTR)

Search NTR Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=NTR>)

NTR 6100. Advanced Nutrition and Metabolism. 4 Hours.

Examines the metabolism, physiological actions, and interrelationships of carbohydrates, protein, fats, vitamins, minerals, and water. Discusses the regulation of the biochemical pathways and the nutritional principles of macronutrient and micronutrient metabolism; absorption, excretion, transport, and cellular metabolism; nutritional and toxicological standards for humans and animal models; and bioavailability of minerals.

NTR 6101. Nutrition Program Planning. 4 Hours.

Focuses on individual and community nutritional assessment. Emphasizes development, implementation, and evaluation of nutrition intervention programs. Offers students an opportunity to practice setting realistic goals that produce outcomes that improve health and support wellness. Explores changing nutritional behavior and the barriers to such change. This course is intended for graduate students in nutrition or other health sciences and/or human services graduate students interested in developing, implementing, and evaluating community-based nutrition programs.

NTR 6110. Medical Nutrition Therapy. 4 Hours.

Explores the application of nutrition principles to the treatment and prevention of diseases. This treatment can range from changes in diet to providing specialized therapies such as intravenous or tube feeding. Discusses lifestyle strategies and therapeutic nutrient intervention to correct nutritional insufficiencies; promote optimal health; and prevent, manage, or correct medical problems.

NTR 6112. Research Methods in Nutrition. 4 Hours.

Examines the varying techniques and methods used in nutritional research. Offers students an opportunity to learn how to critically analyze and interpret research literature.

NTR 6115. Health Promotion/Disease Prevention. 4 Hours.

Examines health promotion—the science and art of helping people change their lifestyle to move toward a state of optimal health. Lifestyle changes can prevent chronic diseases, such as heart disease, cancer, and diabetes, which are the leading causes of death and disability in the United States. Reviews and critically assesses current efforts to influence lifestyle change, at both the individual and population levels. Offers students an opportunity to plan, organize, and conduct lifestyle change programs.

NTR 6118. Clinical Health Behavior Change. 4 Hours.

Explores health behavior theories to facilitate the adoption of healthful behaviors to various groups. Includes motivational interviewing; practice of nonverbal, active listening; goal assessment; and group counseling. Explores the evaluation of nutrition education interventions.

NTR 6119. Pediatric Nutrition. 4 Hours.

Explores the nutritional requirements of the healthy child from infancy through adolescence. Covers the assessment, treatment, and management of a variety of pediatric diseases and conditions, including prematurity, growth failure, food allergies and intolerances, developmental disabilities, diabetes, and obesity. Explores the global issues affecting children today, including malnutrition, obesity, and environmental health.

NTR 6120. Healthy Aging: Nutrition Strategies for Optimal Longevity. 4 Hours.

Offers a general survey of the impact of aging on the nutritional status of older adults. Covers the relationship between nutrition, body composition, and activity level and their impact on rehabilitation of older adults. Encourages students to look for the clinical signs and symptoms in aging clients that may require nutritional interventions. Offers students an opportunity to acquire strategies for the treatment and prevention of diseases and conditions that are associated with aging and become familiar with various cultures known for their longevity.

NTR 6130. Healthcare and Nutrition Communication. 4 Hours.

Examines cutting-edge research and current theories in health and nutrition communication. Studies empirically proven health campaigns, offering students an opportunity to understand the key qualities of messages that can best influence health-related decision making. Analyzes the mechanisms for transmitting key knowledge to a target audience, including the potential utility of social networking tools in developing nutrition as an applied science. Offers students an opportunity to test their own messages using print and electronic media. Seeks to help nutrition scientists create communities of "healthy practice" among populations that would benefit the most from improved nutrition.

NTR 6148. Exercise Physiology. 3 Hours.

Covers the advanced study of concepts, principles, and research in the field of exercise physiology. Discusses advanced concepts in the muscular/neuromuscular, cardiovascular, ventilatory, endocrine, and metabolic responses to exercise and exercise training. Specific study of the physiological control mechanisms regulating these systems are also addressed during periods of rest, acute exercise, and following chronic exercise training.

NTR 6150. Sports Psychology. 3 Hours.

Covers topics such as eating disorders among athletes, female athlete triad, and weight management. Discusses performance enhancement, motivation, and stress management of athletes. Offers students an opportunity to develop skills to counsel athletes, as well as sports teams, and to develop an understanding of behavioral change theory as it relates to sports psychology.

NTR 6155. Nutrition Entrepreneurship. 3 Hours.

Includes advanced analysis of the problems and considerations involved in establishing, organizing, and operating a nutrition-based business or clinical nutrition practice. Focuses on tools, techniques, and resources necessary for establishing a business, including developing a business plan, marketing and advertising, and reimbursement and legal and regulatory matters.

NTR 6165. Food and Society. 4 Hours.

Covers healthy food trends and food products that affect how we live. Includes advanced analysis of food in our society and environment. Examples are the organic movement, product and meal trends in supermarkets and restaurants, food and the economy, food politics, food labeling, and culinary nutrition trends. Focuses on how one can implement the findings into one's practice and/or area of expertise.

NTR 6200. Nutrition Education. 4 Hours.

Presents methods for creating and evaluating nutrition content for educational presentations. Offers students an opportunity to develop educational materials with an eye toward audience and context-appropriate language. Encourages students to reflect on the purpose of particular educational materials and then fashion nutrition messages that have the best chance of eliciting meaningful behavioral changes. Requires students to produce highly effective educational materials from start to finish and, in the process, practice the commonly used methods for writing, editing, and designing appropriate educational tools.

NTR 6201. Commercialization of Nutrition and Nutritional Information. 3 Hours.

Examines the commercialization of food from the perspectives of the marketers and consumers. In the United States, the consumption of food and nutritional information is mediated by advertisements and infomercials. In contemporary society, the market shapes what we eat and what we think that we should eat. This course offers students an opportunity to evaluate the role that commercial enterprises play in influencing notions of healthy nutrition and nutrition education. Features images and copy found in print advertisements, television, popular online sources, and movies and product placements.

NTR 6202. The Financing of Nutrition and Wellness. 3 Hours.

Assesses the impact that public and private funding has on health communication and nutrition campaigns. In the United States, health campaigns are determined, in part, by the funding that they receive. Unfortunately, private and public funding of healthcare has traditionally embraced a pathological model, one in which payment was driven by curing the sick rather than maintaining the healthy. With a greater focus on controlling healthcare costs, policymakers, employers, and insurance companies have sought to promote health through nutritional information and wellness programs. The challenge is to find ways of financing these efforts. Offers students an opportunity to develop policy recommendations for supporting better nutrition practices among a diverse population.

NTR 6866. Applied Research in Nutrition. 1-4 Hours.

Offers graduate students in applied nutrition an opportunity to obtain experience in the formal presentation of research results. Emphasizes the components of quality research. Offers students an opportunity to conduct, analyze, and present an evaluative or applied research project in a clear, concise, and logical manner.

NTR 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

NTR 7130. Overweight and Obesity 1. 4 Hours.

Addresses the epidemiology of obesity, as well as the etiology and possible causes. Discusses the medical management and complications of obesity in-depth. Students review and critically assess current treatment strategies, such as pharmacotherapy, bariatric surgery, and behavioral approaches. Considers new research and paradigms for the causes and treatment of obesity.

NTR 7132. Overweight and Obesity 2. 4 Hours.

Examines a variety of topics in the current literature, some controversial, related to the etiology, management, treatment, and psychosocial ramifications of obesity. Offers students an opportunity to conduct an extensive review of the existing literature on various topics connected with obesity. The goal is to critically analyze and draw conclusions on how particular topics affect certain key areas in obesity, including clinical management, health promotion and disease prevention, and policy, as well as individual perceptions.

NTR 7135. Eating Disorders in Children and Adults. 4 Hours.

Examines eating disorders in children and adults, including the definition and clinical presentation of eating disorders. Considers the medical complications of eating disorders, as well as the relationship between eating disorders and obesity. Examines family issues, especially for children and adolescents, in the etiology and treatment of eating disorders. Analyzes existing approaches to treatment, as well as new and experimental treatments.

NTR 7140. Wellness and Nutrition. 4 Hours.

Debates the notion that ideas of wellness are culturally contingent and socially constructed. As part of that investigation, the course surveys the nexus among nutrition habits and public health, primary education and lifelong healthy habits, and emerging trends toward corporate wellness and nutrition coaching. Offers students an opportunity to study and apply the latest research and theories relating to health maintenance and preventative nutrition. Requires students to carefully reflect upon the various definitions of wellness. Explores the construction of nutrition expertise and its involvement in large public and private programs designed to motivate individuals to engage in healthy lifestyles.

NTR 7147. Sports and Fitness Nutrition. 3 Hours.

Focuses on understanding the specific role of energy and nutrients in fitness and athletic performance. Additional topics include the role of fluid and electrolytes, ergogenic aids, and special diets in physical activity. Explores tools for assessing body composition (body fat, muscle mass), unique dietary concerns across the life span and in special population groups (heart disease, diabetes, obesity), and the effect of diet on endurance.

NTR 7880. Nutrition in Practice. 1-4 Hours.

Presents a guided experience that offers students an opportunity to link theory and practice. Students gain experience in the field of nutrition, either in-person or online, and develop or work on an established project or program that is relevant to the student's specialization. Seeks to help students construct a "portfolio" piece that can be included in job application packages.

NTR 7962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions.

NTR 7978. Independent Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic.

Operations Research (OR)

Search OR Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=OR>)

OR 6205. Deterministic Operations Research. 4 Hours.

Introduces the theory, computation, and application of deterministic models to represent industrial operations. Includes linear programming formulation and solution using spreadsheet and algebraic languages software; simplex, big-M, two-phase, revised simplex, and dual simplex algorithms for solving linear programs; introduction to the theory of simplex, fundamental insight, duality, and sensitivity analysis; transportation, assignment, and transshipment problems; shortest path, minimum spanning tree, maximum flow, minimum cost network flow problems and project networks; and discrete-state and continuous-state dynamic programming models and applications. Requires knowledge of linear algebra.

OR 6500. Metaheuristics and Applications. 4 Hours.

Focuses on solving large combinatorial optimization problems. Metaheuristic search aims to find a "very good" solution that satisfies the problem constraints. Describes multiple metaheuristic search methods such as simulated annealing (SA), tabu search (TS), genetic algorithms (GA), particle swarm optimization (PSO), and multiobjective methods. Uses algorithms to find values of discrete and/or continuous variables that optimize a system's performance. Discusses the application of metaheuristics to a variety of different problems, including hub location allocation, parallel machine scheduling, travelling salesman problem (TSP), curve fitting, clustering, n-queen, min one, etc. Incorporates practical experiments to demonstrate the advantages and disadvantages of metaheuristic search methods for different applications.

OR 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

OR 7230. Probabilistic Operation Research. 4 Hours.

Introduces the theory and use of stochastic models to represent industrial operations. Topics include discrete-state Markov chains and applications, state transitions and properties, first passage probabilities, steady-state analysis; absorbing chains and absorption probabilities; introduction to continuous-time Markov chains, transition rates and steady-state analysis; basic elements of queuing systems, birth-and-death process, and special cases; steady-state analysis of simple queuing models including M/M/s, M/M/s/K, M/M/s/N/N and their special cases; and queuing models involving nonexponential distributions.

OR 7235. Inventory Theory. 4 Hours.

Considers the nature and characteristics of inventory systems. Examines techniques of constructing and analyzing mathematical models of inventory systems with a view toward determining operating policies for such systems.

OR 7240. Integer and Nonlinear Optimization. 4 Hours.

Covers important families of mathematical programming problems and optimization methods. Discusses the cutting plane and the branch and bound algorithm for binary and mixed integer programming problems. Introduces nonlinear programming including unconstrained optimization, the Kuhn-Tucker conditions, gradient methods, and separable, quadratic, and geometric programming.

OR 7245. Network Analysis and Advanced Optimization. 4 Hours.

Considers concepts of advanced linear programming and network flows. Includes theory of the simplex method, the revised simplex algorithm using LU factorization, and simplex for bounded variables and primal-dual methods; methods for solving large-scale models such as Danzig-Wolfe decomposition, Bender's partitioning, Lagrangian relaxation, and subgradient optimization; computational complexity and Karmarkar's algorithm; minimum cost network flows, network simplex, and generalized and multicommodity network flow problems; and special types of network problems including the traveling salesman, routing, network location, and reliability problems.

OR 7310. Logistics, Warehousing, and Scheduling. 4 Hours.

Explores the determination of needs and requirements for logistics within large-scale manufacturing and business environments. Examines warehousing and scheduling in the context of a business logistics system. Introduces managerial, mathematical, and software tools and techniques for modeling and optimizing various aspects of the business supply chain. Considers approaches to examining warehousing operations and the associated algorithms.

OR 7374. Special Topics in Operations Research. 4 Hours.

Offers topics of interest to the staff member conducting this class for advanced study. May be repeated without limit.

OR 7440. Operations Research Engineering Leadership Challenge Project 1. 4 Hours.

Offers students an opportunity to develop and present a plan for the demonstration of a marketable technology product or prototype with an operations-research focus. Constitutes the first half of a thesis-scale project in technology commercialization. Requires work/training with a sponsoring organization or employer to improve a process or develop a project that is of significant value to the organization and demonstrates a quantifiable market impact while enhancing the student's technological and engineering depth and fostering the student's leadership development.

OR 7442. Operations Research Engineering Leadership Challenge Project 2. 4 Hours.

Continues OR 7440, a thesis-scale project in technology commercialization. Offers students an opportunity to demonstrate their development of a marketable technology product or prototype with an operations-research focus and produce a written documentary report on the project to the satisfaction of an advising committee. Requires work/training with a sponsoring organization or employer to improve a process or develop a project that is of significant value to the organization and demonstrates a quantifiable market impact while enhancing the student's technological and engineering depth and fostering the student's leadership development.

OR 7945. Master's Project. 4 Hours.

Offers theoretical or experimental work under individual faculty supervision.

OR 7962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

OR 7978. Independent Study. 1-4 Hours.

Offers theoretical or experimental work under individual faculty supervision. May be repeated without limit.

OR 7990. Thesis. 1-8 Hours.

Offers analytical and/or experimental work conducted under the direction of the faculty in fulfillment of the requirements for the degree. Requires first-year students to attend a graduate seminar program that introduces the students to the methods of choosing a research topic, conducting research, and preparing a thesis. Requires successful completion of the seminar program. May be repeated without limit.

OR 7996. Thesis Continuation. 0 Hours.

Continues thesis work conducted under the supervision of a departmental faculty member.

Organizational Behavior (ORGB)

Search ORGB Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=ORGB>)

ORGB 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ORGB 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ORGB 3201. Organizational Behavior. 4 Hours.

Provides an overview of the actions and behaviors of people in organizations. Uses case studies, videos, experiential exercises, lectures, and discussions to explore the effects of individual, interpersonal, group, organizational, and cross-cultural factors on human behavior. Topics include groups and teams, motivation, leadership, organizational change, organizational culture, structure, conflict resolution, and communication. Both the underlying theories and principles of these topics, as well as their practical applications and implications for organizations, are covered.

ORGB 3209. Organizational Behavior. 4 Hours.

Does not count as credit for business majors. Counts as ORGB 3201 for business minors only.

ORGB 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

ORGB 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

Organizational Change - CPS (OCM)

Search OCM Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=OCM>)

OCM 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

Pharmaceutical Science (PHSC)

Search PHSC Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=PHSC>)

PHSC 1555. Drug Development and Translational Medicine. 4 Hours.

Offers students an opportunity to actively explore the principles of translational medicine, the application of science to patient care, with a focus on pharmaceuticals. Presentations and discussion are led by accomplished scientists and practitioners who are engaged in teaching and research in the areas of drug discovery; development and delivery; and with expertise in the biomedical, pharmaceutical, social and administrative, and clinical sciences. Students visit research laboratories and receive firsthand accounts of how medications are used in patient care settings. .

PHSC 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

PHSC 2000. Professional Development for Pharmaceutical Sciences Co-op. 1 Hour.

Introduces students to the pharmaceutical sciences cooperative education program and professionalism in the field. Students assess their workplace skills, interests, and values and discuss how these impact personal career decisions. Offers students an opportunity to develop effective job search and career management skills, prepare a professional resumé, learn proper interviewing techniques, develop a strong online professional profile, and learn how to use the Northeastern job database and referral process.

PHSC 2100. Lab Research Rotation. 4 Hours.

Offers students an opportunity to conduct laboratory research under the direct supervision of a laboratory mentor, generally a faculty member or laboratory director, gain experience in research techniques, and develop good laboratory practices as they learn about research topics under investigation in the laboratory of their choice. Students attend seminars, departmental events, and other activities relevant to the mentor's laboratory. The time commitment is at least eight hours a week. Mentor expectations and grading criteria are decided upon between the student and the mentor prior to the start of the rotation and must be approved by the course director. Students prepare a presentation that encompasses the research performed by the student that includes description, experimental design, data generated, data interpretation, and discussion of their research project.

PHSC 2301. Human Physiology 1. 3 Hours.

Provides students with an understanding of the principles of physiology. Discusses physiological information mostly related to cardiovascular, respiratory, digestive, urinary, and endocrine systems. Focuses on the physiological mechanisms of the major organ systems. Physiological information is related to the specific areas of pharmacology.

PHSC 2302. Human Anatomy Lab. 1 Hour.

Accompanies PHSC 2301. Focuses on the anatomy of the major organ systems. Interactive CD-ROMs allow each student to study in-depth the structure of each organ system.

PHSC 2303. Human Physiology 2. 3 Hours.

Continues PHSC 2301. Provides students with an understanding of the principles of physiology. Discusses physiological information mostly related to cell physiology, muscle physiology, and physiology of the nervous system. Focuses on the physiological mechanisms of the major organ systems. Physiological information is related to the specific areas of pharmacology.

PHSC 2304. Human Physiology Lab. 1 Hour.

Accompanies PHSC 2303. Covers topics from the course through various experiments.

PHSC 2320. Biochemistry. 4 Hours.

Introduces the structures, functions, and metabolism of amino acids, proteins, carbohydrates, lipids, and nucleic acids. Discusses the mechanisms of enzyme reactions, enzyme kinetics, vitamins, biological oxidation-reduction reactions, and bioenergetics, as well as various inborn errors of metabolism.

PHSC 2330. Immunology. 3 Hours.

Provides students with an understanding of the principles, mechanisms, organs, cells, and molecules of the innate and adaptive immunity. Monoclonal antibodies, organ transplant immunity, hypersensitivity, tolerance, tumor immunity, autoimmunity, and immunodeficiencies are discussed in light of potential therapeutic interventions. Weekly journal club-style presentation of related assigned topic is required.

PHSC 2400. Research Ethics for Beginning Health Scientists. 4 Hours.

Explores various dimensions of ethical research. Introduces ethical foundations and controversies that are central to understanding and developing appropriate ethical frameworks for engaging in research. Requires students to work collaboratively to carefully develop essential skills for ethical analysis and evaluation of professional code of conduct concerns.

PHSC 2650. Introduction to Health Science Research. 4 Hours.

Surveys research methods and topics relevant to health science research with the goal of engaging undergraduate students to commit to research training throughout at least one semester and possibly continuing throughout their undergraduate program. Exposes students to lectures addressing the benefits of a research experience and readings of original literature. Health science faculty from across the university present their lines of research focusing on projects that would be available to students. Seeks to familiarize students with use of the scientific method in addressing unsolved problems and to prepare them to select the most appropriate research laboratory to engage in research.

PHSC 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

PHSC 2991. Research in Pharmaceutical Science. 1-4 Hours.

Offers an opportunity to conduct introductory-level research or creative endeavors under faculty supervision.

PHSC 3411. Pharmaceutics 1. 4 Hours.

Develops an understanding of pharmaceutical dosage forms, with emphasis on solids, liquids, semisolids, parenterals, inhalation, and novel drug delivery systems. Combines the discussion of pharmaceutical products developed in industry and those compounded in local pharmacies. Focuses on application of mathematical principles and problem-solving skills in pharmaceutical compounding.

PHSC 3412. Pharmaceutics 2. 4 Hours.

Continues PHSC 3411. Examines the physical and chemical properties of the drug as it relates to pharmaceutical product development. Covers concepts of thermodynamics, colligative properties, ionic equilibria and buffers, solubility, complexation and protein binding, reaction kinetics, mass transport, interfacial phenomena and dispersion, and rheology.

PHSC 3419. Pharmaceutics Laboratory. 1 Hour.

Formulates pharmaceutical dosage forms such as powders, capsules, solutions, suspensions, emulsions, ointments, gels, creams, lotions, and suppositories, and tests the quality of the products in the lab using approved methods of analysis. Also provides an understanding of the physical and chemical properties of drugs as they relate to formulation development through experimental observation of dissolution, stability, and effects of pH and co-solvent on solubility of drugs.

PHSC 3430. Pharmacokinetics and Biopharmaceutics. 3 Hours.

Focuses on the basic principles and methods of biopharmaceutics and pharmacokinetics. Covers the kinetics of drug absorption, distribution, metabolism, and excretion; linear and nonlinear pharmacokinetics; general concept of one- and two-compartment models with instantaneous (i.v. bolus), zero order (i.v. infusion), or first order (oral administration or i.m. injection) input; evaluation of bioavailability and investigation of the factors affecting drug availability; influence of the route of administration, dosage form, and regimen on bioavailability of drugs; bioequivalence study; multiple dosing kinetics; general approaches to dosage adjustment in renal disease; noncompartmental analysis; and pharmacokinetic-pharmacodynamic modeling.

PHSC 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

PHSC 4340. Pharmacology for the Health Professions. 4 Hours.

Provides the fundamentals of pharmacology to students entering the health professions. Topics include the general principles of drug action, drug distribution, and drug elimination, with attention to the development of reasoning skills necessary to identify, avoid, and solve practical drug-related problems. Drugs are presented according to therapeutic or functional classification.

PHSC 4501. Pharmacology/Medicinal Chemistry 1. 5 Hours.

Introduces the principles and basic concepts of pharmacology and the general mechanisms of drug action including drug receptor interactions. Discusses the major drug classes affecting the peripheral autonomic and central nervous systems including anxiolytics, sedative-hypnotics, anesthetics, anticonvulsants, neuroleptics, antidepressants, and antimanic agents. Considers therapeutic uses, mechanisms of drug action, and undesirable actions including side effects and adverse reactions.

PHSC 4502. Pharmacology/Medicinal Chemistry 2. 5 Hours.

Continues PHSC 4501. Covers the mechanisms of action, structure-activity relationships, therapeutic uses, and adverse effects of drugs including cardiovascular agents, hormones, anticancer drugs, antibiotics, and antiinflammatory agents.

PHSC 4600. Pharmacy Capstone. 4 Hours.

Acts as a final integrator of the major, general education, and experiential aspects of the student's education. Expects students to demonstrate motivation and initiative and to work cooperatively with their faculty mentor, community partners, and fellow students (where applicable) in order to complete a comprehensive, high-quality scholarly work (e.g., a research project, educational project, administrative project, business plan, case report, or community-service learning project or professional manuscript) appropriate for dissemination to the university and professional community. The timeline for completion is set by the faculty mentor and agreed to by the individual or all members of the student group. May be repeated once.

PHSC 4850. Capstone for BS in Pharmaceutical Sciences. 4 Hours.

Designed to facilitate integration of major, general education, and experiential aspects of the individual student's program of study with a focused scientific research experience under the mentorship of a faculty member. Offers students an opportunity to develop a research question, perform data collection and analysis, and satisfactorily complete a quality research report (detailing background; methods; results; discussion, including relevance to their pharmaceutical science career development; and references), followed by participation in a seminar on their work presented to the Northeastern community. In addition, students are strongly encouraged to present their findings at local, regional, national, and international professional meetings. Requires approval of director of pharmaceutical sciences BS program.

PHSC 4970. Junior/Senior Honors Project 1. 4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student's major field. Combined with Junior/Senior Project 2 or college-defined equivalent for 8-credit honors project. May be repeated without limit.

PHSC 4971. Junior/Senior Honors Project 2. 4 Hours.

Focuses on second semester of in-depth project in which a student conducts research or produces a product related to the student's major field. May be repeated without limit.

PHSC 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

PHSC 4991. Research. 4 Hours.

Extends current knowledge or offers novel insights through faculty-directed and supervised individual undergraduate research or creative projects. The project must be designed in concert with and obtain formal prior approval from relevant faculty and program director. May be repeated without limit.

PHSC 4992. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

PHSC 4997. Senior Thesis. 4 Hours.

Offers students an opportunity to prepare an undergraduate thesis under faculty supervision.

PHSC 4998. Senior Thesis Continuation. 4 Hours.

Offers students an opportunity to execute a project as described in PHSC 4997, which involves laboratory work; skill development; and the ability to generate, analyze, and report valid and reproducible data with the highest level of honesty and integrity. Students write and defend a thesis project to a public audience that describes the scientific background and context of the research, the hypothesis tested, methods utilized, and experimental results obtained. The thesis also includes interpretation of data, its contribution to the field, and future directions for the research. Students are expected to demonstrate motivation and initiative and to develop skills necessary to work cooperatively with a faculty mentor and other lab personnel.

PHSC 5100. Concepts in Pharmaceutical Science. 2 Hours.

Introduces new students in the Pharmaceutical Science Graduate Program to important concepts in medicinal and combinatorial chemistry as they relate to drug discovery, and a brief overview of pharmacology, drug metabolism, pharmacokinetics, and toxicology. Also introduces the major drug receptor families and their signaling pathways.

PHSC 5102. Concepts in Pharmaceutical Science 2. 2 Hours.

Presents key concepts and challenges of drug design, development, and evaluation. Integrates the principles of drug design, development, and delivery in a discussion of both small-molecule formulations and biologics. Contextualizes the hallmarks along the path of preclinical drug design to clinical translation. Components of the course include Team-Based Learning (TBL) and professionalism. The TBL sessions offer students an opportunity to work on course-related team applications and include graded peer evaluations.

PHSC 5212. Research Skills and Ethics. 2 Hours.

Teaches students the basics of laboratory safety, safekeeping laboratory data, and the process of writing a grant proposal. Also, case studies explore the concepts of data distortion or fabrication, conflicts of interest, confidentiality, ethical aspects of peer review, and the attribution of credit in science.

PHSC 5300. Pharmaceutical Biochemistry. 2 Hours.

Offers students an opportunity to obtain an understanding of the principles of physiological chemistry. Focuses in-depth on the major topics of physiological chemistry, including general chemistry and biomolecules, peptide synthesis and protein structure, carbohydrates and nucleic acids, thermodynamics and kinetics of molecular interactions, and colloids and micelles. Relates biochemical information to the specific areas of pharmacology, pharmaceuticals, and drug discovery/development.

PHSC 5305. Professional Development for Pharmaceutical Sciences. 1 Hour.

Introduces and examines the goals, expectations, policies, and procedures of the Masters' in Pharmaceutical Sciences internship program and professionalism in the field. Discusses the role and involvement of internship employers. Offers students an opportunity to develop job search and career management skills; assess their workplace skills, interests, and values; discuss how those qualities impact career decisions; prepare a professional resumé; and learn proper interviewing techniques. Issues of ethics and professionalism are designed to inform students of issues they will face in the pharmaceutical field. Content of this course is geared to students' participation in the internship program and overall professional development in pharmaceutical sciences.

PHSC 5310. Cellular Physiology. 2 Hours.

Focuses in-depth on the major cellular physiological mechanisms, including physiology of the cell membrane, ion channels and transport phenomena, energy production, signal transduction, synapses, and physiological processes in the cytosol. Relates physiological information on the specific areas of pharmacology, pharmaceuticals, and drug discovery/development. Offers students an opportunity to obtain an understanding of the principles of cellular physiology.

PHSC 5360. Anti-Infectives. 4 Hours.

Reviews the structure and physiology of bacteria, fungi, and viruses and surveys significant organisms of medical importance. Introduces specific antibiotic, antifungal, and antiviral agents and classes of agents once a foundation of knowledge of the microorganisms that cause disease is established. Discusses concepts of pharmacology, pharmacokinetics, antimicrobial resistance, pharmacodynamics of antimicrobial agents, and spectra of activity.

PHSC 5400. Principles of Drug Design. 3 Hours.

Studies important aspects of drug discovery and development with a focus on drug design. Covers basic organic medicinal chemistry concepts and seeks to build students' skills in lead compound discovery, structure-activity relationship studies, and lead optimization strategies. Topics include the fundamentals of pharmacology, pharmacokinetics, and pharmacodynamics of therapeutic agents relevant to the drug-structure optimization. These skills often help develop a strong foundation in the concepts that govern the multidisciplinary process of drug discovery. Uses lectures and peer-reviewed seminar presentations to help students to incrementally increase their knowledge required to identify new, marketable therapeutic agents. Requires organic or medicinal chemistry at the undergraduate level.

PHSC 5500. Repurposing Drugs for Cancer Immunotherapies. 2 Hours.

Offers a multidisciplinary course targeted to students interested in recent advances in biomedical research, clinical practice, and personalized medicine as related to cancer immunotherapies. Describes current promises and disappointments with cancer immunotherapies and recent FDA drug approvals for personalized cancer therapies. Explains the role of immunological and physiological negative regulators of antitumor and tumor biology as needed. Explains underlying principles of immunology, biochemistry, genetics, and preclinical and clinical studies when introducing new concepts. Assigned detailed study of specific areas and discussion of assigned papers are designed to complement classroom material.

PHSC 5555. Pharmaceutical Toxicology. 3 Hours.

Covers fundamental concepts of toxicology and technical methods in toxicology along with comprehensive analysis of both in-vitro and in-vivo toxicity in drug discovery and development. Through lectures given by experts in various fields in toxicology on several topics required for specialized work in research, industrial, and clinical settings, offers students an opportunity to become familiar with methods and analyses including in-vitro and in-vivo toxicity assessments and toxicokinetic-toxicodynamic models and analyses. Includes mechanistic basis of toxicity, methods of toxicological analysis, and case studies pertinent to topics. Requires undergraduate physiology or biochemistry.

PHSC 5560. Nanotoxicity. 3 Hours.

Studies nanotoxicity, the adverse health effects of nanoparticles. Due to their small size, nanoparticles easily cross biological barriers, entering body fluids and cells. Nanoparticles toxicity may cause chronic and acute pathologies. Offers students an opportunity to develop and understand the principles of nanotoxicity. Focuses on mechanisms of cellular and organ damage by nanoparticles. Discusses ports of nanoparticle entry and detrimental effects upon blood, CNS, lungs, and GI system. Stresses mechanisms of intracellular degradation of nanoparticles and toxic effects of nanoparticles upon human cells and major organ systems. Reviews mechanisms of cellular and organ damage including oxidative stress, inflammation, and DNA, as well as toxic effects on nonmammalian cells.

PHSC 5976. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

PHSC 6210. Drug Design, Evaluation, and Development. 2 Hours.

Teaches students the concepts of using immunological, genomic, and proteomic techniques to find novel drug targets. Also introduces the concepts of drug targeting and dosage forms, in vivo/in vitro drug screening, and the importance of pharmacogenetics to explain variability in drug reactions.

PHSC 6212. Research Skills and Ethics. 1 Hour.

Teaches students the basics of laboratory safety, safekeeping laboratory data, and the process of writing a grant proposal. Also, case studies explore the concepts of data distortion or fabrication, conflicts of interest, confidentiality, ethical aspects of peer review, and the attribution of credit in science.

PHSC 6213. Ethical Problems in Health Sciences Research. 2 Hours.

Focuses on a series of cases that raise ethical and professional code of conduct concerns and engages with them collaboratively and carefully to develop essential skills for ethical analysis and evaluation. Scientific practice presents researchers and citizens with myriad ethical challenges. Engaging with those ethical challenges in ways that help yield the benefits of research while respecting ethical boundaries is furthered by not only understanding ethical frameworks but by carefully analyzing and evaluating ethical concerns in context.

PHSC 6214. Experimental Design and Biostatistics. 2 Hours.

Discusses fundamental principles of experimental design and statistical analysis, with emphasis on clinical research. Topics include descriptive statistics, hypothesis testing, analysis of variance, correlation, regression, chi-square test, and nonparametric methods.

PHSC 6216. Human Physiology and Pathophysiology. 2 Hours.

Introduces major topics in human physiology, emphasizing knowledge essential to health-related laboratory research. Topics include neurophysiology, immunology, cardiovascular, respiratory, renal, and gastrointestinal physiology and endocrinology.

PHSC 6218. Biomedical Chemical Analysis. 2 Hours.

Presents the modern reagents, techniques, and instrumentation used to analyze biological samples and purify their components (that is, drugs, metabolites, hormones, macromolecules, organelles, and cells) in health and disease. Emphasizes basic concepts and mechanisms at the chemical level, and applications to human samples.

PHSC 6222. The Chemistry and Biology of Drugs of Abuse. 2 Hours.

Provides an interdisciplinary introduction to substance abuse, including the medicinal chemistry and neurobiology of drugs that act through the opioid, dopamine, acetylcholine, and cannabinoid systems. Compares and contrasts neurochemical mechanisms that are common to many addictive agents and those that are specific to individual drug classes. Highlights the involvement of the brain dopamine system and differences and discusses similarities between the pharmacology of abused and therapeutic drugs, together with the development of medications for treating drug dependence. Includes lectures by experts on particular topics of their own recent research. Introduces students to key aspects of biological and chemical research as they pertain to drug abuse and its treatment.

PHSC 6224. Behavioral Pharmacology and Drug Discovery. 2 Hours.

Designed to prepare students to understand the advantages, shortcomings, and pitfalls of the use of live, behaving animals in drug discovery. Covers an in-depth analysis of ethical issues in animal research, as well as aspects of animal behavioral models, behavior and brain biochemistry, and methods of behavioral analysis. Specific topics include psychopharmacology; fear and anxiety; pain and stress; depression and reward; general arousal and tolerance; drug abuse and habitual behaviors. The ways in which animal behaviors can be described in a quantitative manner and the effects of medications and abused drugs quantified and related to human diseases and drug responses are an important component of the course.

PHSC 6235. Magnetic Resonance Imaging in Drug Discovery. 4 Hours.

Integrates physics, mathematics, and neuroscience, with the cutting-edge technology of magnetic resonance imaging (MRI), to address drug discovery in the treatment of neurodegenerative diseases. Involves a "virtual imaging lab" and "classroom" encouraging critical thinking and transdisciplinary learning skills. Offers students an opportunity to design their own experiments guided by knowledge of the literature, as well as technical and statistical limitations. The Center for Translational Neuroimaging (CTNI) at Northeastern houses a state-of-the-art 7.0 Tesla MR animal scanner. Students in the classroom can "take over" the console and run the experiment, setting parameters for anatomical and functional imaging protocols, and collect and analyze original imaging data for submission for publication in a peer-reviewed journal.

PHSC 6290. Biophysical Methods in Drug Discovery. 2 Hours.

Provides an interdisciplinary introduction to biophysical methods used in modern drug discovery, including hit generation and lead optimization. Emphasizes key experimental methods, including nuclear magnetic resonance (NMR) spectroscopy and X-ray crystallography, as well as computer modeling as applied to ligand- and structure-based drug design. Includes lectures by experts on related topics from their recent drug-discovery research. Presented under the auspices of the Center for Drug Discovery. Requires permission of instructor for students of junior or senior standing.

PHSC 6300. Pharmaceutical Science Seminar. 1 Hour.

Teaches students to evaluate critically the scientific literature in a journal club format. Several sections may be offered each semester to accommodate different specializations or interest groups. May be repeated without limit.

PHSC 6314. Special Topics of Pharmaceutical Science. 2 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

PHSC 6401. Pharmaceutical Science Internship. 1 Hour.

Offers an experiential component of the graduate curriculum that fosters professional development through internship in drug discovery, development, and/or regulatory affairs in a pharmaceutical or biotechnology company. Requires students to work in a company for a minimum of twenty hours per week. Offers students an opportunity to engage in pharmaceutical science research or to work in an environment outside the University but under the supervision of a faculty instructor. May be repeated up to three times.

PHSC 6760. Doctoral Pharmaceutical Science Research 1. 2 Hours.

Offers PhD research in preparation for thesis proposal.

PHSC 6761. Doctoral Pharmaceutical Science Research 2. 2 Hours.

Offers PhD research in preparation for thesis proposal.

PHSC 6810. Pharmaceutical Science Colloquium. 1 Hour.

Requires students to present one formal seminar on their research. This presentation is open to all those interested.

PHSC 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

PHSC 6964. Co-op Work Experience. 0 Hours.

Provides eligible students with an opportunity for work experience. May be repeated without limit.

PHSC 6984. Pharmaceutical Science Research. 2 Hours.

Offers students laboratory research under the guidance of an adviser. May be repeated once for up to 4 total credits.

PHSC 6990. Thesis. 2 Hours.

Offers research/experimental work for master's thesis. Students may register twice. May be repeated once.

PHSC 6996. Thesis Continuation. 0 Hours.

Offers continued registration while student completes master's thesis or other research project to meet the research requirement in pharmaceutical science.

PHSC 7010. Pharmaceutical Sciences Laboratory. 4 Hours.

Offers a hands-on graduate laboratory course that introduces students to the investigative approaches and laboratory methods used in contemporary pharmaceutical sciences research. Laboratory exercises have a practical relationship to essential techniques in modern drug discovery, drug targeting and delivery, and determining mechanisms of drug action. These exercises cover basic laboratory skills, the rationale for and application of standard laboratory methods, training in the use of equipment and techniques central to pharmaceutical sciences research, how to maintain a laboratory notebook, statistical analysis and interpretation of data, and how to present research results in technical laboratory reports.

PHSC 7020. Scientific Writing: Thesis Proposal. 2 Hours.

Presents the principles of writing a proposal based on the NIH R01 grant proposal template used by the department. Participants develop their own proposal in collaboration with their faculty advisor or the immediate project supervisor designated by their faculty advisor (the project principle investigator). Offers students an opportunity to meet with their own project principle investigators to develop content and map out the project aims and experimental design and to produce a revised draft of their thesis proposal. Each student must have initiated MS or PhD thesis research and have some preliminary data; PhD students must have passed their qualifying exam; MS students must petition the graduate committee in writing for permission to enroll.

PHSC 8940. Doctoral Training and Research. 1 Hour.

Intended to show full-time status for pharmaceutical science PhD students in the semester in which they are taking the comprehensive exam. In addition to successfully completing the comprehensive exam, students are expected to perform research in preparation for the doctoral proposal; the grade for this course documents successful performance.

PHSC 8986. Doctoral Full-Time Research. 0 Hours.

Expects student to conduct full-time research in an adviser's laboratory. May be repeated without limit.

PHSC 9000. Comprehensive Exam. 0 Hours.

Indicates successful completion of the doctoral comprehensive exam.

PHSC 9681. Doctoral Proposal. 2 Hours.

Offers preparation of PhD dissertation proposal and proposal defense before dissertation committee. Requires passing of comprehensive exam. May be repeated without limit.

PHSC 9990. Dissertation. 1-3 Hours.

Offers research/experimental work for PhD thesis. Students may register three times. May be repeated once.

PHSC 9996. Dissertation Continuation. 0 Hours.

Offers continuation of PhD dissertation research. May be repeated without limit.

Pharmaceutics (PMST)

Search PMST Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=PMST>)

PMST 6250. Advanced Physical Pharmacy. 2 Hours.

Covers the physical and chemical principles in drug formulation design, with emphasis on such topics as solutions of nonelectrolytes and electrolytes, ionic equilibria, drug complexation, reaction kinetics, mass transport, and interfacial phenomena.

PMST 6252. Pharmacokinetics and Drug Metabolism. 3 Hours.

Focuses on concepts of one- and two-compartment linear and nonlinear pharmacokinetics and compartmental modeling with plasma and/or urinary data. Discusses principles and methods of metabolic biotransformation and disposition of xenobiotics in biological system.

PMST 6254. Advanced Drug Delivery System. 3 Hours.

Examines in-depth the role of sustained, controlled, and site-specific delivery systems for drugs and genetic materials using polymeric systems, colloidal drug delivery systems, and vectors for gene therapy.

PMST 6258. Advanced Pharmacokinetics and Toxicology. 3 Hours.

Focuses on expanding prior basic pharmacokinetics to more advanced topics required for specialized work in research, clinical, and industrial settings. Using presentation and class participation, offers students an opportunity to become familiar with various analyses and modeling techniques, including compartmental/physiologic models, pharmacokinetic-pharmacodynamic analysis and modeling, and toxicokinetics/toxicodynamics. Requires prior completion of PMST 6252 or equivalent graduate pharmacokinetics course with calculus.

PMST 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

Pharmacology (PMCL)

Search PMCL Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=PMCL>)

PMCL 6260. Pharmacology 1. 2 Hours.

Surveys the chemical and pharmacological basis of the major classes of drugs and their use in the treatment of disease. Characteristics of drugs studied include indications, adverse reactions, contraindications, structure-activity relationships, metabolism, mechanism of action, and clinically significant interactions.

PMCL 6261. Pharmacology 2. 2 Hours.

Continues PMCL 6260, although in a format that is not contingent that PMCL 6260 precedes this course.

PMCL 6262. Receptor Pharmacology. 2 Hours.

Reviews receptors for drug substances and for endogenous ligands in a format that combines lecture presentations and discussion. Focuses on the evaluation of current literature. Covers techniques available to study receptors, various models for receptor-ligand interactions, stereochemical aspects of receptor interactions, receptor-mediated coupling mechanisms, and evaluation of several specific receptor systems.

PMCL 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

Pharmacy - Medicinal Chemistry - CPS (PMC)

Search PMC Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=PMC>)

PMC 6212. Clinical Drug Development Data Analysis: Concepts . 4 Hours.

Examines the process of planning, collecting, analyzing, and reporting data from drug development studies. Focuses on the goals of each phase (1-4) of the clinical drug development process and how to achieve these objectives within the confines of the FDA regulations and ICH guidelines. Covers requirements in other countries, including the UK Data Protection Act, issues related to the differences between the development of drugs for oncologic or AIDS indications compared to traditional drugs, cultural influences, current standards of therapy, the need for validated tools, and failure analyses.

PMC 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

Pharmacy Practice (PHMD)

Search PHMD Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=PHMD>)

PHMD 1000. College: An Introduction. 1 Hour.

Introduces the University, college, and health professions to enhance students' understanding of self and the decisions they make academically and socially as members of the University's diverse, multicultural community. Offers students an opportunity to engage in group activities and individual assignments along with active participation in a learning community to help them adjust to life on an urban campus, develop a better understanding of the learning process, acquire essential academic skills, and make connections with the faculty and students in the college.

PHMD 1001. Introduction to the Profession of Pharmacy. 1 Hour.

Introduces the profession of pharmacy. Addresses professionalism, pharmacists' responsibilities, and the education and training of pharmacists.

PHMD 1201. Introduction to Pharmacy Practice. 2.5 Hours.

Seeks to prepare pharmacy students for their first introductory pharmacy practice experience (IPPE)/co-op. Introduces students to the policies, procedures, and expectations of the Cooperative Education Program. Offers students an opportunity to develop the skills needed to be successful in the preparation, activity, and reflection components of the pharmacy co-op program; to prepare their first résumés; and to learn proper interviewing techniques. Exposes students to the various co-op opportunities available to them as well as potential career paths within the pharmacy profession. Covers workplace issues including diversity, sexual harassment, ethics, and confidence of information. Introduces students to the technical knowledge and skills required for their first pharmacy experiences in both community and institutional pharmacy practice and to drug information resources. Offers students an opportunity to develop basic communication skills to aid them in successful completion of their first IPPE.

PHMD 1202. Lab for PHMD 1201. 0.5 Hours.

Offers a laboratory course involving the learning of several skills needed for future patient-care experiences. Intended to supplement lecture content and provide practical reinforcement of concepts. Offers students an opportunity to apply knowledge learned in the classroom related to the appropriate and effective use of communication strategies and sterile techniques. Labs related to the learning of communication skills support a client-centered approach in assessing, adapting, and evaluating patient medication use needs. Specifically, students have an opportunity to learn and practice six core communication skills: (1) listening, (2) asking questions, (3) providing empathy, (4) understanding and managing confusion, (5) understanding and managing conflict, and (6) understanding and analyzing nonverbal behavior.

PHMD 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

PHMD 2000. Professional Development Co-op. 1 Hour.

Introduces the Bouvé Cooperative Education Program. Offers students an opportunity to develop job-search and career-management skills. Students perform assessments of their workplace skills, interests, and values and discuss how they impact personal career decisions. Offers students an opportunity to prepare a professional-style résumé, learn proper interviewing techniques, and gain an understanding of the opportunities available to them for co-op. Introduces career paths, choices, and career decision making. Familiarizes students with workplace issues relative to their field of study and presents the MyNEU COOL database in the job-search and referral process. Presents and discusses co-op policies, procedures, and expectations of the Bouvé Cooperative Education Program and co-op employers.

PHMD 2310. Professional Communication in Pharmacy Practice. 2 Hours.

Offers pharmacy students an opportunity to learn the principles for understanding, applying, evaluating, and creating successful verbal and nonverbal communication interactions in a variety of pharmacist and interprofessional settings. Through a patient-centered approach, reviews and builds on core communication skills learned in the foundational introduction to pharmacy practice courses. Topics include using effective communication approaches to detect and intervene to improve adherence, facilitate behavioral change, collaborate with other professionals, and tailor communication to special and culturally diverse patient populations.

PHMD 2311. Lab for PHMD 2310. 0.5 Hours.

Supplements lecture content from PHMD 2310. Designed to provide pharmacy students with several skills needed for future patient-care experiences and provide practical reinforcement of concepts. Students apply knowledge learned in the classroom related to the appropriate and effective use of communication strategies. Labs related to the learning of communication skills support a client-centered approach in assessing, adapting, and evaluating patient medication use needs. Specifically offers students an opportunity to learn and practice six core communication skills: listening, asking questions, providing empathy, understanding and managing confusion, understanding and managing conflict, and understanding and analyzing nonverbal behavior.

PHMD 2350. Healthcare Systems. 3 Hours.

Examines the evolution of the American healthcare delivery system from the early forms of organized institutional healthcare through the dynamic, and increasingly integrated, delivery systems of the present. Explores the interactions of regulatory, economic, political, and social aspects of the healthcare system with particular emphasis on pharmacy practices. Compares current policies and proposals for health reform and pharmacy benefit coverage. Analyzes the impact and consequences of national and international actions in one era on the structure, function, and outcomes of healthcare and professional pharmacy practice in later years. Major emphases include factors affecting American population health, health disparities, and strategies, including pharmacy/pharmacists, to improve the nation's health.

PHMD 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

PHMD 2991. Research in Pharmacy Practice. 1-4 Hours.

Offers an opportunity to conduct introductory-level research or creative endeavors under faculty supervision.

PHMD 3450. Research Methodology and Biostatistics. 3 Hours.

Offers an interactive course covering aspects of research designs used in experimental and observational studies, hypothesis testing, and an introduction to basic biostatistics. Offers students an opportunity to critically examine selected articles from the clinical literature, to analyze the framing of the research question and the methods used to insure the validity and generalizability of the study's findings, and to assess for potential ethical issues in research design and conduct. Clinical trials, observational studies, and problem sets illustrate principles of research design, conduct, and data analysis.

PHMD 3600. Leadership and Advocacy in Health Professions. 2 Hours.

Designed to help facilitate successful careers of young healthcare professionals and expand students' knowledge of their leadership potential. Consists primarily of topic discussions that include a variety of issues related to professional development, focusing on leadership, organizational and relational skills, and advocacy. Covers global issues in leadership and advocacy. Encourages students to recognize the need for leadership in health professions and the ability of practitioners to influence change regardless of whether they have a title or position of authority. Seeks to be valuable to students with interests in administrative positions in various settings, including in high-level clinical positions, and to students who plan to pursue postgraduate training.

PHMD 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

PHMD 4350. Exploring Academic Careers. 2 Hours.

Seeks to prepare pharmacy students to become more confident and effective as educators. Also seeks to increase the student's awareness of academic careers and the roles and responsibilities that faculty play in the class, department, and school of pharmacy. The knowledge, skills, and attitudes discussed and explored in this course are applicable across the profession of pharmacy regardless of practice setting. Restricted to students with fifth-year standing.

PHMD 4581. Cancer Chemotherapy. 2 Hours.

Emphasizes the role of chemotherapy in the management of malignant disease. Reviews specific antineoplastic agents, specific malignancies, and related topics. Focuses throughout the course on supportive care for the cancer patient.

PHMD 4585. Research Methods in Health Systems. 4 Hours.

Exposes students to the research methods that health system pharmacists use most often when conducting research and builds on the content of PHMD 2350, PHMD 3450, and PHMD 4560. Incorporates a seminar discussion format led by healthcare system-based pharmacists actively involved in clinical research and helps prepare students for careers or postgraduate training programs (e.g., residencies) in health systems. Faculty use published studies, live patient databases, and descriptions of their current research projects to illustrate the topics in each session.

PHMD 4611. Comprehensive Disease Management 1. 6 Hours.

Covers foundational concepts of pharmacy practice, including patient evaluation; identification of drug-related problems; pathophysiology; and clinical management of diseases of the respiratory, cardiovascular, and endocrine systems. Specifically covers asthma and COPD, hypertension, hyperlipidemia, diabetes, fluids/electrolytes, and renal disorders. Reviews, system-by-system, the mechanisms of these diseases and their evidence-based prevention and treatment strategies. Offers students an opportunity to apply scientific knowledge and principles of medicinal chemistry, pharmacology, pharmaceuticals, and pharmacokinetics to the design of rational, evidence-based therapeutic strategies to provide care to patients in inpatient, ambulatory, and community settings. Emphasizes pathophysiology, self-care, patient education, assessment, medication administration, management, monitoring, and preventative health and population-based health outcomes.

PHMD 4612. Comprehensive Disease Management 1 Seminar. 1 Hour.

Designed to provide students with opportunities to apply concepts from PHMD 4611 to patient cases, special projects, and other medication-related issues focusing on foundational aspects of pharmacy practice, identification of drug-related problems, and diseases of the respiratory, endocrine, cardiovascular, and renal systems. Accompanies PHMD 4611 and seeks to facilitate accomplishment of course objectives using an active learning format. While completing seminar work, students are expected to review, discuss, integrate, and apply information presented in comprehensive disease management lectures and readings as well as previous and concurrent course work.

PHMD 4621. Comprehensive Disease Management 2. 6 Hours.

Covers the pathophysiology and clinical management of diseases of the renal, cardiovascular, neurological, and gastrointestinal systems. Reinforces foundational concepts of pharmacy practice and diseases covered in PHMD 4611, while completing a system-by-system review of the mechanisms of renal, cardiovascular, neurological, and gastrointestinal disorders and their evidence-based prevention and treatment strategies. Offers students an opportunity to design rational therapeutic strategies to provide care to patients with these disease states in inpatient, ambulatory, and community settings. Emphasizes pathophysiology, self-care, patient education, assessment, medication administration, management, monitoring, and preventative health and population-based health outcomes.

PHMD 4622. Comprehensive Disease Management 2 Seminar. 1 Hour.

Designed to provide students with opportunities to apply concepts from PHMD 4621 to patient cases, special projects, and other medication-related issues focusing on foundational aspects of pharmacy practice; identification of drug-related problems; and diseases of the renal, cardiovascular, neurological, and gastrointestinal systems. Accompanies PHMD 4621 and seeks to facilitate accomplishment of course objectives using an active-learning format. While completing seminar work, students are expected to review, discuss, integrate, and apply information presented in comprehensive disease management lectures and readings as well as previous and concurrent course work. Activities in seminar are reinforced by laboratory skill-building exercises in PHMD 4623.

PHMD 4623. Comprehensive Disease Management 2 Skills Lab. 0.5 Hours.

Offers a self-paced, blended learning experience designed to provide the student with functional knowledge and skills in the area of physical assessment, patient education, and counseling in the ambulatory clinic and community pharmacy settings. Uses discussions, videos, podcasts, simulations, and hands-on learning activities in the lab. Offers students an opportunity to apply information gained in previous and concurrent courses to clinical situations. While completing laboratory work, students are expected to review, discuss, integrate, and apply information presented in the closely aligned PHMD 4621 and PHMD 4622 as well as previous and concurrent course work.

PHMD 4631. Comprehensive Disease Management 3. 6 Hours.

Covers the pathophysiology and clinical management of infectious diseases, solid organ transplant, dermatology, and otic/ophthalmic disorders. Reinforces foundational concepts of pharmacy practice and diseases covered in PHMD 4611 and PHMD 4612, while completing a system-by-system review of the mechanisms of infectious diseases and their evidence-based prevention and treatment strategies. Offers students an opportunity to design rational therapeutic strategies to provide care to patients with these disease states in inpatient, ambulatory, and community settings. Emphasizes pathophysiology, self-care, patient education, assessment, medication administration, management, monitoring, and preventative health and population-based health outcomes.

PHMD 4632. Comprehensive Disease Management 3 Seminar. 1 Hour.

Designed to provide students with opportunities to apply concepts from PHMD 4631 to patient cases, special projects, and other medication-related issues focusing on foundational aspects of pharmacy practice, identification of drug-related problems, and management of the infectious diseases and dermatologic and oral/otic disorders. Accompanies PHMD 4631 and seeks to facilitate accomplishment of course objectives using an active-learning format. While completing seminar work, students are expected to review, discuss, integrate, and apply information presented in comprehensive disease management lectures and readings as well as previous and concurrent course work. Activities in seminar are reinforced by laboratory skill-building exercises in PHMD 4633.

PHMD 4633. Comprehensive Disease Management 3 Skills Lab. 0.5 Hours.

Teaches and assesses various skills, including interpretation, processing, and verification of medication orders; detection and resolution of drug-related problems; use of current pharmacy software programs; and patient education and counseling in the community pharmacy setting. Uses discussions, videos, podcasts, simulations, and hands-on learning activities in the lab. While completing laboratory work, students are expected to review, discuss, integrate, and apply information presented in the closely aligned PHMD 4631 and PHMD 4632 as well as previous and concurrent course work.

PHMD 4641. Comprehensive Disease Management 4. 6 Hours.

Covers the pathophysiology and clinical management of men's and women's health issues and neurological, psychiatric, and oncologic disorders. Reinforces foundational concepts of pharmacy practice and diseases covered in PHMD 4611, PHMD 4612, and PHMD 4613, while completing a system-by-system review of the mechanisms of infectious diseases and their evidence-based prevention and treatment strategies. Offers students an opportunity to design rational therapeutic strategies to provide care to patients with these disease states in inpatient, ambulatory, and community settings. Emphasizes pathophysiology, self-care, patient education, assessment, medication administration, management, monitoring, and preventative health and population-based health outcomes.

PHMD 4642. Comprehensive Disease Management 4 Seminar. 1 Hour.

Designed to provide students with opportunities to apply concepts from PHMD 4641 to patient cases, special projects, and other medication-related issues focusing on foundational aspects of pharmacy practice, identification of drug-related problems, and management of women's and men's disease, psychological disorders, and cancers. Accompanies PHMD 4641 and seeks to facilitate accomplishment of course objectives using an active-learning format. While completing seminar work, students are expected to review, discuss, integrate, and apply information presented in comprehensive disease management lectures and readings as well as previous and concurrent course work. Activities in seminar are reinforced by laboratory skill-building exercises in PHMD 4643.

PHMD 4643. Comprehensive Disease Management 4 Skills Lab. 0.5 Hours.

Teaches and assesses various skills, including interpretation, processing, and verification of medication orders; detection and resolution of drug-related problems; use of current pharmacy software programs; medication reconciliation; presentation of hospitalized patients; and management of sterile compounding systems in the hospital pharmacy setting. Uses discussions, videos, podcasts, simulations, and hands-on learning activities in the lab. While completing laboratory work, students are expected to review, discuss, integrate, and apply information presented in the closely aligned PHMD 4641 and PHMD 4642 as well as previous and concurrent course work.

PHMD 4700. Principles in General Medicine. 2 Hours.

Offers students an opportunity to apply concepts learned in comprehensive-disease-management modules to patient cases, special projects, and other medication-related problems in an active-learning environment. Creates an environment similar to that of acute care advanced pharmacy practice experiences (APPEs) to enable students to gain familiarity and confidence in disease-state management, oral communication skills, and professional behavior and interactions. Focuses on oral presentations and communication skills, which is similar to how students are evaluated on clinically based rotations; students are also evaluated by quizzes and exams to measure mastery of content-specific objectives.

PHMD 4880. Special Topics. 2 Hours.

Explores topics germane to the use of medication as established by the course coordinator in various section offerings. May be repeated up to two times.

PHMD 4890. Contemporary Issues in Geriatric Pharmacy. 2 Hours.

Focuses on physiological and practical aspects of medication use in the elderly, the pharmacist's role in geriatric care, and the management of disease states and syndromes that predominantly occur in the elderly. Pharmacists must assess and assure safe and effective use of medication in the geriatric population to prevent adverse events that increase morbidity and mortality and reduce quality of life. Utilizes problem-based learning by promoting critical thinking, effective use of resources in research, and application of concepts to real-world situations.

PHMD 4970. Junior/Senior Honors Project 1. 4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student's major field. Combined with Junior/Senior Project 2 or college-defined equivalent for 8-credit honors project. May be repeated without limit.

PHMD 4971. Junior/Senior Honors Project 2. 4 Hours.

Focuses on second semester of in-depth project in which a student conducts research or produces a product related to the student's major field. May be repeated without limit.

PHMD 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

PHMD 4991. Research. 4 Hours.

Extends current knowledge or offers novel insights through faculty-directed and supervised individual undergraduate research or creative projects. The project must be designed in concert with and obtain formal prior approval from relevant faculty and program director. May be repeated without limit.

PHMD 4992. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

PHMD 5223. Evidence-Based Medicine. 2 Hours.

Studies the principles of evidence-based medicine and how to apply them to patient-centered care. Offers students an opportunity to develop skills in critical appraisal of the scientific literature and practical application of the evidence to clinical decision making. Consists of didactic instruction, in-class group projects, and a group-based written assignment. Applies principles of research methodology, biostatistics, and professional writing.

PHMD 5250. Pharmacy Care Management. 3 Hours.

Focuses on the managerial and administrative skills required by a contemporary pharmacist practicing in either a community or hospital setting. Covers classical management principles of planning, decision making, organizing, hiring, and controlling. Case study methods are used as an interactive teaching tool. Also covers pertinent current events.

PHMD 5270. Economic Evaluation of Pharmaceuticals and Pharmacy Practice. 2 Hours.

Introduces the principles of economic theory of healthcare markets and economic evaluation of health products and services. Economic theory topics include fundamentals of supply and demand, market structure, market failure, and the role of government. Economic evaluation topics include measuring costs and benefits of a specific treatment, types of formal decision analysis, ethical considerations, and implementation in the real world. Restricted to students with fifth-year PharmD standing.

PHMD 5330. Jurisprudence. 3 Hours.

Examines how federal and state regulatory bodies, statutes, laws, regulations, policies, guidance, and practice guides set the standard for the present-day practice of pharmacy.

PHMD 5438. Advanced Pharmacy Practice Experience Preparatory Seminar 1. 0.5 Hours.

Seeks to provide relevant information to enable fifth-year students to make informed decisions concerning the selection and completion of the advance pharmacy practice experiences (APPEs). Using the professional portfolio as a catalyst for exploration, students are required to examine and discuss the variety of APPEs offered. The review of APPE types includes utilizing effective strategies to identify appropriate APPE selections. Students are guided by faculty on how to make APPE selections based on student-identified professional career goals.

PHMD 5439. Advanced Pharmacy Practice Experience Preparatory Seminar 2. 0.5 Hours.

Designed to provide students with opportunities to apply concepts from PHMD 6438 and to continue to provide relevant information to enable fifth-year students to make informed decisions concerning the selection and completion of the advance pharmacy practice experiences (APPEs). Seeks to provide new knowledge and strengthen existing knowledge to ensure a smooth transition from the didactic courses to APPEs.

PHMD 5450. Advanced Pharmacy Practice Experience Preparatory Seminar. 1 Hour.

Offers students an opportunity to collect relevant information to make informed decisions concerning the selection of advanced pharmacy practice experiences (APPEs). Designed to provide new knowledge (e.g., what is expected of a P4 student) and to strengthen existing knowledge (e.g., from didactic courses) to offer a smooth transition from the didactic courses to APPEs.

PHMD 5575. Pharmaceutical Industry. 2 Hours.

Offers a global overview of pharmaceutical industry career options and pathways. Focuses on all major functions of the industry, such as clinical research and medical affairs. Additional areas covered include regulatory affairs, health economic and outcomes research, marketing, sales, scientific liaisons, and pharmacovigilance. Explores the phases of drug development and how these phases interact with different departments.

PHMD 5600. Pharmacy Capstone. 4 Hours.

Acts as a final integrator of the major, general education, and experiential aspects of the student's education. Expects students to demonstrate motivation and initiative and to work cooperatively with their faculty mentor, community partners, and fellow students (where applicable) in order to complete a comprehensive, high-quality scholarly work (e.g., a research project, educational project, administrative project, business plan, case report, or community-service learning project or professional manuscript) appropriate for dissemination to the university and professional community. The timeline for completion is set by the faculty mentor and agreed to by the individual or all members of the student group. May be repeated once.

PHMD 5675. Ambulatory Care Pharmacy Practice in Urban Health. 2 Hours.

Introduces various aspects of ambulatory care pharmacy practice and social, economic, cultural, and psychological intricacies. Covers chronic disease management and prevention and wellness. Offers students an opportunity to gain insight into the pharmacist's role as part of a patient-centered medical home model and/or an interdisciplinary primary care team, with an emphasis on urban health.

PHMD 5880. Special Topics. 2,3 Hours.

Explores topics germane to medication and medication use, as established by the course instructor.

PHMD 5900. Self-Care and Nonprescription Medications: A Team-Based Approach. 2 Hours.

Focuses on the clinical use, safety, and efficacy of common nonprescription medications and complementary alternatives (vitamins, minerals, supplements, herbals, etc.) used in the outpatient setting to treat minor medical problems. Pharmacists are often approached by members of the community to recommend treatments for common ailments. It is important for pharmacists to quickly and accurately assess patients to determine if they are candidates for self-care or if a referral to another healthcare provider is warranted. Offers students an opportunity to develop the necessary skills to determine if self-care treatment is an option for patients and to make appropriate self-care and nonprescription product selection recommendations based on the assessment of a patient's health status, medical problems, and current practice of self-treatment through case-based examples.

PHMD 5976. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated for up to 4 total credits.

PHMD 5984. Research. 1-4 Hours.

Offers an opportunity to conduct research under faculty supervision. May be repeated without limit.

PHMD 6440. Internal Medicine Advanced Pharmacy Practice Experience. 6 Hours.

Applies principles of pathophysiology, therapeutics, and communication to the pharmacy-care management of individual patients in the hospital setting. In collaboration with other members of the healthcare team, and under the supervision of a clinical preceptor, offers identification of appropriate drug therapy and monitoring requirements for common pathophysiologic processes, and, when indicated, modification of population-based treatment strategies based on the unique characteristics of individual patients.

PHMD 6441. Acute Care Advanced Pharmacy Practice Experience. 6 Hours.

Applies principles of pathophysiology, therapeutics, and communication to the pharmacy-care management of individual patients. In collaboration with other members of the healthcare team, and under the supervision of a clinical preceptor, offers identification of appropriate drug therapy and monitoring requirements for common pathophysiologic processes, and, when indicated, modification of population-based treatment strategies based on the unique characteristics of individual patients.

PHMD 6442. Ambulatory Care Advanced Pharmacy Practice Experience. 6 Hours.

Applies principles of pathophysiology, therapeutics, and communication to the pharmacy-care management of individual patients in an ambulatory clinic environment. In collaboration with other members of the healthcare team, and under the supervision of a clinical preceptor, offers identification of appropriate drug therapy and monitoring requirements for common pathophysiologic processes, and, when indicated, modification of population-based treatment strategies based on the unique characteristics of individual patients.

PHMD 6443. Community Advanced Pharmacy Practice Experience. 6 Hours.

Applies principles of pathophysiology, therapeutics, and communication to the pharmacy-care management of individual patients in a community setting. In collaboration with other members of the healthcare team, and under the supervision of a clinical preceptor, offers identification of appropriate drug therapy and monitoring requirements for common pathophysiologic processes, and, when indicated, modification of population-based treatment strategies based on the unique characteristics of individual patients.

PHMD 6445. Ambulatory Care Elective Advanced Pharmacy Practice Experience. 6 Hours.

Applies principles of pathophysiology, therapeutics, and communication to the pharmacy-care management of individual patients in an ambulatory clinic environment. In collaboration with other members of the healthcare team, and under the supervision of a clinical preceptor, offers identification of appropriate drug therapy and monitoring requirements for common pathophysiologic processes, and, when indicated, modification of population-based treatment strategies based on the unique characteristics of individual patients. May be repeated without limit.

PHMD 6446. Psychiatry Advanced Pharmacy Practice Experience. 6 Hours.

Applies principles of pathophysiology, therapeutics, and communication to the pharmacy-care management of individual patients under psychiatric care. In collaboration with other members of the healthcare team, and under the supervision of a clinical preceptor, offers identification of appropriate drug therapy and monitoring requirements for common pathophysiologic processes, and, when indicated, modification of population-based treatment strategies based on the unique characteristics of individual patients. May be repeated without limit.

PHMD 6447. Community Elective Advanced Pharmacy Practice Experience. 6 Hours.

Applies principles of pathophysiology, therapeutics, and communication to the pharmacy-care management of individual patients in a community setting. In collaboration with other members of the healthcare team, and under the supervision of a clinical preceptor, offers identification of appropriate drug therapy and monitoring requirements for common pathophysiologic processes, and, when indicated, modification of population-based treatment strategies based on the unique characteristics of individual patients. May be repeated without limit.

PHMD 6448. Long Term Care Advanced Pharmacy Practice Experience. 6 Hours.

Applies principles of pathophysiology, therapeutics, and communication to the pharmacy-care management of individual patients in a nursing home or rehabilitation center. Under the supervision of a clinical preceptor and, when appropriate, in conjunction with other members of the healthcare team, offers identification of appropriate drug therapy and monitoring requirements for common pathophysiologic processes, and, when indicated, modification of population-based treatment strategies based on the unique characteristics of individual patients. May be repeated without limit.

PHMD 6449. Geriatrics Advanced Pharmacy Practice Experience. 6 Hours.

Applies principles of pathophysiology, therapeutics, and communication to the pharmacy-care management of individual patients in a geriatric practice setting. Under the supervision of a clinical preceptor, and, when appropriate, in conjunction with other members of the healthcare team, offers identification of appropriate drug therapy and monitoring requirements for common pathophysiologic processes, and, when indicated, modification of population-based treatment strategies based on the unique characteristics of individual patients. May be repeated without limit.

PHMD 6450. Pediatrics Advanced Pharmacy Practice Experience. 6 Hours.

Applies principles of pathophysiology, therapeutics, and communication to the pharmacy-care management of individual patients in a pediatric practice setting. Under the supervision of a clinical preceptor, and, when appropriate, in conjunction with other members of the healthcare team, offers identification of appropriate drug therapy and monitoring requirements for common pathophysiologic processes, and, when indicated, modification of population-based treatment strategies based on the unique characteristics of individual patients. May be repeated without limit.

PHMD 6451. Neonatology Advanced Pharmacy Practice Experience. 6 Hours.

Applies principles of pathophysiology, therapeutics, and communication to the pharmacy-care management of individual patients in a neonatal practice setting. Under the supervision of a clinical preceptor, and, when appropriate, in conjunction with other members of the healthcare team, offers identification of appropriate drug therapy and monitoring requirements for common pathophysiologic processes, and, when indicated, modification of population-based treatment strategies based on the unique characteristics of individual patients. May be repeated without limit.

PHMD 6452. Critical Care Advanced Pharmacy Practice Experience. 6 Hours.

Applies principles of pathophysiology, therapeutics, and communication to the pharmacy-care management of individual patients in a critical-care practice setting. Under the supervision of a clinical preceptor, and, when appropriate, in conjunction with other members of the healthcare team, offers identification of appropriate drug therapy and monitoring requirements for common pathophysiologic processes, and, when indicated, modification of population-based treatment strategies based on the unique characteristics of individual patients. May be repeated without limit.

PHMD 6453. Surgery Advanced Pharmacy Practice Experience. 6 Hours.

Applies principles of pathophysiology, therapeutics, and communication to the pharmacy-care management of individual patients in a surgical practice setting. Under the supervision of a clinical preceptor, and, when appropriate, in conjunction with other members of the healthcare team, offers identification of appropriate drug therapy and monitoring requirements for common pathophysiologic processes, and, when indicated, modification of population-based treatment strategies based on the unique characteristics of individual patients. May be repeated without limit.

PHMD 6454. Cardiology Advanced Pharmacy Practice Experience. 6 Hours.

Applies principles of pathophysiology, therapeutics, and communication to the pharmacy-care management of individual patients in a cardiology practice setting. Under the supervision of a clinical preceptor, and, when appropriate, in conjunction with other members of the healthcare team, offers identification of appropriate drug therapy and monitoring requirements for common pathophysiologic processes, and, when indicated, modification of population-based treatment strategies based on the unique characteristics of individual patients. May be repeated without limit.

PHMD 6456. Drug Information Advanced Pharmacy Practice Experience. 6 Hours.

Applies drug information skills to site-specific drug information requests under the supervision of a clinical preceptor, and, when appropriate, in conjunction with other members of the site team. Using appropriate sources, the student analyzes drug information findings, such as dosing, monitoring, indications, efficacy, and adverse drug reactions. May be repeated without limit.

PHMD 6457. Oncology Advanced Pharmacy Practice Experience. 6 Hours.

Applies principles of pathophysiology, therapeutics, and communication to the pharmacy-care management of individual patients in an oncology practice setting. Under the supervision of a clinical preceptor, and, when appropriate, in conjunction with other members of the healthcare team, offers identification of appropriate drug therapy and monitoring requirements for common pathophysiologic processes, and, when indicated, modification of population-based treatment strategies based on the unique characteristics of individual patients. May be repeated without limit.

PHMD 6461. Infectious Disease Advanced Pharmacy Practice Experience. 6 Hours.

Applies principles of pathophysiology, therapeutics, and communication to the pharmacy-care management of individual patients on an infectious disease consult service. Under the supervision of a clinical preceptor, and, when appropriate, in conjunction with other members of the healthcare team, offers identification of appropriate drug therapy and monitoring requirements for common pathophysiologic processes, and, when indicated, modification of population-based treatment strategies based on the unique characteristics of individual patients. May be repeated without limit.

PHMD 6462. Pharmacy Industry Advanced Pharmacy Practice Experience. 6 Hours.

Focuses on the application of regulatory affairs and healthcare principles in the pharmaceutical industry. Under the supervision of a preceptor, and, when appropriate, in conjunction with other members of the site team, participates in appropriate activities, such as drug research and development, marketing, medical affairs, regulatory affairs, and information service. May be repeated without limit.

PHMD 6463. Pharmacy Administration Advanced Pharmacy Practice Experience. 6 Hours.

Applies healthcare and management principles, with emphasis on pharmacy administration, under the supervision of a preceptor, and, when appropriate, in conjunction with other members of the site team. May be repeated without limit.

PHMD 6464. Regulatory Advanced Pharmacy Practice Experience. 6 Hours.

Participates in appropriate activities including but not limited to principles of and compliance with pharmacy law and review of regulations governing the FDA's mandatory reporting of adverse drug reactions under the supervision of a preceptor, and, when appropriate, in conjunction with other members of the site team. In addition, students may have the opportunity to be given a step-by-step introduction to public record laws, Board Regulations at 247 CMR, and pharmacy statutes at Massachusetts General Laws, Chapter 112, 24(A)–42(A). May be repeated without limit.

PHMD 6465. Managed Care Advanced Pharmacy Practice Experience. 6 Hours.

Applies principles of pathophysiology, therapeutics, and communication to the pharmacy-care management of individual patients in a managed-care practice setting. Under the supervision of a clinical preceptor, and, when appropriate, in conjunction with other members of the healthcare team, offers identification of appropriate drug therapy and monitoring requirements for common pathophysiologic processes, and, when indicated, modification of population-based treatment strategies based on the unique characteristics of individual patients. May be repeated without limit.

PHMD 6466. Transplantation Advanced Pharmacy Practice Experience. 6 Hours.

Applies principles of pathophysiology, therapeutics, and communication to the pharmacy-care management of individual patients in a transplantation unit. Under the supervision of a clinical preceptor, and, when appropriate, in conjunction with other members of the healthcare team, offers identification of appropriate drug therapy and monitoring requirements for common pathophysiologic processes, and, when indicated, modification of population-based treatment strategies based on the unique characteristics of individual patients. May be repeated without limit.

PHMD 6467. Directed Practice Advanced Pharmacy Practice Experience. 6 Hours.

Offers nontraditional experience with an approved preceptor at an appropriate site. Based on availability. May be repeated without limit.

PHMD 6468. International Advanced Pharmacy Practice Experience. 6 Hours.

Provides an international experience with an approved preceptor at an appropriate site. Based on availability. May be repeated without limit.

PHMD 6469. Management Advanced Pharmacy Practice Experience. 6 Hours.

Offers students an opportunity to apply healthcare and management principles, with an emphasis on pharmacy management, under the supervision of a preceptor and, when appropriate, in conjunction with other members of the site management team. May be repeated up to two times.

PHMD 6470. Education Advanced Pharmacy Practice Experience. 6 Hours.

Offers students an opportunity to teach in the pharmacy curriculum under the supervision of a faculty member. Students have an opportunity to examine how teachers use experience-based and problem-based approaches to engage the range of student learners (third- through fifth-year pharmacy students) to attain their learning goals. May be repeated up to two times.

PHMD 6471. Research 1 Advanced Pharmacy Practice Experience. 6 Hours.

Offers students interested in gaining basic or clinical research experience an opportunity to work under the direction of an experienced researcher at an appropriate site. Students can elect either a basic science (lab-based) preceptor or a clinical (patient-based) preceptor. Students can expect to be an active participant in a variety of different research activities and experiences that are deemed appropriate by the preceptor. The research efforts of the student may result in a peer-reviewed research abstract and/or presentation. May be repeated up to two times.

PHMD 6472. Research 2 Advanced Pharmacy Practice Experience. 6 Hours.

Offers students an opportunity to further develop research skills and experience gained in PHMD 6471. Intended for those students interested in pursuing a postgraduate research training program (e.g., fellowship or graduate school). The research efforts of the student in the course may result in authorship opportunities on a peer-reviewed research abstract and/or manuscript. May be repeated up to two times.

PHMD 6473. Radiopharmacy Advanced Pharmacy Practice Experience. 6 Hours.

Offers students an opportunity to examine the application of radiopharmaceuticals in medical imaging methods. Includes but is not limited to computed tomography (CT), magnetic resonance imaging (MRI), positron emission tomography (PET), and single-photon tomography (SPECT). Students completing this course may cover aspects of product preparation, administration, and data interpretation. May be repeated up to two times.

PHMD 6474. Public Health Advanced Pharmacy Practice Experience. 6 Hours.

Offers students an opportunity to apply knowledge of public health and policy skills to site-specific needs to advance pharmacy practice within the health system. Seeks to increase knowledge in the principles of public health, with opportunities to work on program implementation and evaluation, policy formation, public health research, and participate in planning and administrative meetings within the public health environment. Offers each student an opportunity to participate as a member of a team to complete group and individual assignments. May be repeated up to two times.

PHMD 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

PHMD 6964. Co-op Work Experience. 0 Hours.

Provides eligible students with an opportunity for work experience. May be repeated without limit.

PhD Experiential Leadership (PHDL)

Search PHDL Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=PHDL>)

PHDL 7600. Leading Self and Others. 4 Hours.

Inculcates students with knowledge, self-awareness, skills, and attitudes to effectively influence others, to lead teams, and to be productive team members by leading from the middle. Requires engagement with an outside organization to scope a project with organizational value that is complementary to the PhD dissertation requiring the PhD student to move out of their comfort zones. At completion of this course, successful students should demonstrate the ability to influence others in leading teams and producing reliable and practical value to a sponsoring organization; appropriately apply methods in defining clear objectives, desired outcomes, and identifying and addressing customer needs in solving problems requiring breadth and depth in scientific and technical realms; and articulate the purpose, goals, and milestones of their Experiential PhD Leadership Challenge project. Requires acceptance into the Experiential PhD Leadership Certificate program.

PHDL 7660. Experiential PhD Challenge Project 1. 4 Hours.

Offers PhD students an opportunity to use research expertise in an authentic setting and with authentic consequences to develop and present a plan for the demonstration of an organizational challenge. This challenge can consist of a technology solution, a policy analysis with recommendations, or a review of organizational processes that involve higher-order critical thinking. Requires engagement and training with a sponsoring organization to improve a process, assess opportunity, or propose a solution that is of significant value to the organization and demonstrates a measurable impact while enhancing the PhD student's PhD education and intellectual agility while fostering leadership development. Requires acceptance into the Experiential PhD Leadership Certificate program.

PHDL 7662. Experiential PhD Challenge Project 2. 4 Hours.

Continues PHDL 7660. Offers an authentic experience in an authentic setting to develop and present a plan for the demonstration of an organizational challenge and produce a written documentary report on the project to the satisfaction of an advising committee. Requires engagement and training with a sponsoring organization to improve a process and assess opportunity or a proposal solution that is of significant value to the organization and demonstrates a measurable impact while enhancing the PhD student's PhD education and intellectual agility while fostering leadership development. Requires acceptance into the Experiential PhD Leadership Certificate program.

PHDL 7666. Contextual Integration. 0 Hours.

Reflects on the manifestation of leadership styles, power and influence, and situational leadership observed through the Leadership Challenge. While executing the Challenge Project, students complete a series of self-directed modules providing opportunities for learning, growth, and interaction within their sponsoring organization. Modules include organizational leadership, leadership characteristics, developing project management skills, challenges to enhance leadership skills, report on experience and accomplishments, impact of academic research groups on external world, and vice versa. At the completion of their project and modules, students reflect on their development and accomplishments as part of a formal presentation to program faculty and fellow students. This presentation is available for incorporation into the student's PhD defense, and the accompanying report becomes a chapter in the student's dissertation. Requires acceptance into the Experiential PhD Leadership Certificate program. .

Philosophy (PHIL)

Search PHIL Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=PHIL>)

PHIL 1000. Philosophy at Northeastern. 1 Hour.

Intended for freshmen in the College of Social Sciences and Humanities. Introduces freshmen to the liberal arts in general; familiarizes them with their major; helps them develop the academic skills necessary to succeed (analytical ability and critical thinking); provides grounding in the culture and values of the University community; and helps them develop interpersonal skills—in short, familiarizes students with all skills needed to become a successful university student.

PHIL 1101. Introduction to Philosophy. 4 Hours.

Introduces students to philosophy by acquainting them with the theories and arguments of classical and contemporary philosophers and by teaching skills of constructing and analyzing arguments. Emphasizes philosophical inquiry. Topics include the basis of morality, free will vs. determinism, the existence of God, the problem of suffering, and the nature of knowledge.

PHIL 1102. Introduction to Contemporary Moral Issues. 4 Hours.

Focuses on current controversial issues and moral debates. Specific topics vary but include subjects like abortion, euthanasia, global poverty, economic justice, affirmative action, gender relations, animal rights, the environment, the death penalty, war, cloning, and same-sex marriage. Offers an opportunity to learn to apply both the methods of philosophical analysis and various ethical and political theories to these controversies.

PHIL 1104. Goddesses, Witches, Saints, and Sinners: Women in Western Religions. 4 Hours.

Introduces and examines the theory that Western religions were originally goddess centered through analyses of image, text, and ritual in the ancient world. Explores scholarship about the patriarchalization of these primal religions. Includes a consideration of scripture such as the Hebrew Bible, Greek Testament, and Qu'ran, as well as noncanonical texts. PHIL 1104 and WMNS 1104 are cross-listed.

PHIL 1105. Science and Pseudoscience. 4 Hours.

Examines the distinction between science and pseudoscience, how scientific theories change over time, the limits of scientific explanation, and whether or not scientific practice is rational and objective. What makes a theory scientific? Does culture influence scientific reasoning? What separates Einstein's theory of relativity and astrological horoscopes? Covers a variety of topics in the history of science such as the Copernican revolution and the practice of psychoanalysis. Also covers contemporary issues regarding the scientific status of IQ tests, intelligent design theory, and others.

PHIL 1110. Introduction to Religion. 4 Hours.

Examines the methods, disciplines, and theories employed in the academic study of religion. Focuses on major theories of religion employed in the discipline of religious studies, including historical, psychological, anthropological, and sociological approaches. Introduces students to the primary methods of research in the academic study of religion.

PHIL 1111. Introduction to World Religions. 4 Hours.

Offers a historical and thematic overview of the most widely recognized religions in the world today: Christianity, Judaism, Islam, Hinduism, and Buddhism. Focuses on the formative periods and historical developments of the great religions, ritual practices, and the differing ways in which they answer the fundamental religious questions. Considers ways in which religious practitioners have attempted to understand the nature of the world, human society, and a person's place within them.

PHIL 1112. Debating Ethical Controversies. 4 Hours.

Introduces students to the fundamentals of moral theory; ethical reasoning; social and political philosophy; as well as theories of social, political, and institutional change. Emphasizes in-depth ethical analysis and evaluation of the issues studied, their social and historical sources and context, as well as the way in which responses to them can and should lead to institutional and policy changes. Offers students an opportunity to be selected for an off-campus competitive debate experience. This course is modeled after the Intercollegiate Ethics Bowl debates on current social and ethical issues. .

PHIL 1115. Introduction to Logic. 4 Hours.

Covers the fundamentals of (formal) deductive and inductive logic. Begins with a thorough treatment of Boolean (i.e., truth-functional or propositional) logic, which provides the foundation for both mathematical and statistical reasoning. Discusses various applications of Boolean logic, including the reconstruction and evaluation of (natural language) deductive arguments. Covers inductive-logical reasoning, such as the fundamentals of the probability calculus and its applications to inductive (ampliative) inference. Offers students an opportunity to understand both deductive (e.g., mathematical) and inductive (e.g., statistical) reasoning.

PHIL 1120. Understanding the Bible. 4 Hours.

Introduces students to the Old and New Testaments, so that they may enter into a dialogue with the Bible, understanding not only what it says, but why it is said that way. To do this, discussion focuses on the Bible's social, political and cultural backgrounds.

PHIL 1130. Ethics: East and West. 4 Hours.

Focuses on how traditions imagine the moral life in cross-cultural contexts. Topics may include ideals of human flourishing, notions of virtue and vice, and conceptions of self and community. Offers students an opportunity to learn methods of philosophical analysis and argumentation in cross-cultural contexts.

PHIL 1145. Technology and Human Values. 4 Hours.

Studies philosophy of technology, as well as ethics and modern technology. Considers the relationship between technology and humanity, the social dimensions of technology, and ethical issues raised by emerging technologies. Discusses emerging technologies such as biotechnology, information technology, nanotechnology, and virtual reality.

PHIL 1160. Introduction to Economic Justice. 4 Hours.

Attempts to answer the questions: What is economic justice? What are the criteria by which we tell whether a society is (or is not) an economically just society? Looks at views on these issues developed by advocates of capitalism, socialism, and the welfare state.

PHIL 1162. Ethics and Philosophy through Sport. 4 Hours.

Introduces issues in ethics, epistemology, and metaphysics through sports. Each topic consists of a case study from the domain of sports in which an ethical or philosophical issue arises, paired with a classical or contemporary reading on the issue. Thus, this course uses examples from sport that exemplify core philosophical topics that arise as well in domains beyond sport. Studies justice and fairness, ability and disability, conceptual clarity/definition, individual vs. collective welfare, social goods, punishment, animal welfare, and the rationality of group identification. Uses data analysis, prediction models, and rational expectations in sports to illustrate several central issues in epistemology, including the problem of induction, counterfactual reasoning, decision theory, and game theory.

PHIL 1165. Moral and Social Problems in Healthcare. 4 Hours.

Introduces ethical theories and moral principles, and then uses these theories and principles to analyze the moral problems that arise in the medical context. Topics include euthanasia, medical paternalism, informed consent, patient confidentiality, the right to die, the ethics of medical research, abortion, the right to healthcare, distribution of scarce medical resources, and the ethical implications of health maintenance organizations.

PHIL 1170. Business Ethics. 4 Hours.

Examines ethical principles and considerations involved in making moral business decisions. Studies basic ethical viewpoints as a foundation; analyzes specific characteristics of business life through case studies and examples. Topics include corporate responsibility, employee rights, conflict of interest and roles, advertising and information disclosure, environmental issues, and self- and governmental regulations.

PHIL 1180. Environmental Ethics. 4 Hours.

Focuses on a current ecological crisis and addresses the values that underlie our concern over this crisis, whether the values at issue are anthropocentric or biocentric. Explores the ethical implications these ecological concerns have for our individual lifestyles, and for our role as members of communities.

PHIL 1185. The Ethics of Food. 4 Hours.

Introduces the ethics of food. Elucidates a wide range of ethical issues associated with food production, processing, distribution, and consumption. Offers students an opportunity to develop skills in ethics and values analysis that can be applied to evaluate food-related practices and policies. Includes topics such as the ethics of different food systems, genetically modified crops, meat eating, hunting, food security, food justice, sustainability, synthetic meat, food advertising, food safety, and foodie culture.

PHIL 1195. Research Ethics. 4 Hours.

Addresses how to engage in scientific, medical, and technological research in an ethically responsible manner. Research is crucial to understanding social, environmental, and health problems, as well as to developing effective responses to them. If the paradigm of responsible research is too restrictive, the benefits of scientific progress and technological innovation can be delayed or unrealized. At the same time, researchers have a responsibility to protect research subjects, to appropriately engage with members of the community, and to avoid behaving in ways that undermine scientific research in the long run. Explores the many ethical dimensions of research, and introduces students to the ethical foundations and controversies that are central to developing appropriate ethical frameworks for engaging in research.

PHIL 1220. The Meaning of Death. 4 Hours.

Offers an inquiry into different philosophical and religious perspectives on death and life after death, including an examination of some powerful contemporary accounts of personal confrontation with death along with investigations into attitudes toward death in other traditions (for example, Hinduism and Buddhism).

PHIL 1260. Apocalypticism in Film. 4 Hours.

Begins with an investigation of biblical texts that give rise to apocalypticism, definitions of apocalypticism, and an introductory exploration of the various ways in which apocalypticism has manifested itself in Western culture. Examines the diverse and changing presentation of apocalypticism in film and includes titles such as 'The Book of Eli,' 'The Day the Earth Stood Still,' 'Independence Day,' 'The Seventh Seal,' and 'Blade Runner'.

PHIL 1270. Judaism, Christianity, and Islam: Abrahamic Religions. 4 Hours.

Introduces the three major religious traditions: Judaism, Christianity, and Islam, sometimes called "Abrahamic traditions," as they all claim a special relationship with the biblical figure Abraham. Explores the foundation narratives, doctrines, rituals, and ethics of these three traditions, independently and in relation to each other. Focuses on how these traditions adapted to specific cultural and historical contexts. Offers students firsthand experience of the complex issues involved in the academic study of religion in comparative context.

PHIL 1271. Sex in Judaism, Christianity, and Islam. 4 Hours.

Explores approaches to gender, social organization of sexuality and gender, sexual ethics, and marriage in Judaism, Christianity, and Islam. Explores various sources within each tradition that serve as normative foundations, contemporary cultural and sociological dynamics that challenge those foundations, and psychological/existential considerations for understanding the general nature of human sexuality. Addresses how these traditions understand gender and gender roles, seek to shape and control interactions between men and women, regulate sexual relations outside of and within marriage, view sexuality education, regard homosexuality, and examine historical and contemporary approaches to marriage, divorce, and parenting. PHIL 1271 and WMNS 1271 are cross-listed.

PHIL 1272. Ethics in the World's Religions. 4 Hours.

Examines the ethical systems emerging from various religions. Includes Eastern religions with an emphasis on the Abrahamic religions (Judaism, Christianity, and Islam) and the different stances taken within the branches of each religion. Explores, for example, different perspectives among various types of Christianity, Islam, and Judaism. Examines the religious ethics of various indigenous peoples, Native Americans, Australian Aborigines, Maori, and some of the African peoples.

PHIL 1275. Hinduism, Buddhism, and Beyond: Eastern Religions. 4 Hours.

Examines Hinduism, Jainism, Theravada Buddhism, Mahayana Buddhism, Confucianism, Taoism, and Shinto within South Asia (India) and east Asia (China and Japan). Combines readings in primary source materials (the religious texts of these traditions) with secondary examinations of the historical and doctrinal developments within each tradition and region. This course intends to give students a context in which to examine the ways in which religions develop in interlocking sociocultural and political contexts and to provide a grounding in the lived experiences of these religious traditions.

PHIL 1280. Encountering Islam: Traditions, Debates, and Crosscultural Diversity. 4 Hours.

Explores Islam through its foundations narrative, rituals, doctrines, and ethical teachings. Presents Islam in terms of its diversity by focusing on a series of key debates in Islamic thought and practice from its early history to the present day in cross-cultural perspectives.

PHIL 1285. Jewish Religion and Culture. 4 Hours.

Explores the basic features of Judaism in the ancient, rabbinic, and modern periods. Employs an historical critical approach to the formative texts and their interpreters. Analyzes Jewish practices within specific historical contexts and discusses the ways in which practices relate to the texts and history of Judaism. Examines the rich varieties of Jewish cultural expressions. JWSS 1285 and PHIL 1285 are cross-listed.

PHIL 1290. Chinese Philosophy and Religion. 4 Hours.

Surveys the origins and development of the indigenous religious traditions of China, from the oracle bone divinations of the Shang Dynasty to the philosophical and religious traditions of Confucianism, Mohism, Yangism, Daoism, and Legalism. Identifies and elucidates those elements of ancient Chinese thought that have had the most lasting influence on the Chinese ethos and worldview. Studies the foundational texts of ancient China and also examines the relevant practices that helped to define the various traditions of thought. Focuses on how religious and philosophical ideas influenced the larger culture of Chinese life in regard to the arts, medicine, the social order, and government.

PHIL 1295. Religious Perspectives on Health and Healing. 4 Hours.

Explores aspects of the historical, religious, and cultural context for contemporary alternatives in healthcare, beginning with an examination of several examples of traditional healing practices and their accompanying religious and philosophical views about human life. Explores this "holistic" tradition in two frames of reference: the ascendancy of scientific rationalism over religion; and the takeover, by male-dominated professions, of healing functions that society has traditionally assigned to women (that is, the rise of obstetrics and the suppression of midwifery). Emphasizes major women healers of the nineteenth century. Includes some contemporary efforts at integration of scientific and traditional values in the modern healthcare system.

PHIL 1410. From Vodou and the Rastas to Afro-Islam: African Religions in the Americas. 4 Hours.

Explores the religions of Africa as they express themselves in the Americas in various Christian forms; in new religions such as Vodou, Santeria, and the Rastafari; and unique forms of Islam, Judaism, and Christianity. Begins by exploring indigenous African religions, then traces the forced transplanted of those religions and the way in which new religions emerge from the combination, or syncretism, of African symbols and belief and the forms of Christianity that existed in the New World when Africans arrived. To examine these religious traditions, the course draws on the methodology of comparative religion to explore the theory, practice, and symbol systems of the religions of Africa and the African Diaspora in the New World.

PHIL 1666. The Problem of Evil in Film. 4 Hours.

Seeks to answer the question, what is evil? Uses a variety of film genres to examine the definitions of evil in relation to concepts such as power, sin, hate, greed, envy, murder, neglect, fear, terror, tragedy, and 'the Other.' Studies the problem of evil from the perspectives of religious studies and philosophy. Examines the various explanations for evil from a variety of Western religious traditions and explores the presentation of ethical dilemmas and moral theory to assess the content of a variety of films. Studies film titles such as 'The Dark Knight,' 'The Exorcist,' 'Frankenstein,' 'Dr. Strangelove,' 'Star Wars,' and 'The Wizard of Oz.'

PHIL 1667. Science Fiction and Film: Moral Dilemmas and Ethical Analysis. 4 Hours.

Explores how science fiction films function as mythical cautionary tales about moral dilemmas of the twentieth and twenty-first centuries and as projections about how these dilemmas may be resolved or continue in the future. Provides a framework for an ethical analysis and examines how themes such as manifest destiny, nationalism, utopia, good vs. evil, war, and concepts of "the Other" are presented in classic and contemporary film. Also shows how science fiction film sometimes reinterprets pre-existing stories from world cultures and world religious traditions, updating earlier moral dilemmas to the contemporary situation.

PHIL 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

PHIL 2001. Ethics and Evolutionary Games. 4 Hours.

Surveys the basic ideas and principles from evolutionary game theory and how they can be applied to philosophical questions about ethical and social norms. Investigates how cooperation evolves and is maintained; where our sense of fairness comes from and how it affects the way we interact with others; why individuals are altruistic; and whether there is a rational basis for our most basic social norms. Basic ethical norms can involve cooperation, altruism, mutual aid, fairness, coordination, and communication. Evolution and game theory, the formal study of social interaction, have recently been applied to these areas in order to better understand how these norms can arise naturally. Prior completion of PHIL 1115, PHIL 1215, or the NU Core requirement for mathematical/analytical thinking level 1 recommended.

PHIL 2016. The Philosophy and Ethics of Lying and Deception. 4 Hours.

Examines lying and other forms of deception in a wide range of modern contexts from advertising to politics, using different theoretical approaches. Offers students an opportunity to use philosophical theories and methodologies to investigate what lying is, why people lie, when and why it is wrong to lie, and how we can learn from what other people say despite all of this lying. In modern society, we are confronted with lies, spin, half-truths, fake news, and even “BS” on a daily basis. Since these forms of deception play such a central role in human life, many philosophers—including Plato, Augustine, and Kant—have studied the ontology, ethics, epistemology, economics, and logic of lying and deception.

PHIL 2050. Information and Uncertainty. 4 Hours.

Introduces the foundations of probabilistic inference, information theory, and their uses for drawing conclusions from noisy data. Applications include diagnosing diseases with inconclusive medical tests, locating autonomous vehicles when sensors are imperfect, and how best to make inferences with incomplete or partial information. Central topics include distinguishing deductive and probabilistic inference, philosophical interpretations of probability, fundamental justifications for the rules of probability, and key concepts of information theory. Introduces analytic and mathematical methods of analysis in these cases and contemporary computational (i.e., programming) techniques for implementing and applying theories of information and probabilistic inference.

PHIL 2100. The Religious Worlds of Boston: Faith and Devotion in Urban Life. 4 Hours.

Examines the nature of religion and religious life in Boston, emphasizing the lived experience of the sacred in an urban setting. Offers students an opportunity to develop research methods based in ethnography, the analysis of texts, and the interpretation of material culture. Readings include works in the method and theory of religious studies, the practice of ethnography, and case studies of lived religion, especially those that focus on urban religion. Expects students to engage in fieldwork in Boston, examining the implicit religious dimensions of everyday life and particular religious communities. Assignments include field reports, analysis of the religious landscape of Boston, and a research paper on a designated religious community. Requires prior completion of one introductory-level course in the social sciences or humanities.

PHIL 2143. Philosophy for Children. 4 Hours.

Explores big questions in philosophy—how should one conduct oneself, what does it mean to know something, are there object values in an aesthetic domain such as art? Offers students an opportunity to learn methodologies and tools of philosophical inquiry and apply them to works of children’s literature in order to be able to facilitate philosophical discussions in the elementary school classroom. Emphasizes creating a community of inquiry and learning how to devise and communicate different answers to philosophical questions at the elementary level. Students develop lesson plans to help engage young children in philosophical discussion and reflection.

PHIL 2301. Philosophical Problems of Law and Justice. 4 Hours.

Focuses on general questions about the law: What is the nature and proper scope of the law? How should the law be enforced and are there alternatives to punishment? How can laws be properly interpreted? Examples of legal controversies are related to the theories studied.

PHIL 2302. Philosophical Problems of War and Peace. 4 Hours.

Concentrates on ethical and philosophical issues about war and peace. Focuses on the nature and justification of war, moral questions about tactics in war, ideas for avoiding war, concepts of and strategies for attaining peace, and the morality of relations between nations.

PHIL 2303. Social and Political Philosophy. 4 Hours.

Focuses on basic questions about the nature of the state and the relationship of individuals to the state. What basis is there for individuals to obey the laws of the state? What conditions must a government meet to be legitimate? What justification can be given for democratic forms of government? Also examines what sorts of controls the state should exert over citizens, and what benefits citizens have a right to expect from the state. Includes readings from both classical and contemporary sources. Not open to freshmen students.

PHIL 2322. Responses to the Holocaust. 4 Hours.

Explores the variety of responses to the mass death brought on by the Holocaust. Examines the responses of theology, and literature, as well as relevant ethical issues. Requires prior completion of one philosophy course.

PHIL 2325. Ancient Philosophy and Political Thought. 4 Hours.

Examines the philosophers of classical Greece, primarily Socrates, Plato, and Aristotle. These philosophers examined the nature of the material world, of the city, and of the person. The course takes up both the moral and political writings as well as the metaphysical writings. Devotes considerable attention to major works such as Plato’s *Republic*. Some time is given to early Greek philosophers, to the Sophists, and to later developments. Requires written analysis of philosophical texts. PHIL 2325 and POLS 2325 are cross-listed.

PHIL 2330. Modern Philosophy. 4 Hours.

Focuses on the hundred years between 1650 and 1750, sometimes called “the century of genius.” It was a period in which philosophers reacted to the new scientific discoveries of Copernicus, Kepler, and Galileo. Out of this reaction came new ways of thinking about the nature of knowledge and the nature of reality. Focuses on such major figures as the rationalists Descartes, Leibniz, and Spinoza, and the empiricists Locke, Berkeley, and Hume. Requires prior completion of one philosophy course.

PHIL 2395. Japanese Buddhism. 4 Hours.

Surveys the major forms of Japanese Buddhism, from the earliest transmission of Buddhism to the maturation of Buddhist thought and practice during the Kamakura and Muromachi periods. Focuses not only on the major schools and figures of each period but also the ways in which Buddhism influenced and shaped Japanese culture. Examines, in particular, the formative influence of Buddhism on Japanese aesthetic sensibilities, samurai culture, and ritual. Focuses thematically on the religious practices that defined each school and how those practices were incorporated into a holistic religious vision.

PHIL 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

PHIL 3000. Interdisciplinary Approaches to Understanding and Solving Contemporary Issues. 4 Hours.

Trains students in interdisciplinary use of the tools of the three disciplines constituting the PPE major: Philosophy, Political Science and Economics. Through guest lectures, discipline specific research, course lecture and discussion, and a service learning opportunity that accompanies the duration of the course, students are exposed to the evaluative process through the lens of each of the disciplines that comprise the PPE major. Facilitates both an appreciation for each discipline and the value of their combination with respect to the evaluation and solution of a social issue.

PHIL 3333. Intercollegiate Ethics Bowl Competition. 1 Hour.

Offers students an opportunity to participate as members of Northeastern's Ethics or Bioethics Bowl team. Students work with their teammates in preparing for regional and national competitions. Preparation includes devising novel arguments for each competition's cases and weekly meetings with teammates leading up to the competition where students polish their arguments, rebuttals, and questions. Culminates with the option of traveling and participating in a regional and possible national debate competition. .

PHIL 3343. Existentialism. 4 Hours.

Examines existentialist philosophy in its greatest representatives, such as Kierkegaard, Nietzsche, Heidegger, Camus, and Sartre. Focuses on central themes including self-alienation, inauthenticity, authenticity, and existential experiences. Requires prior completion of two philosophy courses.

PHIL 3435. Moral Philosophy. 4 Hours.

Explores two basic questions: What sorts of things are good or bad? What actions are right or wrong? Covers major philosophical theories about the nature of morality—whether it is relative or absolute, whether it accords or conflicts with self-interest. Such classic theories as utilitarianism and Kant are examined as well as contemporary developments and debates. Requires prior completion of two philosophy courses.

PHIL 3460. Philosophy and Literature. 4 Hours.

Provides the student the opportunity to learn to recognize, appreciate, and criticize philosophical themes in literature. Includes readings from acknowledged classics by philosophical authors. Requires prior completion of two philosophy courses.

PHIL 3500. Sexuality, Gender, and the Law. 4 Hours.

Examines the legal regulation of gender and sexuality. Investigates concrete legal cases to study the history of constitutional interpretation and the current status of rights for women and sexual minorities. Focuses on important theoretical issues emerging in the writings of diverse feminist and queer legal scholars. Addresses debates over the value of conventional equality approaches in legal doctrine; equality vs. difference perspectives; ways in which legal language constructs gender and sexuality; the incorporation of sexuality and gender in ideologies of law; and the intersections of gender, sexuality, and race in legal doctrine and legal theory. PHIL 3500, POLS 3500, and WMNS 3500 are cross-listed.

PHIL 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

PHIL 4390. Cults and Sects. 4 Hours.

Offers an examination of the varieties of religious experience from the perspectives of sociology and psychology of religion. Focuses on such cultic and sectarian groups as Christian Science, the American Shakers, the Unification Church, the Hare Krishna movement, and the Black Muslims. Provides students the opportunity to acquire critical investigative tools with which to analyze different religious expressions. Requires prior completion of three philosophy courses or permission of instructor.

PHIL 4393. Asian Religions in the United States. 4 Hours.

Examines challenges from Americans to Asian religions and from Asians to the American interpretations of Asian religions. Asian religions in the United States include two basic groups of believers. The first are the immigrant communities and their children who retain their religion and reinterpret this tradition in the North American setting. The second group are American converts to Asian religions who recreate the traditions to answer their needs. While no religion is static, the movement of a tradition to a new land always involves a certain amount of reinterpretation. Also explores some of the challenges of a study such as this class.

PHIL 4395. Ramayana. 4 Hours.

Examines the Ramayana, the story of Ram, Lakshmana, Sita, and Hanuman—from Ram's exile and Sita's abduction to the victorious battle to recapture her—one of the world's great epics and a central religious story for Hindus. Explores the classical Sanskrit Ramayana, regional variants, subverted interpretations, and pop culture representations. From Sanskrit text recitation to ritual dance-drama performances, from comic books and a television series to Hindu nationalist politics, the Ramayana has provided a ground for debates about what it means to be a good king, what it means to be a good person, and also what it means to be Hindu. All texts are read in English. Prior knowledge about Hinduism would be very useful.

PHIL 4500. Theory of Knowledge. 4 Hours.

Focuses on questions about the nature and justification of claims to knowledge. Is there genuine knowledge? How do we tell when a belief or theory is sufficiently justified to count as knowledge? Discusses theories such as various forms of rationalism, empiricism, and skepticism. Requires careful reading of works by such influential thinkers as René Descartes, Bertrand Russell, A. J. Ayer, and T. S. Kuhn. Requires prior completion of three philosophy courses.

PHIL 4510. Philosophy of Science. 4 Hours.

Focuses on the nature of scientific method, scientific theories, and scientific explanations. Examines the central question of why science is thought to provide the most reliable account of the nature of reality. Requires prior completion of three philosophy courses (PHIL 1115 or PHIL 1215 recommended) or permission of instructor.

PHIL 4515. Advanced Logic. 4 Hours.

Studies the major results in the metatheory of first-order logic. Examines consistency, completeness, and decidability. Discusses the general notion of an effectively computable process, Church's thesis, and the existence of unsolvable problems.

PHIL 4535. Philosophy of Mind. 4 Hours.

Seeks to show what puzzles and problems result from an honest attempt to answer these questions in a reasonable way: What is the relation between mind and body? Is the mental merely a function of bodily process and behavior, or does it somehow exist "over and above" the material? How are self-knowledge and knowledge of other minds achieved, and what is the relation between words and thoughts? Examines classical sources, such as Descartes and Locke, and contemporary sources, such as Wittgenstein and Putnam. Also seeks to arrive at some answers—however tentative or provisional—to these questions. Constantly challenges students to think and write well about these difficult subjects. Requires prior completion of three philosophy courses or permission of instructor.

PHIL 4545. Religion and Politics in South Asia. 4 Hours.

Analyzes how to think critically both about the ways religion is presented to us and the connections we make between political movements and religious groups. Explores questions such as: What could it mean for politics to be religious and for religions to be political? Are “religious conflicts” essentially religious? What is the relationship between socioeconomic movements and religion? Do religions take the blame for political movements? Focuses on two South Asian communal conflicts that are couched in terms of religious identity: the Hindu-Muslim conflicts and Hindu-Sikh conflicts. Uses primary and secondary sources to study these conflicts to analyze the workings of religious rhetoric and political rhetoric about religions.

PHIL 4547. Seminar: Apocalypticism. 4 Hours.

Designed to explore Jewish and Christian apocalypticism from the time it bursts onto the scene c. 165 BCE through its contemporary popular expressions. Begins with an in-depth look at the biblical materials contained in Daniel and Revelation, explores apocryphal and pseudepigraphal texts, and examines millenarian and messianic expectations in their historical perspectives. Requires prior completion of three philosophy courses or permission of instructor.

PHIL 4550. Philosophy of Economics. 4 Hours.

Explores the philosophy behind economics. Surveys central ideas in the foundations of economics and formal methods in economics, including utility theory, rational choice theory, game theory, and social choice. Explores applications of economic modeling to institutions, markets, and social interactions. Examines the philosophical significance of economic inquiry, including fact/value distinctions, the ideal of economic rationality, the nature of economic modeling, and the place of economics among the sciences. Requires prior completion of at least three philosophy and/or economics courses.

PHIL 4606. Seminar: Theories and Methods in Religious Studies. 4 Hours.

Focuses on the history of the study of religion as it developed during the nineteenth and twentieth centuries. Examines readings from a wide range of foundational thinkers and contemporary scholarship to illustrate the roots of religious studies and the state of the field today. Designed to simultaneously acknowledge the interdisciplinary nature of religious studies by asking students to read in several methodological schools while allowing each student to pursue a particular school in more depth. Includes theorists from anthropology, comparative method, cultural studies, hermeneutics, history of religions, mythology, phenomenology, philosophy of religion, ritual and performance studies, sociology, psychology, and visual theology. Offers an opportunity for students to see the ways religious studies methodologies speak to each other and how they might be used to examine particular religious phenomena. Requires prior completion of 16 SH of philosophy and religion.

PHIL 4901. Topics in Philosophy Seminar. 4 Hours.

Focuses on one specific problem or issue in philosophy. Topics vary, and students may register for the course more than once. Requires prior completion of three philosophy courses. May be repeated without limit.

PHIL 4903. Seminar in Religion. 4 Hours.

Examines topics including theodicy, cosmogony, contemporary issues in religion, and comparative ethics. Topics vary, and students may register for the course more than once. Requires prior completion of three philosophy or religion courses. May be repeated without limit.

PHIL 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

PHIL 4992. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

PHIL 4994. Internship. 4 Hours.

Offers an opportunity for an internship. May be repeated without limit.

PHIL 5001. Global Justice. 4 Hours.

Explores the theoretical, political, and philosophical foundations of the obligations that underlie global justice. Theoretical approaches include human rights, human capabilities, cosmopolitanism, particularism, and universalism. Examines nationalism and the particular set of obligations that it generates. Following the theoretical component, the course considers social issues that arise in a global context: (1) the duties to the distant poor, (2) global philanthropy and problems of donee accountability, (3) global health and essential medicines and issues in environmental justice, and (4) issues in international law.

PHIL 5002. Ethics and Public Policy. 4 Hours.

Offers students from multiple disciplines an opportunity to obtain training in basic methodology in analytic ethics and political philosophy. Focuses on the intersection of ethical analysis and policy evaluation. Organized around different policy areas, such as energy production and distribution, urban planning, healthcare provision, criminal justice, and artificial intelligence. Engages broad issues involving the relationship between ethics and public policy, as well as the scope and limits of legitimate government authority. Looks at specific policies and policy domains and offers students multiple theoretical frameworks for approaching ethical questions embedded in those policy areas. .

PHIL 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

Philosophy - CPS (PHL)

Search PHL Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=PHL>)

PHL 1100. Social and Political Philosophy. 3 Hours.

Examines theories of social change, social institutions, and major contemporary political theories. Asks general questions, such as what constitutes a good state, what actions are right or wrong, and explores differing answers to those questions. Contrasts Immanuel Kant's view that actions are intrinsically moral to John Stuart Mill's theory that the end result determines the rightness or wrongness of an act. Includes material from social theorists such as Paley, Nietzsche, B. F. Skinner, and Ayer.

PHL 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

PHL 2100. Business Ethics. 3 Hours.

Focuses on basic ethical viewpoints as a foundation and examines specific characteristics of business life through cases and examples. The fact that there is not one universal set of behaviors one considers ethical and no guidelines to follow to determine ethical behavior poses unique challenges to managers today. Yet, managers are daily faced with situations where individual values may conflict with those of teams or organizations. Explores topics such as corporate responsibility and conflict of interest, employee rights, and advertising and information disclosure.

PHL 2120. Ethical Issues in Communication. 3 Hours.

Examines ethical issues in communication. Discusses how ethical choices affect communication to internal and external audiences, management transparency, strategic ambiguity, and employee privacy.

PHL 2130. Ethical Issues in Healthcare. 3 Hours.

Considers biomedical, clinical, social, and legal issues related to ethical issues and integrates such considerations into ethical decision making. Emphasizes the concepts of do no harm, quality of life, and conflict resolution. Other topics include patients' rights and the protection of their confidentiality, privacy, and personal prerogatives. Explores case studies and readings to assess the presence of ethical considerations.

PHL 2140. Ethical Issues in Science and Engineering. 3 Hours.

Examines ethical principles and considerations involved in making moral decisions. Analyzes specific examples in medicine, science and engineering through case studies and readings.

PHL 2310. Symbolic Logic. 3 Hours.

Introduces propositional and first-order quantification logic. Offers students an opportunity to evaluate the status of logical formulas and arguments, to create examples and counterexamples, and to construct both informal and formal proofs.

PHL 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

PHL 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

PHL 4955. Project. 1-4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student's major field. May be repeated without limit.

PHL 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

Philosophy - CPS Specialty (PHLS)

Search PHLS Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=PHLS>)

PHLS 1101. Introduction to Philosophy. 4 Hours.

Introduces students to philosophy by acquainting them with the theories and arguments of classical and contemporary philosophers and by teaching skills of constructing and analyzing arguments. Emphasizes philosophical inquiry. Topics include the basis of morality, free will vs. determinism, the existence of God, the problem of suffering, and the nature of knowledge.

PHLS 1145. Technology and Human Values. 4 Hours.

Examines the changing values of the modern, technologically advanced world. Attempts to increase our understanding of the supposed breach between the literary and scientific cultures, the diverse approaches towards their reconciliation, and the human dimensions of science and technology. Topics include the neutrality of technology with respect to good or evil uses, technology as an instrument for human liberation, and the issue of proper and effective modes of controlling technology in today's world.

Philosophy - Religious Studies (RELS)

Search RELS Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=RELS>)

RELS 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

RELS 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

RELS 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

RELS 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions.

Physical Education - CPS (PHE)

Search PHE Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=PHE>)

PHE 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

Physical Therapy (PT)

Search PT Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=PT>)

PT 1000. College: An Introduction. 1 Hour.

Provides an introduction to the University, college, and health professions to enhance students' understanding of self and the decisions they make academically and socially as members of the University's diverse, multicultural community. Group activities and individual assignments along with active participation in a learning community help students adjust to life on an urban campus, develop a better understanding of the learning process, acquire essential academic skills, and make connections with the faculty and students in the college.

PT 1880. Introduction to Sports Medicine. 4 Hours.

Offers an introductory course intended for students interested in sports, coaching, medicine, and exercise. Exposes students to the field of sports medicine. Emphasizes orthopedic anatomy, exercise principles, and a basic introduction to prevention of injury and illness related to athletes. Includes a cadaveric lab and lectures.

PT 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

PT 2000. Professional Development Co-op. 1 Hour.

Introduces the Bouvé Cooperative Education Program. Offers students an opportunity to develop job-search and career-management skills. Students perform assessments of their workplace skills, interests, and values and discuss how they impact personal career decisions. Offers students an opportunity to prepare a professional-style résumé, learn proper interviewing techniques, and gain an understanding of the opportunities available to them for co-op. Introduces career paths, choices, and career decision making. Familiarizes students with workplace issues relative to their field of study and presents the MyNEU COOL database in the job-search and referral process. Presents and discusses co-op policies, procedures, and expectations of the Bouvé Cooperative Education Program and co-op employers.

PT 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

PT 2991. Research in Physical Therapy. 1-4 Hours.

Offers an opportunity to conduct introductory-level research or creative endeavors under faculty supervision.

PT 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

PT 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

PT 4992. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

PT 4996. Experiential Education Directed Study. 1-4 Hours.

Draws upon the student's approved experiential activity and integrates it with study in the academic major. Restricted to those students who are using it to fulfill their experiential education requirement. May be repeated without limit.

PT 5010. Human Gross Anatomy. 4 Hours.

Covers the structure and function of the human body with emphasis on the skeletal, muscular, digestive, cardiopulmonary, and peripheral nervous systems. Uses a regional and systemic approach to explore the details of the limbs, thorax, abdomen, and pelvic regions of the body. Considers clinical application of these systems' basic abnormalities of structure and function. Corequisite labs provide hands-on exploration of the human body utilizing cadaveric specimens.

PT 5011. Lab for PT 5010. 1 Hour.

Covers the structure and function of the appendicular and axial skeletal systems of the body through prosected human cadavers and osteology. Emphasizes the skeletal, muscular, digestive, cardiopulmonary and peripheral nervous systems.

PT 5101. Foundations of Physical Therapy. 3 Hours.

Designed to provide a basic practical understanding of patient care procedures used in physical therapy practice. Covers body mechanics, therapeutic positioning, patient ambulation, transfer techniques, soft tissue mobilization, and documentation. Offers the learner an opportunity to obtain the information needed to use therapeutic modalities in a variety of clinical settings. Introduces physical therapy students to professional behaviors.

PT 5102. Lab for PT 5101. 1 Hour.

Accompanies PT 5101. Covers topics from the course through various experiments.

PT 5111. Professional Development for Bouvé Graduate Co-op. 1 Hour.

Introduces graduate students to the Bouvé Cooperative Education Program and offers an opportunity to develop job-search and career-management skills. Students perform assessments of their workplace skills, interests, and values and discuss how they impact personal career decisions. Offers students an opportunity to prepare a professional-style résumé, learn proper interviewing techniques, and gain an understanding of the opportunities available to them for co-op. Introduces career paths, choices, and career decision making. Seeks to familiarize students with workplace issues relative to their field of study and to teach them to use myNEU COOL database in the job-search and referral process. Presents and discusses co-op policies, procedures, and expectations of the Bouvé Cooperative Education Program and co-op employers.

PT 5131. Gross Anatomy. 4 Hours.

Covers the structure and function of the human body with particular emphasis on the skeletal, muscular, nervous, and cardiovascular systems and clinical application to these systems. Considers basic abnormalities of structure and function. Involves lectures, cadaver prosection, osteology, and surface anatomy labs.

PT 5132. Lab for PT 5131. 1 Hour.

Accompanies PT 5131. Covers topics from the course through various activities.

PT 5133. Kinesiology. 3 Hours.

Studies normal movement through the analysis of muscle and joint function. Introduces fundamental examples of pathokinesiology, aberrant motions, and postures. Emphasizes analysis of the major joints and regions of the body as related to the field of physical therapy, including aspects of gait analysis. Encourages critical thinking and integrates material learned in prior course work, including, but not limited to, anatomy and physiology.

PT 5134. Lab for PT 5133. 1 Hour.

Offers students an opportunity to measure skills of goniometry and manual muscle testing to assess joint mobility and muscle performance. Also covers assessment of posture and gait. Integrated with PT 5133 and builds upon the foundation of gross anatomy.

PT 5138. Neuroscience. 4 Hours.

Covers the structure and physiological function of the human nervous system with emphasis on the clinical aspects of motor and somatosensory systems. Studies the anatomy of the brain, brain stem, and spinal cord in specimens and on slides and integrated with the basic physiology of motor and sensory systems. The application of neuroscience to clinical neurological cases is a foundation of this course.

PT 5139. Lab for PT 5138. 1 Hour.

Accompanies PT 5138. Covers topics from the course through various experiments.

PT 5140. Pathology. 4 Hours.

Covers foundational knowledge of pathological processes of major body systems. Addresses general medicine, laboratory medicine, and pathophysiology as related to patient conditions that impact physical therapy management. Case-based discussion allows for integration of pathology and pharmacology content.

PT 5145. Introduction to the Healthcare System. 2 Hours.

Offers students an opportunity to obtain the foundation to understand and appreciate the framework of the U.S. healthcare system. Compares other selected global healthcare systems. Examines historical events, policy changes, and current issues that impact the delivery of healthcare services.

PT 5150. Motor Control, Development, and Learning. 4 Hours.

Covers three broad areas—motor control, motor development, and motor learning. Examines neural, behavioral, and physical mechanisms that contribute to the control of movement in humans. Focuses on motor control in healthy persons, with some discussion of alterations associated with musculoskeletal and neural impairment. Addresses motor development and maturation from intrauterine life through old age (senescence). Considers the interaction of body-system development and growth on acquisition of and changes in typical skill development. Examines factors that influence the learning of new motor skills (motor learning) as a result of practice.

PT 5151. Lab for PT 5150. 1 Hour.

Offers students an opportunity to apply knowledge gained in PT 5150 to activities designed to illustrate various principles and concepts related to motor control, motor development, and motor learning. Uses a series of guiding questions/activities in each laboratory and analyzes associated literature to offer students an opportunity to apply class concepts to healthy individuals and to those with clinical problems related to motor control, motor development, or motor learning.

PT 5160. Psychosocial Aspects of Healthcare. 3 Hours.

Examines interpersonal relationships among patients, families, health professionals, and society, with reference to the impact of and reaction to illness and disability. Identifies personal and societal beliefs, values, and attitudes that affect the role of people with illness or disabilities in our culture and the healthcare system; how patients' beliefs, values, and experiences affect their expectations and interactions with healthcare professionals; and how beliefs, values, and experiences shape professional development and affect relationships with patients.

PT 5161. Psychosocial Aspects of Healthcare Seminar. 1 Hour.

Offers students an opportunity to engage in hands-on service roles and address the needs/interests of community partners. Students also have an opportunity to reflect on their learning through service during on-campus and online activities/assignments.

PT 5165. Sports Medicine: Managing the Injured Athlete. 4 Hours.

Offers students an opportunity to obtain in-depth knowledge in sports medicine. Covers taping and bracing procedures and techniques to assess concussions with various current protocols. Exposes students to current common pathologies within the athletic population. Discusses return-to-play criteria for an athlete once an injury has occurred and has subsequently been treated and rehabilitated.

PT 5209. Neurological Rehabilitation 1. 4 Hours.

Covers the foundations of the physical therapy examination, evaluation, and intervention with patients with neurological deficits. Presents examination skills, theoretical bases, and clinical applications of integrated intervention approaches for the patient with a neurological diagnosis. Includes the etiology, pathology, and physical therapy management of common neurological disorders affecting the pediatric population.

PT 5210. Lab for PT 5209. 1 Hour.

Accompanies PT 5209. Covers topics from the course through various experiments.

PT 5226. Physical Therapy Professional Seminar 2. 2 Hours.

Continues PT 5135 and builds on concepts introduced in the earlier course. Affords students the opportunity to reflect on issues in experiential education and prepare for future experiential learning.

PT 5227. Physical Therapy Project 1. 3 Hours.

Provides students with the opportunity to conduct an independent project under the mentorship of physical therapy faculty in areas such as research, education, clinical practice, administration, or service learning.

PT 5229. Physical Therapy Project 2. 2 Hours.

Provides students with a continued opportunity to work with individual faculty on scholarship activities to create a scholarly work in partial fulfillment of the requirement for a Doctor of Physical Therapy degree. Allows students to continue the research or education project that was initiated in PT 5227. Guides students as necessary to enable them to complete their capstone project.

PT 5230. Pediatric and Geriatric Aspects of Life Span Management. 3 Hours.

Incorporates analysis and comparison of methods of physical therapy (PT) management of selected populations across the life span, which includes pediatrics and geriatrics. Focuses on utilizing evidenced-based rationale for clinical decision making within the context of PT examination, evaluation, PT diagnosis, prognosis, and plan of care. Discusses how patient/client management seeks to reflect core professional values, as well as topics of prevention and wellness in these patient populations.

PT 5410. Functional Human Neuroanatomy. 4 Hours.

Examines the detailed structure of the human nervous system, linking structure to function at both the clinical and neurobiological level. Offers students an opportunity to obtain a solid functional anatomical foundation for neuroscience. Reviews basic neuroanatomy and then provides a detailed look into the structure of the nuclei within the central nervous system and their connectivity. Examines the role of these structures in motor and sensory function as well as in complex cognitive functions at a physiological and clinical level.

PT 5411. Lab for PT 5410. 1 Hour.

Examines the detailed structure of the human nervous system in specimens of the human brain and spinal cord as well as in images of stained sections of these tissues and magnetic resonance images (MRI). The structure of individual nuclei and the main sensory and motor tracts of the nervous system are examined and discussed by students working in small groups. Although focusing on anatomical details, the lab introduces the student to clinical diagnosis of neurological cases.

PT 5450. Introduction to Therapeutic Activities. 2 Hours.

Offers students an opportunity for exposure to the biologic underpinnings of therapeutic activities, as well as to increase their skill in the application of such activities, including exercise prescription, therapeutic handling skills, and functional activity design. Skills taught in this course shape interventions used in the physical therapy treatment of people across the life span with a variety of impairments of body structure, function, and functional activity limitations.

PT 5500. Pharmacology for Physical Therapy. 2 Hours.

Offers a clinically oriented course covering knowledge of clinical pharmacology in the physical therapy profession. Discusses prescription and over-the-counter drugs and common herbal supplements. Drug classification, pharmacokinetics, pharmacodynamics, mechanism of action, drug interactions, and common side effects are brought into the clinical perspective of patient management. Explores recognition of expected drug effects, side effects, idiosyncratic reactions, and signs of abuse or nonadherence. Along with PT 5140, emphasizes the therapist's proper incorporation of pharmacotherapeutic knowledge into patient assessment, differential diagnosis, and design of treatment regimens.

PT 5503. Cardiovascular and Pulmonary Management. 4 Hours.

Discusses physical therapy examination evaluation, interventions, and outcome assessment of common cardiac and pulmonary dysfunctions. Discusses etiology and pathology of common cardiac and pulmonary disorders. Uses case-based learning to promote synthesis of the material.

PT 5504. Lab for PT 5503. 1 Hour.

Accompanies PT 5503. Covers topics from the course through various experiments.

PT 5505. Musculoskeletal Management 1. 4 Hours.

Discusses physical therapy examination evaluation, interventions, and outcome assessment of common musculoskeletal dysfunctions. Uses case-based learning to promote synthesis of the material.

PT 5506. Lab for PT 5505. 1 Hour.

Accompanies PT 5505. Covers topics from the course through various experiments.

PT 5515. Integumentary Systems and Advanced Modalities. 2 Hours.

Applies anatomy, physiology, epidemiology, and pathology to explore the issues of medical, surgical, pharmacological, and psychological and physical therapy management of individuals throughout the life span with integumentary system impairments. Provides students with the opportunity to develop examination skills to derive diagnoses, prognoses, evaluations, and effective physical therapy interventions based on relevant evidence. Builds on information from PT 5104 to include electrophysiological testing and interpretation. Uses case studies to integrate the information learned in class.

PT 5516. Lab for PT 5515. 1 Hour.

Accompanies PT 5515. Covers topics from the course through various experiments.

PT 5540. Clinical Integration 1: Evidence and Practice. 2 Hours.

Designed to prepare physical therapy students to integrate previous courses taught in the curriculum to safely manage patients in the acute-care setting, including the intensive-care unit, the critical-care unit, and step-down settings. Uses a combination of lecture, instruction in the simulation center, and standardized patient interactions. Follows the "Guide to Physical Therapy Practice for Evaluation and Intervention" in these settings. Offers students an opportunity to learn to perform an examination; to evaluate examination data to formulate a plan of care; to provide interventions; to determine a discharge plan for individuals in the acute-care environment; and to demonstrate core professional values in classroom, recitation, and standardized patient interactions.

PT 5600. Ergonomics and the Work Environment. 3 Hours.

Builds upon the public health definition that ergonomics is the applied science that optimizes overall human-systems performance and well-being within the work environment. Emphasizes a public health approach suited for healthcare professionals building on their strengths and training in analytical diagnostic skills and interventions, ranging from primary to tertiary approaches. Covers topics including epidemiology, job hazard analysis, and intervention methods and research. Offers students an opportunity to obtain the knowledge and skills to improve the physical ergonomic factors in a workplace in order to increase the health and well-being of workers.

PT 5601. Project for PT 5600. 1 Hour.

Focuses on a project to accompany PT 5600.

PT 5610. Workplace Wellness and Health Promotion. 3 Hours.

Focuses on the skills needed to create, implement, and evaluate workplace health promotion and injury prevention programs. Studies the National Institute of Occupational Safety and Health's (NIOSH) essential elements of workplace health programs, utilizing and reviewing the literature in support of these essential elements throughout the semester. Workplace factors have strong associations with the health and health behaviors of workers. Builds upon basic wellness and organizational ergonomic principles to offer students an opportunity to develop the skills needed and to obtain the knowledge of the work environment and health promotion.

PT 5611. Project for PT 5610. 1 Hour.

Builds on PT 5610. Focuses on understanding the development of workplace health promotion and injury prevention programs and delves deeper into material covered in PT 5610 with additional readings and a final project.

PT 5710. Psychosocial Aspects of Disability. 4 Hours.

Explores the psychological, social, and cultural factors that underlie responses and adaptations to chronic illness and disability by individuals and families. Offers a foundation for nonjudgmentally ascertaining and supporting clients' needs. Includes coping needs and strategies that are used by those without complicating factors, as well as those that may be used by individuals who have comorbid conditions such as psychiatric disorders; substance abuse; or cultural, gender, or age differences. Presents best practices on interviewing skills, assessment, and interventions to support the needs of people affected by chronic illness or disability.

PT 5976. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

PT 6000. Leadership, Administration, and Management. 2 Hours.

Offers students an opportunity to develop the ability to analyze and evaluate changes in the healthcare system, health policy, and the impact on the delivery of services with a focus on physical therapy. Appraises key business and management concepts, including personnel, insurance, finance, marketing, productivity, and financial and legal regulations within the context of ethical practice. Emphasizes and examines leadership concepts in the areas of advocacy, legislation, and the promotion of the profession.

PT 6215. Assistive Technology. 3 Hours.

Studies theory and current practice in the use of prosthetics, orthotics, and assisted-living devices.

PT 6216. Lab for PT 6215. 1 Hour.

Accompanies PT 6215. Covers topics from the course through various experiments.

PT 6219. Physical Therapy Administration. 4 Hours.

Explores concepts in administration and management applied to physical therapy. Involves seminar and discussion groups.

PT 6221. Neurological Rehabilitation 2. 4 Hours.

Focuses on the physical therapy management of adults with neurological dysfunctions. Concentrates on management of functional activity limitations, participation restrictions, and impairments resulting from neurological disease and/or trauma. Offers students an opportunity to learn about the etiology, pathology, clinical signs, and medical management of adults with neurological disorders; to learn to perform an examination, evaluate the examination data to formulate a plan of care, and provide interventions; and to use evidence-based decision making.

PT 6222. Lab for PT 6221. 1 Hour.

Accompanies PT 6221. Covers topics from the course through various experiments.

PT 6223. Musculoskeletal Management 2. 4 Hours.

Provides an in-depth analysis of musculoskeletal management. Compares intervention protocols as an integral component of this course. Allows, in the lab component, for practical application of spinal joint mobilization, modalities, ergonomic assessment, functional training, and therapeutic exercise. Uses case-based learning to promote synthesis of the material.

PT 6224. Lab for PT 6223. 1 Hour.

Accompanies PT 6223. Covers topics from the course through various experiments.

PT 6233. Advanced Physical Therapy Topics in Orthopedics. 2 Hours.

Provides students with an opportunity to obtain in-depth knowledge in orthopedics and physical therapy. Course topics vary each semester offered. Topics are determined by significant events and changes in the field. This course may be taken more than once, as long as topics are different. May be repeated without limit.

PT 6237. Advanced Special Topics in Physical Therapy. 2 Hours.

Provides students with an opportunity to obtain in-depth knowledge in a specific physical therapy topic area. Course topics vary each semester offered. Topics are determined by significant events and changes in the field. This course may be taken more than once, as long as topics are different. May be repeated without limit.

PT 6241. Screening for Medical Conditions in Physical Therapy Practice. 4 Hours.

Designed to prepare physical therapy students to recognize the signs and symptoms of medical conditions and adverse drug reactions as they relate to patient examination and to triage appropriately. Emphasizes screening for medical conditions with the goal of recognizing red, yellow, and green flags as they relate to patient care. Stresses medical referral to other healthcare practitioners in an efficient and effective manner.

PT 6243. Health Education, Promotion, and Wellness. 3 Hours.

Covers health promotion, wellness, disease, impairment, functional limitations, disability, and health risks. Addresses the concept of human difference as a construct relative to behavior theories, lifestyle choices, and health and wellness. Offers students an opportunity to learn how to develop an educational health promotion program for a community group considering the impact of health disparities, epidemiology, learning styles, barriers, and resources. Also offers students an opportunity to explore a potential consultative role to business, schools, government agencies, and other organizations.

PT 6244. Recitation for PT 6243. 0 Hours.

Provides small-group discussion format to cover material in PT 6243.

PT 6250. Clinical Integration 2: Evidence and Practice. 2 Hours.

Offers students an opportunity to practice demonstrating core professional values in classroom, recitation, and standardized patient interactions and to learn how to skillfully manage complex patients across the life span and across practice patterns in a variety of clinical settings. Integrates evidence-based content from previous courses in the curriculum. Introduces special topics in physical therapy, including bariatric care, home care, and hospice.

PT 6251. Diagnostic Imaging. 3 Hours.

Designed to integrate diagnostic imaging principles and techniques relevant to physical therapy practice. Reviews commonly used diagnostic imaging techniques and discusses clinical case studies in a case-based online course.

PT 6330. Functional Anatomy 1. 2 Hours.

Covers the normal structure, function, and principles of biomechanics of the human body. Emphasizes the regions of the head, neck, and trunk. Also considers the basic abnormalities of structure and function.

PT 6331. Lab for PT 6330. 1 Hour.

Accompanies PT 6330. Covers the normal structure, function, and principles of biomechanics of the human body through cadaveric exploration, surface anatomy, and analysis of movement. Emphasizes the regions of the head, neck, and trunk.

PT 6340. Functional Anatomy 2. 4 Hours.

Covers the normal structure and function and principles of biomechanics of the human body, including the analysis of human movement. Emphasizes the upper and lower extremities. Considers basic abnormalities of structure and function.

PT 6341. Lab for PT 6340. 1 Hour.

Accompanies PT 6340. Covers the normal structure, function, and principles of biomechanics of the human body through cadaveric exploration, surface anatomy, and analysis of movement. Emphasizes the skeletal, muscular, nervous, and cardiovascular systems of the upper and lower extremities.

PT 6350. Foundations of PT Examination and Therapeutic Activities. 4 Hours.

Designed to educate the learner on how to apply, interpret, and perform introductory physical therapy tests and measures and therapeutic activity and exercise interventions. The tests and measures are components of the physical therapist examination process and examine human movement; and the introductory therapeutic activities and exercises are those that would be selected for treatment after those specific examination techniques. Provides an introductory framework to the patient/client professional relationship. Emphasizes the development of the learner's affective, psychomotor, and cognitive skills necessary to assure proper patient/client examination and intervention in the clinical environment.

PT 6351. Lab for PT 6350. 1 Hour.

Accompanies PT 6350. Provides an introductory framework to the patient/client professional relationship.

PT 6441. Clinical Education 1. 6 Hours.

Provides students with opportunities to practice examination, evaluation, and intervention skills previously learned in the classroom and on co-op. Students work under the supervision and guidance of a licensed physical therapist.

PT 6442. Clinical Education 2. 6 Hours.

Continues PT 6441. Provides students with additional opportunities to practice examination, evaluation, and intervention skills learned in the classroom and during the previous course. Students are expected to function at a higher level requiring less supervision and guidance from a licensed physical therapist than was needed during their first clinical education experience.

PT 6448. Clinical Education 3. 9 Hours.

Designed to provide students with the opportunity to meet entry-level requirements to practice as physical therapists. Supervised and guided by a licensed physical therapist, students practice examination, evaluation, intervention, documentation, and administrative skills and are expected to function at the level of a new graduate by the completion of this experience. Includes a written assignment. Helps students, through reflection of what they have learned, identify who they are as professionals, establish early career goals, and provide insight for the need to be a lifelong learner.

PT 6505. Musculoskeletal Management 3. 3 Hours.

Builds upon content from earlier musculoskeletal management courses to further provide students with the theoretical basis and clinical application of examination and intervention of more complex orthopedic patient presentations for the extremities, head, spine, and pelvic region. Uses an evidence-based, problem-solving approach to prioritize and plan patient care, including medical screening and identifying need for referral. Offers learners an opportunity to integrate selected topics that reflect the philosophies of various noted practitioners in the field of orthopedic physical therapy.

PT 6506. Lab for PT 6505. 1 Hour.

Accompanies PT 6505. Uses an evidence-based, problem-solving approach to prioritize and plan patient care, including medical screening and identifying need for referral. .

PT 6510. Evidence-Based Practice and Research Design. 3 Hours.

Offers an overview of the research process and its application in clinical arenas. Emphasizes the role of the health professional as a consumer of research, with concern for the ethical management and treatment of patients and their families. Elements of research design and their implications in clinical settings provide the framework for the analysis of research. Also emphasizes the use of research findings for evidence-based practice. Encourages interdisciplinary approaches.

PT 6511. Research Methods and Statistics in PT. 2 Hours.

Offers students an opportunity to learn about statistical concepts that can be applied to the PT capstone project (PT 6512 and PT 6513). Additionally, understanding statistics helps students become adept consumers of studies, a necessary component of clinicians to keep informed of the latest research for their own practice.

PT 6512. DPT Capstone 1. 1 Hour.

Offers students an opportunity to work directly with a faculty mentor(s) on scholarship activities to be disseminated (e.g., peer-reviewed journal article, conference poster) in the future. Students are assigned faculty mentor(s). Mentors determine the type of project students conduct for two semesters. Students are responsible for communicating with their mentor(s) throughout the semester and for completing the work that has been assigned by the specified deadlines. Additionally, students are expected to work cooperatively with fellow students assigned to the group to develop their project.

PT 6513. DPT Capstone 2. 2 Hours.

Continues PT 6512. Faculty guide students through the completion of their capstone projects. Students are expected to be motivated and self-directed to complete a high-quality project suitable for dissemination.

PT 6520. Prosthetic Management. 1 Hour.

Exposes the learner to current physical therapy clinical practices related to prosthetic rehabilitation as collaborative team members in the care for individuals with amputations. Discusses examination and implementation of physical therapy interventions in the management of individuals with an amputation. Uses a problem-solving approach to develop critical thinking skills to manage individuals with a variety of amputations and prosthetics, including an understanding of the bridge to robotics. Emphasizes prosthetics of the lower extremity and mobility impairments.

PT 6521. Lab for PT 6520. 1 Hour.

Accompanies PT 6520. Seeks to develop learners' hands-on application of examination and intervention for individuals with prosthetics. Uses a problem-solving approach to develop critical thinking skills and care strategies for individuals with a variety of amputations and prosthetics, including an understanding of the bridge to robotics. Emphasizes prosthetics of the lower extremity and individuals' mobility.

PT 6550. Pediatric Aspects of Life Span Management. 3 Hours.

Incorporates analysis and comparison of methods of physical therapy (PT) management of the pediatric population. Pediatric population is inclusive of the child, the child's parents, and/or caregivers. Focuses on utilizing evidenced-based rationale for clinical decision making within the context of PT examination, evaluation, PT diagnosis, prognosis, and plan of care. Patient/client management reflects core professional values. Also discusses topics of prevention and promotion of optimal health and wellness in this patient population.

PT 6555. Geriatric Aspects of Life Span Management. 2 Hours.

Incorporates a comprehensive analysis and comparison of methods of physical therapy (PT) management of the geriatric population. Focuses on utilizing an evidenced-based approach for clinical decision making within the context of PT examination, evaluation, PT diagnosis, prognosis, and plan of care. Patient/client management reflects core professional values. Also discusses topics of prevention and wellness. .

PT 6600. Special Topics. 2 Hours.

Offers learners an opportunity to expand upon current evidence-based topics to reflect current advancements in physical therapist practice. Topics are determined by significant events and changes in the field across areas of clinical practice and in line with accreditation and National Physical Therapist Licensure Examination. Focuses on advanced patient management and complex case analysis that involves multiple systems across the life span. Learners use clinical reasoning theory and evidence-based practice to reflect on patient diagnosis and management.

PT 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

PT 6964. Co-op Work Experience. 0 Hours.

Provides eligible students with an opportunity for work experience.

PT 6978. Independent Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

PT 7001. Core Concepts in Rehabilitation Science and Research. 3 Hours.

Exposes students to core concepts in rehabilitation science, including theory, experimental design, models of disablement, and knowledge transfer methods. Offers students an opportunity to develop the skills to critically evaluate models and theories used in rehabilitation science in order to apply select models/theories to their own programs of research. Students evaluate research designs and knowledge translation methods relevant to rehabilitation science and apply this information in planning the design, implementation, and dissemination of their own proposed research.

PT 7010. Measurement and Analysis of Human Movement and Bioinstrumentation. 4 Hours.

Offers students an opportunity to learn how to measure kinematics, kinetics, and muscle activity using bioinstrumentation, including 3D motion capture system, force plates, and electromyography, as well as to learn signal conditioning and processing techniques and how to compute physiological variables such as joint angles, joint torques, ground reaction force, center of pressure, and center of mass. Topics include programming skills in LabVIEW and MATLAB. Students use this information to formulate solutions to biomechanical problems.

PT 7020. Technologies in Movement and Rehabilitation Science. 4 Hours.

Covers technologies that have relevance to rehabilitation of individuals with disorders of movement. Topics include measurement of human movement, electroencephalography (EEG), functional magnetic resonance imaging (fMRI), electromyography (EMG), virtual reality and gaming, robotics, neuroprosthetics, noninvasive brain stimulation, and peripheral stimulation. Exposes students to a historical perspective on how the technology evolved, applications of the technology, an overview of how the technology works, existing variants, strengths, limitations/gaps, and future directions.

PT 7030. Interdisciplinary Seminar in Rehabilitation Science. 1 Hour.

Engages PhD students in discussions and presentations related to human movement and rehabilitation research in order to help them gain important skills related to critiquing and communicating scientific work. Offers students an opportunity to learn how to provide constructive feedback to colleagues about completed works and works in progress, as well as their communications regarding conference presentations and manuscripts from (or for) peer-reviewed archival journals. Works reviewed include works by students and by world-renowned leaders in the field. Presentations include students, as well as internationally established researchers.

PT 9000. PhD Candidacy Achieved. 0 Hours.

Indicates successful completion of program requirements for PhD candidacy.

PT 9990. Dissertation. 0 Hours.

Offers dissertation supervision by members of the department. May be repeated once.

Physical Therapy - CPS (PTH)

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PTH 6100. Differential Diagnosis and Medical Screening. 4 Hours.

Offers students an opportunity to obtain the knowledge and skills to competently screen patients for non-neuromusculoskeletal conditions, interpret clinical findings, and make sound clinical judgments that include providing appropriate referral when beyond the scope of physical therapy practice. Emphasizes diagnostics theory and process skills for a physical therapist to perform a complete and thorough history and relevant regional physical examination.

PTH 6102. Cultural Competency for Healthcare Providers. 1 Hour.

Seeks to address the American Physical Therapy Association's mandate that physical therapists have the necessary skills, knowledge, and attitudes to treat patients with a wide range of differences. These differences are not limited to race or ethnicity alone; therefore, it is not sufficient to instruct students in the characteristics of a particular non-Anglo-European culture. As noted in the Code of Ethics, physical therapists must be able to understand, value, and individualize patient communication and interventions to reflect these differences. Offers students an opportunity to begin developing an understanding and respect for cultural and personal differences and to build a foundation for further professional growth.

PTH 6103. Consultation, Delegation, and Screening. 1 Hour.

Offers parameters for legal and ethical delegation to others. Offers students an opportunity to obtain the knowledge and skills to determine when a person requires further evaluation by a physical therapist or referral to another healthcare professional when the findings are beyond the scope of physical therapy practice. In addition, students are expected to acquire skills in providing consultation to nonpatient groups and to individuals who are responsible for the health needs of the community. This may involve working with groups of clients, policy makers, healthcare providers, and community-service workers.

PTH 6104. Integumentary System. 2 Hours.

Discusses the physical therapist patient management process as it applies to the integumentary system. Examines the process of normal wound healing and the role of the physical therapist in the management of wounds. Covers pressure ulcers, ulcers due to venous and arterial insufficiency, diabetic ulcers, and burns. Details the examination, evaluation, diagnosis, prognosis, intervention, and outcome assessment of each wound category. Incorporates the use of case studies to integrate the information. Requires permission of instructor for students without a physical therapy degree.

PTH 6105. Metabolic Disorders. 2 Hours.

Offers a clinically oriented course that discusses the physical therapist patient management process as it applies to metabolic disorders. Presents basic medical science and medical management of diabetes mellitus (DM), thyroid, parathyroid and bone disorders, steroid therapy, liver disease, and metabolic syndrome. Details the role of the physical therapist in examination, evaluation, diagnosis, prognosis, intervention, and outcome assessment involving the most common endocrine and metabolic problems encountered in physical therapy practice. Includes the use of case studies. Offers students an opportunity to synthesize their own physical therapy diagnosis and plan of care for patients with metabolic disorders. Requires prior completion of degree in physical therapy.

PTH 6110. Diagnostic Imaging. 4 Hours.

Introduces the practicing physical therapist to clinical interpretation of various medical imaging techniques, including plain film radiography, magnetic resonance imaging, and computerized tomography. Emphasizes developing familiarity with the visual appearance of various image modalities, recognition and appreciation of common views employed, assessment of normal and abnormal anatomy, and avoidance of common pitfalls in clinical interpretation within the scope of physical therapy practice.

PTH 6120. Clinical Nutrition. 3 Hours.

Covers the fundamental role of nutrition in promoting health with special emphasis on the physiological functions of energy-providing nutrients in the body and their interrelationships. Offers health professionals an opportunity to learn how to effectively communicate public health promotion strategies, techniques used to teach diet and nutrition, and behavioral theories used in diet and nutrition intervention. Emphasizes clinical applications for the treatment of weight disorders, diabetes, cardiovascular disease, eating disorders, and nutrition in the life cycle. Examines nutrition across the life span along with the nutritional requirements needed to maintain good health and to promote healing and rehabilitation.

PTH 6130. Pharmacology. 3 Hours.

Covers advanced concepts of pharmacologic management of patients/clients and the interrelationship of pharmacologic management with physical therapy interventions. This includes the physiological processes involved in pharmacodynamics as well as pharmacokinetics with nutrition, absorption, distribution, metabolism, and excretion. Offers students an opportunity to learn how to identify those drugs commonly taken by physical therapy patients and their side effects.

PTH 6140. Motor Control. 4 Hours.

Examines advanced topics in motor control and learning. Involves the study of mechanisms underlying the production, control, and rehabilitation of movement control and motor learning. The application of current research to clinical practice across a variety of settings is a vital component of this course. Discusses the behavioral, neural, cognitive, and physical components of motor control and learning, emphasizing the integration of these with physical therapy practice.

PTH 6200. Research Methods and Statistical Analysis. 5 Hours.

Presents a computer-oriented introduction to statistical methods with applications in life science. Incorporates descriptive statistics, correlation, probability and regression, and the fundamentals of statistical inference. Discusses the relevance of research and statistical analysis in determining the evidence for the effectiveness of physical therapy.

PTH 6235. Administrative and Management Keys for Contemporary Physical Therapist Practice. 4 Hours.

Introduces physical therapists to the latest delivery models of practice and offers the underlying rationale for recent and pending evolutionary reform changes affecting practice. Expounds upon both the clinical and administrative responsibility and accountability essential for all contemporary physical therapy practice success. Presents the clinical competencies that are essential and define direct-access physical therapy. Explores additional administration and management concepts with regard to developing a business plan; managing finances, facilities, and staff; assessing outcomes; and engaging in marketing and public relations. Reviews current trends in payment for physical therapy services as related to implementing the marketing strategies necessary to promote and defend autonomous, yet collaborative, models of physical therapy care.

PTH 6430. Educational Strategies for Effective Healthcare Delivery. 4 Hours.

Explores the diverse and growing teaching expectations and opportunities for physical therapists, including the roles of educator with students, patients/clients, family members, and in the community with an emphasis on cultural sensitivity. The role of physical therapist as educator requires an understanding of educational theory and pedagogy in various settings, from one-on-one sessions with a patient/client, to classroom situations, to public speaking in front of large and diverse crowds.

PTH 6480. Evidence-Based Exercise for the Older Adult. 4 Hours.

Seeks to supply the clinician with the most current and pertinent scientific evidence regarding the role of exercise in older adults. Offers students an opportunity to learn best practices to create an exercise prescription. Employs lectures, discussion boards, and case-study analysis to investigate the cardiopulmonary, musculoskeletal, integumentary, and neuromuscular systems involved in health of older adults. Offers students an opportunity to design exercise prescriptions for special populations, including those individuals with osteoporosis, diabetes, arthritis, and cardiopulmonary disease.

PTH 6490. Pediatric Physical Therapy: Emerging Topics and Evidence-Based Practice. 4 Hours.

Offers a forum for discussing current and pertinent scientific evidence on pediatric physical therapy. Topics include updated information on new medical diagnoses and the role of physical therapy (e.g., mitochondrial disorders), current evidence with regard to tests and measures, interventions, and adaptive equipment. Presents information on emerging and complementary and alternative therapies. Utilizes a variety of learning experiences, including online lecture, discussion, and case studies. Involves students in topic selection, literature presentations, and clinical case studies.

PTH 6560. Patient Management Models and Evidence-Based Practice in Orthopedics. 2 Hours.

Examines the differential diagnosis process as it relates to orthopedic physical therapy. Discusses systems of classification in diagnosis and how this relates to interventions and outcomes in orthopedic physical therapy. Focuses on analyzing the literature to include clinical predictor rules and discusses how evidence informs practice.

PTH 6561. Evidence-Based Examination and Outcomes for the Cervical-Thoracic Spine and Temporomandibular Joint. 4 Hours.

Reviews the anatomy and biomechanics of the cervical-thoracic spine and temporomandibular joint as it relates to musculoskeletal dysfunction. Presents an update on current medical and surgical interventions. Incorporates evidence from the literature to guide clinical reasoning, differential diagnosis, evaluation, and interventions for common cervical-thoracic spine and temporomandibular joint disorders. Interprets and analyzes the impact of pharmacology and diagnostic imaging based on the patient/client management model.

PTH 6562. Evidence-Based Examination and Outcomes for Upper Extremity: Shoulder, Elbow, and Hand. 4 Hours.

Reviews the anatomy and biomechanics of the shoulder, elbow, wrist, and hand as it relates to musculoskeletal dysfunction. Seeks to provide the clinician with current, pertinent scientific evidence regarding the rehabilitation of the upper extremity to inform evidence-based practice. Interprets and analyzes the impact of pharmacology and diagnostic imaging in guiding differential diagnosis based on the patient/client management model. Offers students an opportunity to improve critical thinking and decision making regarding the examination and treatment of selected upper-extremity disorders.

PTH 6563. Evidence-Based Examination and Outcomes for Lumbar Spine and Sacroiliac Joint. 4 Hours.

Reviews the anatomy and biomechanics of the lumbar spine and sacroiliac joint as it relates to musculoskeletal dysfunction. Presents an update on current medical and surgical interventions. Offers students an opportunity to use group case studies to improve their evidence-informed clinical decision making regarding the examination of the lumbar spine and sacroiliac joint. Analyzes the most current, pertinent scientific evidence and information regarding the rehabilitation of the lumbar spine and sacroiliac joint to include manipulation, imaging, and pharmacology.

PTH 6564. Evidence-Based Examination and Outcomes for Lower Extremity: Hip, Knee, Foot, and Ankle. 4 Hours.

Reviews the anatomy and biomechanics of the hip, knee, ankle, and foot as it relates to musculoskeletal dysfunction. Offers students an opportunity to use case studies to gain advanced understanding of normal and abnormal gait as it relates to orthopedic dysfunction and to learn interventions to address faulty biomechanics. Seeks to provide clinicians with the most relevant information regarding evidence-informed rehabilitation for lower-extremity examination and treatment techniques.

PTH 6900. Comprehensive Case Analysis. 4 Hours.

Offers students an opportunity to write a comprehensive and publishable case report, refine it, and analyze it with integration of the components of the patient/client management model, the processes of clinical decision making, and the effective and efficient use of resources. Cases include patients/clients from one of the four categories of conditions that make up the preferred practice patterns in the Guide to Physical Therapist Practice. This case includes information from all courses taken as part of the Doctorate in Physical Therapy and serves as a capstone for the program.

PTH 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

Physician Assistant (PA)

Search PA Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=PA>)

PA 5100. Principles of Leadership in Healthcare. 3 Hours.

Introduces general leadership theory, knowledge, and skills. Offers students an opportunity to gain insight into differing leadership theories (scientific, moral, transactional, transformational, and situational) and be able to assess current knowledge and skill in essential leadership practices. Covers vision, planning, decision making, communication, interpersonal/group leadership, conflict/issue resolution, motivation/developing others, power/ethics, culture/climate, change, mentorship, and evaluation.

PA 5101. Advocacy in Leadership. 3 Hours.

Focuses on preparing the PA leader in two types of advocacy in leadership: to advance the agenda of the rapidly changing profession by examining relevant health policy research and analysis (legislative advocacy) and to successfully advocate for their ideas as leaders (self-advocacy).

PA 5102. Medical Billing and Reimbursement for Advanced Practice Providers. 3 Hours.

Introduces the basics of medical insurance billing and current payment methodologies in the inpatient, outpatient, and surgical settings. Focuses on Medicare billing, since third-party payer rules can vary per payer and/or per state. Emphasizes compliance with regulatory requirements, proper documentation requirements, and common Medicare billing practices.

PA 5103. Metrics: Measuring, Comparing, and Privileging Your PA and NP Workforce. 3 Hours.

Introduces the fundamentals of metrics and analysis surrounding PA and NP productivity, outcomes, competencies, and retention. Emphasizes understanding and applied methodology, not statistical analysis. By the end of the course, students should have a firm grasp on dashboard anatomy, metric categories, dashboard analysis, the clinical competency-dashboard relationship, and special considerations for PA and NP metric tracking.

PA 6200. Anatomy and Physiology 1. 3 Hours.

Emphasizes the structure and function of the human body including cells, tissues, and organs. Highlights interrelationships among systems and regulation of physiological functions involved in maintaining homeostasis. Focuses on features of clinical importance. Covers musculoskeletal, neurologic, cardiovascular, respiratory, gastrointestinal, endocrine, immunologic, and renal systems. Requires cadaver laboratory sessions. This course is the first in a two-course sequence.

PA 6201. Anatomy and Physiology 2. 3 Hours.

Emphasizes the structure and function of the human body including cells, tissues, and organs. Highlights interrelationships among systems and regulation of physiological functions involved in maintaining homeostasis. Focuses on features of clinical importance. Covers musculoskeletal, neurologic, cardiovascular, respiratory, gastrointestinal, endocrine, immunologic, and renal systems. Requires cadaver laboratory sessions. This is the second of a two-course sequence.

PA 6203. Physical Diagnosis and Patient Evaluation 1. 3 Hours.

Presents the techniques for eliciting an accurate history, performing an appropriate physical examination, making case presentations, and documenting patient information. Includes issues such as effective communication, confidentiality, cultural competence, and dealing with patients who are terminally ill or disabled. Emphasizes skill development. Students participate in all aspects of the clinical encounter.

PA 6204. Physical Diagnosis and Patient Evaluation 2. 3 Hours.

Presents the techniques for eliciting an accurate history, performing an appropriate physical examination, making case presentations, and documenting patients' information. Includes issues such as effective communication, confidentiality, cultural competence, and dealing with patients who are terminally ill or disabled. Emphasizes the correlation of pertinent physical findings with their respective clinical conditions. Students participate in all aspects of the clinical encounter.

PA 6205. Pharmacology 1. 2 Hours.

Examines the classification, mechanisms of action, and use of a broad spectrum of therapeutic agents. Focuses on dose response, side effects, adverse reactions, and the role of patient concordance in medication effectiveness.

PA 6206. Pharmacology 2. 2 Hours.

Continues PA 6205. Examines the classification, mechanisms of action, and use of a broad spectrum of therapeutic agents. Focuses on dose response, side effects, adverse reactions, and the role of patient concordance in medication effectiveness. .

PA 6207. Clinical Laboratory and Diagnostic Methods. 4 Hours.

Covers a variety of diagnostic and therapeutic evaluations including clinical laboratory methods, radiologic studies, and electrocardiography. Includes basic principles of diagnostic and therapeutic patient evaluation, radiology, indications and interpretation of clinical laboratory studies, demonstration and practice of various diagnostic methods, and electrocardiography theory and interpretation.

PA 6208. Professional Issues for Physician Assistants. 2 Hours.

Offers students the opportunity to understand their professional environment, community resources, legal parameters, and ethical situations they may face. Also addresses interpersonal dynamics in working with physicians and other healthcare providers. Some material is covered in problem-based learning sessions.

PA 6311. Principles of Medicine 1. 4 Hours.

Presents a systems approach to the principles of disease processes and includes such topics as physiology, pathophysiology, the natural history of disease, diagnostic procedures, and therapeutic measures. This course is the first of a three-semester series covering core medical concepts and knowledge grounded in scientific principles and evidence-based medicine on the diseases and conditions commonly encountered in clinical practice.

PA 6312. Principles of Medicine 2. 4 Hours.

Continues PA 6311. Presents a systems approach to the principles of disease processes and includes such topics as physiology, pathophysiology, the natural history of disease, diagnostic procedures, and therapeutics measures. This course is the second of a three-semester series covering core medical concepts and knowledge grounded in scientific principles and evidence-based medicine on the diseases and conditions commonly encountered in clinical practice.

PA 6313. Principles of Medicine 3. 4 Hours.

Continues PA 6312. Presents a systems approach to the principles of disease processes and includes such topics as physiology, pathophysiology, the natural history of disease, diagnostic procedures, and therapeutics measures. This course is the third of a three-semester series covering core medical concepts and knowledge grounded in scientific principles and evidence-based medicine on the diseases and conditions commonly encountered in clinical practice.

PA 6320. Principles of Obstetrics and Gynecology. 2 Hours.

Focuses on the management of women and fetuses from pre-pregnancy to term as, during much of that time, care is provided to both patients simultaneously. Gynecology attends to women's reproductive issues from prepuberty through senescence. Uses a variety of presentations, clinical case scenarios, and related readings as the basis for students' learning and development of critical thinking skills related to assessment and management of a woman's health. Students may be expected to read, discuss, acquire, and briefly write about women's health issues.

PA 6321. Principles of Surgery. 2 Hours.

Offers students an opportunity to explore the surgical environment, approach to the surgical patient, and management of surgical conditions with an emphasis on clinical presentation, operative and nonoperative intervention, and perioperative management. Students participate in clinical skills sessions on a variety of surgical techniques including suturing, knot tying, sterile technique, and other minor surgical procedures.

PA 6322. Principles of Orthopedics. 2 Hours.

Discusses common orthopedic problems, including those of the hand, knee, shoulder, and back. Examines special problems of acute trauma and managing uncomplicated orthopedic cases. Also considers such topics as how to complete an adequate patient medical history and perform a physical examination of an orthopedic patient.

PA 6323. Clinical Neurology. 2 Hours.

Presents the clinical application of neuroanatomy and neurophysiology. Offers the opportunity to develop an understanding of the nervous system's normal functioning as well as a clinical approach to assessing and managing nervous system disorders and disease states, and their effects on patients and their families.

PA 6324. Principles of Pediatrics. 2 Hours.

Presents the physiological and psychological fundamentals of child development. Focuses on the major common pediatric illnesses, including their signs, symptoms, and treatment regimens; various immunizations and medications used in pediatrics and their indication and dosage in relation to specific disorders; and management of pediatric emergencies.

PA 6325. Principles of Psychiatry. 2 Hours.

Provides an opportunity to understand how to work with patients and families exhibiting psychiatric problems. Includes such topics as psychological growth and development, psychiatric diagnoses, and the effect of social milieu on behavior, the psychological bases of drug and alcohol abuse, the dynamics of psychosomatic problems, the role of culture in self-concepts, and family attitudes toward mental illness as well as appropriate psychotropic medications.

PA 6326. Aspects of Primary Care. 4 Hours.

Studies approaches to and management of the patient in a primary care setting. Discusses specific diseases and medical conditions common to primary care, including HIV/AIDS. Considers psychosocial aspects of disease as well as aspects of prevention.

PA 6327. Emergency Medicine and Critical Care. 2 Hours.

Presents the principles of life-support techniques. Focuses on the initial management of acute medical and traumatic conditions in hospital and prehospital situations. Instructs students in basic cardiopulmonary resuscitation techniques including BLS and ACLS. Includes such topics as airway management, hemodynamic monitoring and management, dysrhythmia recognition and treatment, cardiac arrest, hypovolemic states and management, invasive procedures, multiorgan system failure, nutritional support, and metabolic management of the ICU patient.

PA 6328. Aging and Rehabilitation Medicine. 2 Hours.

Studies techniques of effective planning and decision making for patients with significant acute and chronic problems. Discusses the purposes, techniques, and potential of rehabilitation medicine. Also focuses on biological changes of aging and appropriate theories of management.

PA 6329. Healthcare Delivery. 2 Hours.

Explores the principal components of the healthcare delivery system, emphasizing its social, political, and economic evolution and development. Discusses trends and their implications.

PA 6330. Research Design. 2 Hours.

Considers research methods and designs used in varied professional settings. Emphasizes development of research techniques, including the ability to define research problems; write hypotheses; review and interpret literature; apply research designs; organize, analyze, and present data; and draw relevant conclusions.

PA 6400. Applied Study in Medicine. 5 Hours.

Offers supervised clinical practice experience that is designed to foster students' growth regarding general medical knowledge and clinical reasoning skills. Students may have the opportunity to review historical information, interview patients, perform physical exams, order and interpret studies, perform procedures, present assessments, develop differentials, educate patients, coordinate interdisciplinary communication, document encounters, develop professionalism skills, and improve the ability to triage and manage tasks efficiently.

PA 6401. Applied Study in Ambulatory Medicine. 5 Hours.

Offers supervised clinical practice experience. Allows students to further hone their content knowledge and clinical skills either in the area of primary care or in a selected subspecialty area of medicine. Offers students an opportunity to develop skills related to both the initial assessment, as well as the ongoing management of patients with established diagnoses, while working to develop their clinical reasoning skills given initial presentations. Emphasizes assessing and managing both acute and chronic medical problems.

PA 6402. Applied Study in Family Practice. 5 Hours.

Offers supervised clinical practice experience. Offers students an opportunity to evaluate and treat patients while emphasizing the patient as an individual and family member. Clinical rotation experience may include exposure to preventative medicine, patient education, integration of community services, and medical diagnosis and management for both acute and chronic conditions.

PA 6403. Applied Study in Emergency Medicine. 5 Hours.

Offers supervised clinical practice experience. Offers students an opportunity to gain experience triaging, evaluating, and managing patients in an emergency medicine setting. Clinical skills honed may include the ability to diagnose and manage patients who present with urgent and emergent complaints, ranging from acute illnesses and traumatic injuries to life-threatening issues.

PA 6404. Applied Study in Obstetrics and Gynecology. 5 Hours.

Offers supervised clinical practice experience. Offers students exposure to clinical medicine as it relates to typical women's health issues. May include common gynecologic disorders, obstetrical complaints, and/or family planning.

PA 6405. Applied Study in Pediatrics. 5 Hours.

Offers supervised clinical practice experience. Offers students an opportunity to manage care of pediatric patients. Common components of this rotation may include exposure to both well child and urgent care visits, offering students an opportunity to develop interview and physical examination skills with children of all ages.

PA 6406. Applied Study in Surgery. 5 Hours.

Offers supervised clinical practice experience. Designed to allow students to gain experience in a surgical setting. Experiences may include preoperative, intraoperative, as well as postoperative patient care. Offers students an opportunity to hone their procedural and assessment skills, distinguish between surgical vs. nonsurgical presentations, and differentiate acute from elective complaints.

PA 6407. Applied Study in Mental Health. 5 Hours.

Offers supervised clinical practice experience. Exposes students to a variety of behavioral medicine patient care experiences. Emphasizes recognizing various types of mental health disorders that may require referral to a specialist and managing problems that can be handled by the nonspecialist. Offers students an opportunity to further their understanding of effective patient interactions and the mental health components of health, disease, and disability.

PA 6408. Applied Study Elective. 5 Hours.

Offers supervised clinical practice experience. Exposes students to a medical, surgical, or subspecialty of either field for further study. Offers students an opportunity to hone their ability to recognize and treat conditions within these fields of medicine to foster utilization or support of related specialists. Select students may participate in an elective that focuses on global health or on a clinical support role, such as administration, leadership, public health, or technology as it relates to healthcare.

PA 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

Physics (PHYS)

Search PHYS Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=PHYS>)

PHYS 1000. Physics at Northeastern. 1 Hour.

Intended for freshmen in the College of Science. Introduces freshmen to the liberal arts in general; familiarizes them with their major; helps them develop the academic skills necessary to succeed (analytical ability and critical thinking); provides grounding in the culture and values of the University community; and helps them develop interpersonal skills—in short, familiarizes students with all skills needed to become a successful university student.

PHYS 1111. Astronomy. 4 Hours.

Introduces modern astronomical ideas designed for nonscience majors. Topics include an introduction to the cosmos, Earth and its relation to the universe, our solar system (planets, moons, asteroids, and comets), the sun and how it works, stars and their classification, and the life and death of stars. Introduces various tools of the astronomer (the nature of light and radiation, telescopes, the types of spectra, and what they tell us).

PHYS 1122. Modern Science: A Voyage into Matter, Life, and Mind. 4 Hours.

Offers an intellectual voyage into matter, life, and mind—the three pillars of modern science. It is a mosaic of different themes that offer a concise overview of science's greatest minds, ideas, questions, discoveries, theories, and methods while placing all of them within their historical contexts. Emphasizes the profound scientific revolutions of the 20th century—quantum mechanics, biogenetics, and artificial intelligence—that unlocked the secrets of the atom, unraveled the molecule of life, and created the electronic computer. Recognizes significant trends across a wide range of subjects, including medicine, biotechnology, computing and communicating, artificial intelligence and artificial life, and robotics. Discusses the synergism of science, technology, and business on future scientific development.

PHYS 1123. Physics for Future Leaders. 4 Hours.

Introduces basic concepts in physics and other sciences in a manner accessible to nonscience majors. Offers students an opportunity to learn to think scientifically about issues in the realm of public policy and current events. Topics may include fossil fuels and the energy economy, nuclear energy and nuclear weapons, radiation safety, alternative fuels and transportation, space exploration, climate change, and the greenhouse effect.

PHYS 1125. Introduction to Network Science: From the Human Cell to Facebook. 4 Hours.

Introduces network science as a way to understand complex patterns of connections and relationships in increasingly complex social, infrastructure, transportation, information, and biological networks, as well as business and consumer networks. Describes basic conceptual and computational tools to model networks and discusses applications of those tools through a wide range of examples from the World Wide Web to protein and gene networks to massive social networks such as Twitter and Facebook. Discusses both network structures and dynamical phenomena on networks, such as spreading of information, rumors, gossip, and epidemics.

PHYS 1130. Computing, Data, and Science. 4 Hours.

Introduces how to deal with data and computation problems through the use of computer languages commonly used in the sciences. Focuses on manipulating data, but symbolic calculations are also covered. Intended for science majors during the first summer, when such a course can act as a foundation for later work.

PHYS 1132. Energy, Environment, and Society. 4 Hours.

Seeks to provide nonscience students with a practical knowledge of our present use of the Earth's energy resources and the environmental consequences. Topics include fossil fuels for transportation and electrical power, global warming, nuclear energy, solar energy, wind power, biomass, electric and hybrid vehicles, and air pollution. No previous knowledge of physics is assumed; nevertheless, because of the nature of the subject, a significant part of the course includes simple quantitative reasoning.

PHYS 1141. General Physics. 4 Hours.

Covers mechanics, fluids, and vibrations and waves. Emphasizes the application of physics to a variety of problems in structural engineering. Mechanics topics include one-dimensional motion, forces, vectors, Newton's laws, equilibrium, work, energy, and power. Fluids topics include density, pressure, buoyancy, and fluids in motion. Vibrations and waves topics include mechanical vibrations and sound. Requires knowledge of algebra.

PHYS 1145. Physics for Life Sciences 1. 4 Hours.

Covers mechanics, fluids, and temperature and kinetic theory. The application of physics to a variety of problems in the life and health sciences is emphasized. Mechanics topics include one-dimensional motion, forces, vectors, Newton's laws, equilibrium, work, energy, and power. Fluids topics include density, pressure, buoyancy, fluids in motion, viscosity, and surface tension. Temperature and kinetic theory topics include temperature, thermal equilibrium, gas laws, ideal gas law, kinetic theory, vapor pressure, and diffusion. A laboratory is included.

PHYS 1146. Lab for PHYS 1145. 1 Hour.

Accompanies PHYS 1145. Covers topics from the course through various experiments.

PHYS 1147. Physics for Life Sciences 2. 4 Hours.

Continues PHYS 1145. Covers heat, electricity, vibrations and waves, sound, geometrical optics, and nuclear physics and radioactivity. The application of physics to a variety of problems in the life and health sciences is emphasized. Electricity topics include electrostatics, capacitance, resistivity, direct-current circuits, and RC circuits. Vibrations and waves topics include simple harmonic motion and wave motion. Sound topics include wave characteristics, the ear, Doppler effect, shock waves, and ultrasound. Optics topics include reflection, mirrors, refraction, total internal reflection, fiber optics, lenses, the eye, telescopes, and microscopes. Nuclear physics and radioactivity topics include atomic nucleus, radioactivity, half-life, radioactive dating, detectors, nuclear reaction, fission, fusion, radiation damage, radiation therapy, PET, and MRI. A laboratory is included.

PHYS 1148. Lab for PHYS 1147. 1 Hour.

Accompanies PHYS 1147. Covers topics from the course through various experiments.

PHYS 1149. Physics for Pharmacy. 4 Hours.

Offers an integrated lecture and laboratory course for pharmacy students.

PHYS 1150. Lab for PHYS 1149. 1 Hour.

Accompanies PHYS 1149. Covers topics from the course through various experiments.

PHYS 1151. Physics for Engineering 1. 3 Hours.

Covers calculus-based physics. Offers the first semester of a two-semester integrated lecture and laboratory sequence intended primarily for engineering students. Covers Newtonian mechanics and fluids. Stresses the balance between understanding the basic concepts and solving specific problems. Includes topics such as one-dimensional and three-dimensional motion, Newton's laws, dynamics friction, drag, work, energy and power, momentum and collisions, rotational dynamics, forces, torque and static equilibrium, pressure, fluids, and gravity.

PHYS 1152. Lab for PHYS 1151. 1 Hour.

Accompanies PHYS 1151. Covers topics from the course through various experiments. Requires concurrent registration in PHYS 1151 and PHYS 1153.

PHYS 1153. Interactive Learning Seminar for PHYS 1151. 1 Hour.

Offers interactive problem solving for PHYS 1151. Emphasizes organized approaches and use of mathematical techniques, including calculus, to solve a wide range of problems in mechanics. Topics include static equilibrium, applications of Newton's laws and conservation principles, rotational dynamics, and fluids. Requires concurrent registration in PHYS 1151 and PHYS 1152.

PHYS 1155. Physics for Engineering 2. 3 Hours.

Continues PHYS 1151. Offers integrated lecture and laboratory. Covers electrostatics; capacitors; resistors and direct-current circuits; magnetism and magnetic induction; RC, LR, and LRC circuits; waves; electromagnetic waves; and radiation.

PHYS 1156. Lab for PHYS 1155. 1 Hour.

Accompanies PHYS 1155. Covers topics from the course through various experiments. Requires concurrent registration in PHYS 1155 and PHYS 1157.

PHYS 1157. Interactive Learning Seminar for PHYS 1155. 1 Hour.

Offers interactive problem solving for PHYS 1155. Emphasizes organized approaches and use of mathematical techniques, including calculus, to solve a wide range of problems in electricity, magnetism, and waves. Requires concurrent registration in PHYS 1155 and PHYS 1156.

PHYS 1161. Physics 1. 4 Hours.

Covers calculus-based physics. Offers the first semester of a two-semester integrated lecture and laboratory sequence intended primarily for science students. Covers Newtonian mechanics and fluids. Emphasizes the underlying concepts and principles. Takes applications from a wide variety of fields, such as life sciences and medicine, astro- and planetary physics, and so on. Includes topics such as forces, torque and static equilibrium, one-dimensional and three-dimensional motion, Newton's laws, dynamics friction, drag, work, energy and power, momentum and collisions, rotational dynamics, oscillations, pressure, fluids, and gravity.

PHYS 1162. Lab for PHYS 1161. 1 Hour.

Accompanies PHYS 1161. Covers topics from the course through various experiments.

PHYS 1163. Recitation for PHYS 1161. 0 Hours.

Accompanies PHYS 1161. Offers an opportunity for interactive problem solving.

PHYS 1165. Physics 2. 4 Hours.

Continues PHYS 1161. Offers the second semester of a two-semester integrated lecture and laboratory sequence intended primarily for science students. Includes topics such as electrostatics; capacitors; resistors and direct-current circuits; magnetism and magnetic induction; RC, LR, and LRC circuits; waves; electromagnetic waves; and fluids.

PHYS 1166. Lab for PHYS 1165. 1 Hour.

Accompanies PHYS 1165. Covers topics from the course through various experiments.

PHYS 1167. Recitation for PHYS 1165. 0 Hours.

Accompanies PHYS 1165. Offers an opportunity for interactive problem solving.

PHYS 1171. Physics 1 for Bioscience and Bioengineering. 3 Hours.

Designed for students in engineering and science majors with a biologically related curriculum. Studies the fundamentals of calculus-based physics through a relationship with living systems. Includes topics such as kinematics of living systems, stress/strain/strength of biomaterials, fluid flow and boundary layers, aspiration and circulatory models, diffusion and random motion, and thermodynamics with examples from living systems.

PHYS 1172. Lab for PHYS 1171. 1 Hour.

Accompanies PHYS 1171. Experiments include measurement and error, forces in one dimension, work and energy on an air track, fluid flow, Brownian diffusion, uniform circular motion, and ideal gas laws. Requires concurrent registration in PHYS 1171 and PHYS 1173.

PHYS 1173. Interactive Learning Seminar for PHYS 1171. 1 Hour.

Offers interactive problem solving for PHYS 1171. Emphasizes organized approaches to solve a wide range of problems in the course. Requires concurrent registration in PHYS 1171 and PHYS 1172.

PHYS 1175. Physics 2 for Bioscience and Bioengineering. 3 Hours.

Continues PHYS 1171. Includes topics such as wave motion and hearing; electric fields (including application to biological membranes); direct current electrical circuits (including biological circuits); RC circuit models of ion channels; bioelectricity in marine organisms; electromagnetic waves and optics; modern physics (including radioactive decay, applications of radioactivity in nuclear medicine, and carbon 14 dating).

PHYS 1176. Lab for PHYS 1175. 1 Hour.

Accompanies PHYS 1175. Experiments include standing waves, electric charge/field, DC circuits, gel electrophoresis, geometric optics, light spectroscopy, and radioactive decay. Requires concurrent registration in PHYS 1175 and PHYS 1177.

PHYS 1177. Interactive Learning Seminar for PHYS 1175. 1 Hour.

Offers interactive problem solving for PHYS 1175. Emphasizes organized approaches to solve a wide range of problems in the course. Requires concurrent registration in PHYS 1175 and PHYS 1176.

PHYS 1211. Computational Problem Solving in Physics. 4 Hours.

Introduces students to computational problem-solving techniques with common computer languages used in the physical sciences. Begins with programming basics of data handling, visualization tools, random number generators, functions, and control statements and expands to more advanced topics of interpolation, numeric integration, numeric derivatives, ordinary differential equations, and some Monte Carlo techniques. Explores topics contextually using physical models and problems.

PHYS 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

PHYS 2303. Modern Physics. 4 Hours.

Reviews experiments demonstrating the atomic nature of matter, the properties of the electron, the nuclear atom, the wave-particle duality, spin, and the properties of elementary particles. Discusses, mostly on a phenomenological level, such subjects as atomic and nuclear structure, properties of the solid state, and elementary particles. Introduces the special theory of relativity.

PHYS 2305. Thermodynamics and Statistical Mechanics. 4 Hours.

Focuses on first and second laws of thermodynamics, entropy and equilibrium, thermodynamic potentials, elementary kinetic theory, statistical mechanics, and the statistical interpretation of entropy.

PHYS 2371. Electronics. 3 Hours.

Covers the physics underlying computers and our modern electronic world. Focuses on principles of semiconductor devices (diodes, transistors, integrated circuits, LEDs, photovoltaics); analog techniques (amplification, AC circuits, resonance); digital techniques (binary numbers, NANDs, logic gates, and circuits); electronic subsystems (operational amplifiers, magnetoelectronics, optoelectronics); and understanding commercial electronic equipment. Lab experiments are designed to investigate the properties of discrete and integrated devices and use them to design and build circuits.

PHYS 2372. Lab for PHYS 2371. 1 Hour.

Accompanies PHYS 2371. Illustrates topics from the lecture course through various hands-on experimental projects. Covers the process of electronics design from a goal-oriented perspective. Students are expected to consider their own electronics design project and build a prototype device that accomplishes a specific purpose.

PHYS 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

PHYS 3600. Advanced Physics Laboratory. 4 Hours.

Introduces research through experiments that go beyond the simple demonstration of basic physical principles found in introductory physics courses. Data are taken to higher precision and the analysis is more in-depth. Experiments focus on lasers, fiber-optic communication, spectroscopy, Faraday rotation, speed of light, semiconductor physics, Hall effect, fuel cells, and Fourier analysis of music and sound. Lab reports are assessed on organization, format, grammar, and style. Offers students an opportunity to significantly improve their abilities in written scientific communication.

PHYS 3601. Classical Dynamics. 4 Hours.

Covers advanced topics in classical mechanics including vector kinematics, harmonic oscillator and resonance, generalized coordinates, Lagrange's equations, central forces and the Kepler problem, rigid body motion, and mathematical methods in physics.

PHYS 3602. Electricity and Magnetism. 4 Hours.

Covers electrostatics and dielectric materials, magnetostatics and magnetic materials, currents in conductors, induction, displacement currents, computer solutions of EM problems, and Maxwell's equations.

PHYS 3603. Electromagnetic Waves and Optics. 4 Hours.

Focuses on electromagnetic waves in vacua and matter, electrodynamics and radiation, and computer visualization of electromagnetic fields. Also considers special relativity.

PHYS 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

PHYS 4606. Mathematical and Computational Methods for Physics. 4 Hours.

Covers advanced mathematical methods topics that are commonly used in the physical sciences, such as complex calculus, Fourier transforms, special functions, and the principles of variational calculus. Applies these methods to computational simulation and modeling exercises. Introduces basic computational techniques and numerical analysis, such as Newton's method, Monte Carlo integration, gradient descent, and least squares regression. Uses a simple programming language, such as MATLAB, for the exercises.

PHYS 4621. Biological Physics 1. 4 Hours.

Offers an introduction to biophysics focusing on development and implementation of physical models for various biophysical processes that occur in living organisms and in living cells. Topics covered, some of which are explored through computational examples, include thermodynamics of solutions and cells, randomness, diffusion, entropy, membranes, electrostatics, and electricity in cells.

PHYS 4623. Medical Physics. 4 Hours.

Introduces the physical principles and basic mathematical methods underlying the various modalities of medical imaging. These include computed tomography (CT), magnetic resonance (MRI), positron emission tomography (PET), single-photon emission tomography (SPECT), and ultrasound. Covers nuclear physics and the interaction of radiation with biological matter with application to radiation therapy.

PHYS 4651. Medical Physics Seminar 1. 4 Hours.

Offers the first part of a seminar series conducted by expert practitioners from Boston-area hospitals. Examines the clinical applications of medical imaging methods (CT, MRI, and PET), the clinical applications of radiation therapy, and the clinical applications of lasers and optical techniques. Includes site visits to local hospitals and medical instrumentation companies.

PHYS 4652. Medical Physics Seminar 2. 4 Hours.

Continues PHYS 4651. Further examines the clinical applications of medical imaging methods (CT, MRI, and PET), the clinical applications of radiation therapy, and the clinical applications of lasers and optical techniques.

PHYS 4970. Junior/Senior Honors Project 1. 4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student's major field. Combined with Junior/Senior Project 2 or college-defined equivalent for 8-credit honors project. May be repeated without limit.

PHYS 4971. Junior/Senior Honors Project 2. 4 Hours.

Focuses on second semester of in-depth project in which a student conducts research or produces a product related to the student's major field. May be repeated without limit.

PHYS 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

PHYS 4991. Research. 4 Hours.

Offers an opportunity to conduct research under faculty supervision.

PHYS 4992. Directed Study. 1-4 Hours.

Offers independent work under the direction of a member of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

PHYS 4996. Experiential Education Directed Study. 4 Hours.

Draws upon the student's approved experiential activity and integrates it with study in the academic major. Restricted to those students who are using it to fulfill their experiential education requirement. May be repeated without limit.

PHYS 5111. Astrophysics and Cosmology. 4 Hours.

Introduces current ideas in astrophysics and cosmology, with emphasis on recent advances in this field. Topics include tools of the astronomer (telescopes, spectroscopy, and methods of distance measurement); the solar system; stellar properties (stellar spectra, stellar energy sources including gravitational or nuclear); Hertzsprung-Russell diagram; evolution of stars (birth, life, and ultimate collapse); our Milky Way galaxy; and extragalactic objects (galaxies, clusters of galaxies, radio galaxies, and quasars); cosmology (Olber's paradox, recession of galaxies, big bang theory, cosmic background radiation, formation of galaxies, and the future of the universe).

PHYS 5113. Introduction to Particle and Nuclear Physics. 4 Hours.

Introduces the physics of atomic nuclei and elementary particles. Topics include classification of nuclei, strong and weak nuclear forces, mesons and nucleons, quarks and gluons, and unified theories of elementary particle interactions.

PHYS 5115. Quantum Mechanics. 4 Hours.

Focuses on observations of macroscopic and microscopic bodies. Covers the uncertainty principle and wave-particle duality; probability amplitudes; Schrödinger wave theory and one-dimensional problems, Schrödinger equation in three dimensions; and angular momentum and the hydrogen atom.

PHYS 5116. Complex Networks and Applications. 4 Hours.

Introduces network science and the set of analytical, numerical, and modeling tools used to understand complex networks emerging in nature and technology. Focuses on the empirical study of real networks, with examples coming from biology (metabolic, protein interaction networks), computer science (World Wide Web, Internet), or social systems (e-mail, friendship networks). Shows the organizing principles that govern the emergence of networks and the set of tools necessary to characterize and model them. Covers elements of graph theory, statistical physics, biology, and social science as they pertain to the understanding of complex systems.

PHYS 5117. Astrophysics. 4 Hours.

Applies physics concepts to processes in celestial objects, particularly stars. Topics include tools of the astronomer (telescopes, spectroscopy, and methods of distance measurement); stellar properties; nuclear fusion reactions; hydrostatic equilibrium and stellar models; stellar evolution and the Hertzsprung-Russell diagram; morphology and dynamics of galaxies; and high-energy astrophysical phenomena. Not open to students who have completed PHYS 5111.

PHYS 5118. General Relativity and Cosmology. 4 Hours.

Introduces basic concepts in the general theory of relativity, including Riemannian geometry and Einstein's field equations. These concepts are applied in studying the standard model of cosmology. Topics include thermodynamics in an expanding universe, dark matter and dark energy, and modern theories of cosmology. Not open to students who have completed PHYS 5111.

PHYS 5260. Introduction to Nanoscience and Nanotechnology. 4 Hours.

Focuses on reviewing the basic scientific concepts relevant to this field and also gives a broad overview of the current state-of-the-art in research and technology. Nanotechnology promises to transform twenty-first century technology by exploiting phenomena exhibited by nanoscaled materials. This technology is expected to have significant impact in diverse areas such as computers, electronics, health, etc. Successful technological advancement of this field requires that we have a fundamental understanding of the "science" of these materials. This course comprises a series of lectures on various topics: development of nanofabrication methods, advanced microscopy techniques, fabrication of novel nanomaterials, investigation of their fundamental properties and device applications. Provides a strong introduction for students interested in nanoscience and technology.

PHYS 5318. Principles of Experimental Physics. 4 Hours.

Designed to introduce students to the techniques of modern experimental physics. Topics include communication and information physics, signal processing and noise physics, applied relativity physics, detector techniques, semiconductor and superconductor physics, nanoscale microscopy and manipulation, and lasers and quantum optics.

PHYS 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

PHYS 7200. Methods of Advanced Problem Solving. 4 Hours.

Designed to improve the ability of students to solve physics problems, which are of the same degree of difficulty as problems that often appear on the qualifying exam.

PHYS 7210. Introduction to Research in Physics. 0 Hours.

Offers a weekly seminar to introduce first- and second-year physics graduate students to research being done in the Physics department by advanced physics graduate students and faculty. May be repeated without limit.

PHYS 7220. Methods for Teaching in the Introductory Physics Laboratory. 0 Hours.

Introduces first-year physics graduate students to the role of teaching assistant (TA) in the laboratory. Designed to prepare TAs for the experiments they are required to teach undergraduate students. Focuses on improving their teaching and grading effectiveness.

PHYS 7301. Classical Mechanics/Math Methods. 4 Hours.

Covers mathematical methods of physics and classical mechanics. Topics include differential equations, boundary value problems, functions of a complex variable, linear vector spaces, Green's functions, Lagrangian and Hamiltonian mechanics, linear oscillators, and scattering. May include additional topics as time permits.

PHYS 7302. Electromagnetic Theory. 4 Hours.

Analyzes Maxwell's equations in vacuum and special relativity. Topics include electric and magnetic fields due to known sources with boundary conditions, radiation fields, bremsstrahlung, synchrotron radiation, the energy-momentum tensor for the electromagnetic field, fields in material media, boundary conditions at the interface between two media, and scattering of radiation. May include additional topics as time permits.

PHYS 7305. Statistical Physics. 4 Hours.

Briefly reviews thermodynamics. Topics include the principles of statistical mechanics and statistical thermodynamics; density matrix; theory of ensembles; Fermi-Dirac and Bose-Einstein statistics, application to gases, liquids, and solids; theory of phase transitions; and thermodynamics of electric and magnetic systems, transport phenomena, random walks, and cooperative phenomena.

PHYS 7315. Quantum Theory 1. 4 Hours.

Explores the experimental basis of quantum theory, the Schrödinger equation, and probability interpretation of wave mechanics. Topics include the uncertainty principle, application to one-dimensional problems, the harmonic oscillator, orbital angular momentum, and the central force problem.

PHYS 7316. Quantum Theory 2. 4 Hours.

Continues PHYS 7315. Topics include quantum theory of scattering; Born approximation; phase-shift analysis; introduction to S-matrix theory; general formulation quantum mechanics in Hilbert space; spin; identical particles and symmetrization principle; time-independent and time-dependent perturbation theory; semiclassical theory of radiation and atomic spectra; addition of angular momentum; Wigner-Eckart theorem; quantum theory of radiation; and absorption, emission, and scattering of photons. Also introduces free particle Dirac equation.

PHYS 7321. Computational Physics. 4 Hours.

Covers basic numerical methods for differentiation, integration, and matrix operations used in linear algebra problems, discrete Fourier transforms, and standard and stochastic ordinary and partial differential equations. Specific applications of these methods may include classical chaos, computation of eigenstates of simple quantum systems, classical phase transitions, boundary value problems, pattern formation, and molecular dynamics and classical/quantum Monte Carlo methods to simulate the equilibrium and nonequilibrium properties of condensed phases.

PHYS 7323. Elementary Particle Physics. 4 Hours.

Presents a survey of the present state of elementary particle physics, suitable for all graduate students. Topics include overview of strong interactions and their connection to nuclear physics; nonrelativistic quark structure of strongly interacting particles (hadrons); color and the SU(3) Yang-Mills theory of strong interactions; coupling constant renormalization and asymptotic freedom; and the parton model of scattering. Covers weak interactions including phenomenology of the Fermi V-A theory; universality; and neutrino scattering. Studies the Glashow-Weinberg-Salam theory including unification of weak and electromagnetic interaction, neutral currents, the Higgs mechanism, quark masses and mixing, neutrino masses, and neutrino oscillation. Offers experimental support for the standard model. Also examines supersymmetry including the hierarchy problem and broken supersymmetry; role of supersymmetry in cosmology.

PHYS 7324. Condensed Matter Physics. 4 Hours.

Explores condensed matter physics. Topics include Drude and Sommerfeld models of electrons in metals, crystal structure, one-electron states in crystal lattices, Bloch's theorem, semiclassical theory of conduction, semiconductors and semiconducting devices, effects of electron-electron interactions, lattice vibrations and the classical and quantum theories of specific heat, optical properties of solids, investigation of crystal structure and excited states of crystals by x-ray and neutron scattering, simple transport theory based on the Boltzmann equation, and magnetic properties of solids.

PHYS 7325. Quantum Field Theory 1. 4 Hours.

Introduces the principles of quantum field theory. Topics include canonical quantization of scalar and spinor fields, functional integral methods, perturbation theory, regularization and renormalization, and symmetry breaking. Emphasizes applications to particle physics and condensed matter phenomena.

PHYS 7326. Quantum Field Theory 2. 4 Hours.

Presents the quantum theory of gauge fields and their interactions, as well as advanced topics in quantum field theory. Additional topics covered may include Lie groups and Yang-Mills theory, asymptotic freedom, perturbation theory anomalies, and applications to phase transitions.

PHYS 7331. Network Science Data. 4 Hours.

Offers an overview of data mining and analysis and techniques in network science. Introduces students to network data analysis. Presents algorithms for the characterization and measurement of networks (centrality based, decomposition, community analysis, etc.) and issues in sampling and statistical biases. Reviews visualization algorithms and specific software tools. Offers students an opportunity to learn about working with real-world network datasets.

PHYS 7332. Network Science Data 2. 4 Hours.

Focuses on practical exercises in real network data. Offers students an opportunity to learn how to retrieve network data from the real world, analyze network structures and properties, study dynamical processes on top of the networks, and visualize networks. The main programming language used in this course is the current industry standard. This is an interdisciplinary course.

PHYS 7335. Dynamical Processes in Complex Networks. 4 Hours.

Immerses students in the modeling of dynamical processes (contagion, diffusion, routing, consensus formation, etc.) in complex networks. Includes guest lectures from local and national experts working in process modeling on networks. Dynamical processes in complex networks provide a rationale for understanding the emerging tipping points and nonlinear properties that often underpin the most interesting characteristics of socio-technical systems. The course reviews the recent progress in modeling dynamical processes that integrates the complex features and heterogeneities of real-world systems.

PHYS 7337. Statistical Physics of Complex Networks. 4 Hours.

Covers applications of statistical physics to network science. Focuses on maximum-entropy ensembles of networks and on applicability of network models to real networks. Main topics include microcanonical, canonical, and grand canonical ensembles of networks, exponential random graphs, latent variable network models, graphons, random geometric graphs and other geometric network models, and statistical inference methods using these models. Covers applications of maximum-entropy geometric network models to efficient navigation in real networks, link prediction, and community structure inference.

PHYS 7731. Biological Physics 1. 4 Hours.

Introduces the major classes of biological macromolecules and the physics underlying their structure, interaction, and biological function. Emphasis is on physical techniques for characterizing the structure and dynamics of proteins. Students are required to present a written and oral report on a focused research topic in molecular biophysics, based on a critical review of current scientific literature. Topics may include introduction to biomolecular structure, aqueous solution physics and hydrophobic interactions, chemical thermodynamics and reaction dynamics, spectroscopic techniques, molecular force measurements, and protein dynamics.

PHYS 7733. Topics: Elementary Particle Physics and Cosmology. 4 Hours.

Covers unified theories including evidence for supersymmetric SU(5) unification of couplings, and the grand unified scale and proton decay. Discusses particle physics and cosmology including a brief introduction to Einstein's theory of general relativity, candidates for dark matter, inflation and the primordial fluctuations, and the problem of the cosmological constant. Examines developments leading to string theory including normal mode expansion; open and closed strings; deduction of D-26 for bosonic and D-10 for superstrings; scattering amplitudes in strings; heterotic string; compactifications on the torus, orbifolds, and Calabi-Yau manifolds; 4-D strings; and superstring phenomenology. Explores physics with extra dimensions including gravity at small distances, branes, and new approaches to the hierarchy problem. May be repeated without limit.

PHYS 7734. Topics: Condensed Matter Physics. 4 Hours.

Covers selected advanced topics in the theory of solids to be chosen each time by the interested students and instructor. Topics may include theory of normal metals, Hartree-Fock and random phase approximations, optical and transport properties, solid-state plasmas, Raman spectroscopy, quasiparticles and collective excitations, quantum solids, and amorphous solids. May be repeated without limit.

PHYS 7741. Biological Physics 2. 4 Hours.

Continues PHYS 7731. The first part of the course provides a foundation necessary to construct and implement models of neurons and networks of neurons. Topics include Hodgkin-Huxley form of the kinetical equations, single neuron models, dynamics of synapses, plasticity of synaptic strength, and neuromodulators. The second part covers nonlinear time series analysis and nonlinear dynamics in neuroscience. The goal is to provide a set of tools to analyze and model large multidimensional data sets encountered in many biological/neuroscience experiments. Topics include data testing of nonlinearity construction of linear and nonlinear models; spike sorting using independent component analysis and clustering algorithms; and analysis of continuous time series.

PHYS 7962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

PHYS 7976. Directed Study. 1-4 Hours.

Offers independent work under the direction of a member of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

PHYS 7990. Thesis. 1-4 Hours.

Undertakes a master's thesis in a selected topic in experimental or theoretical physics. Written thesis required. May be repeated without limit.

PHYS 9000. PhD Candidacy Achieved. 0 Hours.

Indicates successful completion of the doctoral comprehensive exam.

PHYS 9984. Advanced Research. 1-8 Hours.

Provides an opportunity for advanced students to work with an individual instructor on a topic related to current research. The instructor and student negotiate a written agreement as to what topic(s) are covered and what written or laboratory work forms the basis for the grade. Viewed as a lead-in to thesis research. May be repeated without limit.

PHYS 9986. Research. 0 Hours.

Offers an opportunity to conduct full-time research under faculty supervision. May be repeated without limit.

PHYS 9990. Dissertation. 0 Hours.

Offers experimental and theoretical work for PhD candidates. Requires written thesis and final oral exam. May be repeated once.

PHYS 9996. Dissertation Continuation. 0 Hours.

Offers experimental and theoretical work for PhD candidates. Requires written thesis and final oral exam. May be repeated without limit.

Physics - CPS (PHY)

Search PHY Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=PHY>)

PHY 1200. Physics 1. 3 Hours.

Offers the first semester of a two-semester introduction to algebra-based physics. Emphasizes the underlying concepts and principles of Newtonian physics and fluids. Introduces measurement, estimating, and Newtonian mechanics. Topics covered include kinematics, dynamics, translational motion, vectors, circular motion, gravitation, work, energy, power, momentum, and rotational motion. Further topics covered include static equilibrium, elasticity and fracture, fluids, vibrations, waves, and sound.

PHY 1201. Lab for PHY 1200. 1 Hour.

Accompanies PHY 1200. Covers topics from the course through various experiments.

PHY 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

PHY 2200. Physics 2. 3 Hours.

Offers the second semester of a two-semester introduction to algebra-based physics. Emphasizes the underlying concepts and principles of electricity and thermodynamics. Introduces temperature, the kinetic theory of matter, heat, the laws of thermodynamics, electricity, and Coulomb's law. Topics covered include electric charge and fields, electric potential, electric current circuits, electric capacitance, magnetic forces and fields, and electromagnetic induction. Further topics covered include alternating current circuits, magnetism, electromagnetic waves, the nature of light, and geometric optics.

PHY 2201. Lab for PHY 2200. 1 Hour.

Accompanies PHY 2200. Covers topics from the course through various experiments.

PHY 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

PHY 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

PHY 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

PHY 4992. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic.

PHY 4993. Independent Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic.

PHY 4994. Internship. 1-4 Hours.

Provides students with an opportunity for internship work.

PHY 4995. Practicum. 1-4 Hours.

Provides eligible students with an opportunity for practical experience.

PHY 4996. Experiential Education Directed Study. 1-4 Hours.

Draws upon the student's approved experiential activity and integrates it with study in the academic major.

PHY 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

Physics - CPS Specialty (PHYC)

Search PHYC Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=PHYC>)

PHYC 1010. Physics for Engineers 1. 4 Hours.

Offers a first semester of physics for science and engineering students. Focuses on the study of mechanics, including descriptions of motion (one-, two-, and three-dimensional), Newton's Laws, conservation of energy and momentum, rotation of rigid bodies, fluids, oscillations, and static equilibrium.

PHYC 1011. Lab for PHYC 1010. 1 Hour.

Accompanies PHYC 1010. Covers topics from the course through various experiments.

Political Science (POLS)

Search POLS Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=POLS>)

POLS 1000. Political Science at Northeastern. 1 Hour.

Introduces first-year political science majors to the discipline, the department, and the University as a whole; familiarizes students with the skills needed for success as a university student.

POLS 1150. American Government. 4 Hours.

Analyzes the system of politics and government in the United States. Topics include the philosophical basis, historical origins, design, and functioning of the Constitution as well as formal government institutions. Examines the influence of public opinion, political behavior and participation, parties, and interest groups.

POLS 1151. Recitation for POLS 1150. 0 Hours.

Provides small-group discussion format to cover material in POLS 1150.

POLS 1155. Comparative Politics. 4 Hours.

Presents a comparative study of political organization and behavior in a range of countries beyond the United States. Topics includes political culture, political economy, governing institutions, leadership, and political participation.

POLS 1156. Recitation for POLS 1155. 0 Hours.

Provides small-group discussion format to cover material in POLS 1155.

POLS 1160. International Relations. 4 Hours.

Introduces a broad study of international relations, encompassing both theoretical perspectives and empirical knowledge. Reviews the role of states as well as international and nongovernmental organizations in dealing with security and war, terrorism, human rights, trade, globalization, and environmental protection, among other important contemporary issues.

POLS 1161. Recitation for POLS 1160. 0 Hours.

Provides small-group discussion format to cover material in POLS 1160.

POLS 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

POLS 2282. The Holocaust and Comparative Genocide. 4 Hours.

Examines the origins of the Holocaust, perpetrators and victims, and changing efforts to come to terms with this genocide. The Holocaust, the murder of 6 million Jews by Germans in Nazi-occupied Europe during World War II, is one of the crucial events of modern history. Investigates the uniqueness of the Holocaust relative to other acts of ethnic cleansing or genocide, including mass death in the New World and mass murder in Armenia, Bosnia, and Rwanda. HIST 2282 and POLS 2282 are cross-listed.

POLS 2325. Ancient Philosophy and Political Thought. 4 Hours.

Examines the philosophers of classical Greece, primarily Socrates, Plato, and Aristotle. These philosophers examined the nature of the material world, of the city, and of the person. The course takes up both the moral and political writings as well as the metaphysical writings. Devotes considerable attention to major works such as Plato's *Republic*. Some time is given to early Greek philosophers, to the Sophists, and to later developments. Requires written analysis of philosophical texts. PHIL 2325 and POLS 2325 are cross-listed.

POLS 2328. Modern Political Thought. 4 Hours.

Introduces students to a range of authors who are considered to be most influential in shaping Western political thought and who remain highly relevant in informing contemporary political debate. Offers students an opportunity to think critically about some of the fundamental questions pertaining to political practice—the nature of ideas, institutions, and processes and how to understand and evaluate them.

POLS 2330. American Political Thought. 4 Hours.

Analyzes the fundamental ideas in U.S. political thought that have shaped U.S. political institutions and policies, including liberalism, neoliberalism, conservatism, and nationalism. Examines the historic roots of each viewpoint and their impact. Major topics may include Locke and the liberal tradition, republicanism, Puritan political thought, the American Revolution, the writing of the Constitution, the growth of federal power, executive power, judicial review, and the debate over slavery. Explores the ongoing interaction of political thought and the political process in contemporary U.S. society.

POLS 2332. Contemporary Political Thought. 4 Hours.

Introduces students to a range of positions in contemporary political theory, familiarizing them with key texts, authors, and debates, such as those concerning critiques of power, global justice, and pluralism. Explores a range of methodological and theoretical approaches associated with these texts and examines some of their implications in the assessment of modern societies, their values, and institutional arrangements. Offers students an opportunity to develop the ability to critically reflect on the nature and scope of political discourse.

POLS 2333. Politics and Film. 4 Hours.

Analyzes interconnections between politics and film. Considering film as a political tool, includes such topics as political satire, propaganda, war, censorship, and nationalism. Case examples emphasize current events and contemporary issues.

POLS 2334. Bureaucracy and Government Organizations. 4 Hours.

Examines the general principles underlying the structures, processes, and operation of public organizations. Examines the role of bureaucracies within the larger political system as well as how public agencies develop and change over time.

POLS 2335. Budgeting and Taxation. 4 Hours.

Focuses on the politics of budgeting and taxation in the United States, with a particular emphasis on the federal government. Analyzes budgetary processes, participants, and outcomes as well as policy reforms. State, local, and comparative budgeting are also discussed.

POLS 2340. Business and Government. 4 Hours.

Surveys the relationship between economics and politics in the United States. Considers the role of government in a market economy including the efforts to manage economic growth, prevent monopoly, promote social welfare, and balance the power of business with the demands of democracy.

POLS 2345. Urban Policies and Politics. 4 Hours.

Analyzes the political, administrative, economic, and social dynamics of urban areas. Highlights the diversity of political institutions and practices in American cities. Introduces key policy areas at the city level such as land use, economic development, and education.

POLS 2350. State and Local Politics. 4 Hours.

Examines the political and administrative context of the state and local government in the United States; surveys the structure, function, and politics of states and localities within the context of the U.S. federal system; and highlights the diversity of political institutions and practices at the state and local levels.

POLS 2355. Intergovernmental Relations. 4 Hours.

Analyzes the relationship among national, state, and local levels of government in the United States and the changing patterns of those relationships. Highlights the political, legal, and fiscal nature of intergovernmental relations.

POLS 2356. Democratic Erosion. 4 Hours.

Presents the theoretical and empirical tools to critically and systematically address the urgent political question: Is democracy under threat in the United States and around the world, or are contemporary concerns about global democratic erosion overstated? By engaging in theories of democratic consolidation and backsliding, offers students an opportunity to build an understanding of the causes, symptoms, and consequences of democratic erosion. Examines a range of country cases in comparative perspective so that students can then evaluate the robustness of democratic institutions across regions including Eastern Europe, Latin America, and Sub-Saharan Africa, as well as the United States. Also explores the theme of democratic resilience by examining the case of India during the 1970s. .

POLS 2357. Growth and Decline of Cities and Suburbs. 4 Hours.

Introduces students to the field of urban studies. Focuses on these central issues: how cities and suburbs evolve, what makes a city or suburb a good place to live, and how cities and suburbs are (or are not) planned. Students review the ways in which urban scholars and practitioners study cities and suburbs, their research methodologies, definition of issues, and division of labor among different disciplines. Students explore the roles of individuals, communities, the private sector, and government in planning and shaping the city.

POLS 2358. Current Issues in Cities and Suburbs. 4 Hours.

Introduces students to pressing urban issues: urban sprawl, poverty, education, transportation, economic development, and housing, through an intensive analysis of the Boston metropolitan area. The course is cotaught by university faculty and practitioners in government, community, and nonprofit organizations throughout the metropolitan area. Offers students the opportunity to analyze Boston data, go on outings to see development in progress, talk with urban practitioners about what they do, and conduct research on an urban issue of their choice.

POLS 2360. Politics of Poverty. 4 Hours.

Explores how and why there is poverty, how it affects people's lives, and how it can be eliminated. Examines the relations between poverty, racial and ethnic factors, and the economic, political, and administrative systems. Evaluates a number of alternatives and provides an opportunity for clarifying individual assumptions and feelings about poverty.

POLS 2368. Music and Politics in America and Abroad. 4 Hours.

Explores the role of music in politics and the extent to which songs and their performers shape, frame, or otherwise influence political thought among audiences and listeners. Emphasizes contemporary themes and genres, with particular attention to protest songs. Examples are taken both from the United States and abroad.

POLS 2370. Religion and Politics. 4 Hours.

Explores the role of religion to domestic and international politics. Examines religion as a source of political tension and strife. Draws examples from the United States and the developing world. Covers Islamic fundamentalism in Africa and the Near East, Orthodox Jewish parties in Israel, Catholic liberation theology in Latin America, and Protestant fundamentalism and the religious right in the United States.

POLS 2375. Gender and Politics. 4 Hours.

Explores the relation between what is and what ought to be—and why—in the roles of women in American politics. Examines the traditional roles of women in politics, the suffrage movement, the woman as citizen and voter, the role of gender in achieving power and in political efficacy, and the place of women in politics. Also covers political action to promote women's issues and modern feminism.

POLS 2385. U.S. Health and Welfare Policy. 4 Hours.

Introduces students to U.S. social welfare policy. Emphasizes contemporary debates over welfare, mental health, healthcare, education, and Social Security reform. Examines key issues and processes related to the politics, design, and implementation of public policy in the context of the American governmental system. Incorporates multiple media and methods of instruction into the course, including lectures, in-depth class discussions, and documentary films.

POLS 2390. Science, Technology, and Public Policy. 4 Hours.

Considers the role of science and technology in the policymaking process, not only as a tool but also as a subject of policymaking. Cases include government involvement in innovation and economic growth, the role of the military in the development of science and technology, the governance and regulation of the effects of scientific and technological progress, public funding of science and technology, and ethical aspects of science and technology, including the emerging focus on anticipatory and participatory governance.

POLS 2395. Environmental Politics and Policy. 4 Hours.

Examines the political forces, governmental institutions, socioeconomic factors, and global trends that shape environmental policy at national and subnational levels in the United States. A spectrum of different environmental issues is discussed, with some comparison of policy activity in the U.S., other nations, and at the global level.

POLS 2399. Research Methods in Political Science. 4 Hours.

Examines the range of research methods and designs used in political science, based on applying the logic of social scientific inquiry. Reviews experimental research, comparative methods, case studies, interviewing, surveys, program evaluation, and other topics relevant to the discipline, as well as questions related to the practice of research ethics. Course activities include intensive writing assignments by students. Requires prior completion of at least two of the following courses: POLS 1150, POLS 1155, and POLS 1160.

POLS 2400. Quantitative Techniques. 4 Hours.

Studies methods of quantitative analysis including descriptive statistics, hypothesis testing, cross-tabulation, analysis of variance, bivariate regression and correlation, and multiple regression. Examines how to generate and interpret statistical findings through use of Excel, SPSS, and/or other software programs. Uses examples from political behavior, public policy analysis, public opinion, comparative and international politics, and other areas of political and social-science inquiry to emphasize practical applications.

POLS 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

POLS 2991. Research Practicum. 2-4 Hours.

Involves students in collaborative research under the supervision of a faculty member. Offers students an opportunity to learn basic research methods in the discipline. Requires permission of instructor. May be repeated once for up to 4 total credits.

POLS 3100. Gender, Social Justice, and Transnational Activism. 4 Hours.

Introduces key issues, themes, and debates in feminist transnational theory, practice, and activism in contemporary contexts and how it has changed under socioeconomic, political, and cultural processes of globalization. Examines differences among women relating to race, class, sexuality, national identity, and political economy in reckoning with possibilities for sustainable social justice. Students interrogate the relationship between the local and global; the production of knowledge in different regional spaces; the pragmatics of political mobilization; the varying contours of "social justice"; and other key issues. Offers students an opportunity to discuss the impact of globalization, neoliberalism, and state and intimate violence on gendered politics and relations and to contend with the politics of difference, to debate its challenges, and to imagine possible futures for transnational gender justice. POLS 3100, SOCL 3100, and WMNS 3100 are cross-listed.

POLS 3160. Campaign Strategy. 4 Hours.

Introduces students to the art of political campaigning in primary or general elections. Utilizes a case-study format to approach various aspects of campaign strategy by analyzing successful and unsuccessful campaigns.

POLS 3162. Local Campaigns and Elections. 4 Hours.

Introduces students to the politics of local campaigns and elections. Studies the history of local electoral systems. Utilizing outcomes of recent local elections, offers students an opportunity to analyze the role of voting behavior, campaign strategies, and money in shaping local campaigns and elections.

POLS 3300. The U.S. Congress. 4 Hours.

Explores the structures, dynamics, and styles inherent in public policymaking within the U.S. Congress. Focuses on elections; representations of constituents' interests; the roles that participants play: the president, interest groups, and others; and how all of this is affected by the structure of Congress and the process embedded in the legislative body.

POLS 3302. Judicial Process and Behavior. 4 Hours.

Examines the nature of the judiciary in the United States. Focuses on courts and various aspects of the judicial process, including judicial selection, judicial decision making, the impact of judicial decisions on society, and public opinion of courts. After exploring, from various methodological perspectives, how and why courts behave as they do, the course turns its attention to questions about the role of courts in U.S. politics.

POLS 3304. Presidential Nominating Process. 4 Hours.

Offers students an in-depth examination of the process the two major American parties use to nominate their presidential candidates. Major topics include the history and evolution of the presidential nomination process; the contemporary rules regime; the behavior of candidates, voters, and the media; vice presidential selection; the role of the national conventions; and prospects for reform. Students who do not meet course prerequisites may seek permission of instructor.

POLS 3307. Public Policy and Administration. 4 Hours.

Analyzes the structure of and dynamics inherent in public policymaking and public administration in the United States. Introduces such concepts as problem definition, agenda development, policy formation, program implementation, and policy evaluation. Covers key issues in public administration including budgeting, personnel, and organizational design.

POLS 3309. Lesbian, Gay, Bisexual, and Transgender Issues in Public Policy. 4 Hours.

Examines the politics and public policies of the movement for equality and social justice for lesbian, gay, bisexual, and transgender (LGBT) people in a wide range of state and federal policy areas such as same-sex marriage, military service, family adoption rights, and employment discrimination protection. Reviews the political history of LGBT communities and the treatment of LGBT people since the 1920s in the United States and globally. Analyzes the policy debates by considering voting behavior, trends in public opinion toward LGBT issues, and the political incorporation of LGBT people in the United States and around the world. Students who do not meet course prerequisites may seek permission of instructor.

POLS 3310. Public Opinion, Voting, and Elections. 4 Hours.

Analyzes how Americans think about politics, how they vote, and how the rules of the U.S. electoral system affect electoral outcomes. Major topics include the nature and content of public opinion, mass partisanship, issues and issue voting, presidential and congressional elections, turnout and participation, campaign finance, and recent trends in U.S. electoral behavior.

POLS 3320. Politics and Mass Media. 4 Hours.

Analyzes several facets of the mass media: the role of newspapers, radio, television, and the Internet in public opinion formation; their use and effectiveness in political campaigns; their objectivity and/or bias in reporting the news; and their impact on public policymaking.

POLS 3324. Law and Society. 4 Hours.

Examines the sociological understanding of legal phenomena. Places special emphasis on the role of the law in cultural and social conflicts in American society.

POLS 3405. International Political Economy. 4 Hours.

Addresses international political economy and how we can understand the phenomenon of globalization. Introduces the interaction between international politics and international economics in industrial countries and in developing countries. Covers several theoretical approaches to international political economy. Then analyzes some of the classic issue areas of international trade relations; foreign direct investment and outsourcing; the international monetary and financial system and the role of international institutions; debt and financial crises; and poverty and inequality. Concludes with analysis of how international political economy issues relate to governance, development, and the politics of economic reform.

POLS 3406. International Law. 4 Hours.

Introduces international law and how it redefines and shapes world politics. Offers students an opportunity to learn about the cornerstones of this area of the law: the state, organizations and their legal personality, diplomatic relations, treaties, extraterritorial jurisdiction, extradition, human rights and humanitarian law, the law of the sea trade/economic law, and international criminal law with a focus on the world courts. Considers the degree to which international law is pervasive in the life of individuals and states alike.

POLS 3408. International Security. 4 Hours.

Examines pressing problems in international security that are on the agenda of nation-states and international and nongovernment organizations. Examples include armed violence, terrorism, organized crime, nuclear proliferation, poverty, infectious diseases, energy security, and environmental degradation. Responses are typically sought through international cooperation and the establishment of international norms that apply to complex problems reaching beyond the borders of any one state.

POLS 3409. Global Governance. 4 Hours.

Introduces the concept of global governance, summarizes the core architectural elements of global governance, and examines the key policy purposes and processes, as well as the principal challenges that affect international security. Prior to the creation of the United Nations, global governance hardly existed—relations among states were largely characterized by power politics, and international cooperation was circumscribed to a few areas. Since the foundation of the United Nations, ever denser networks of international regimes were formed encompassing security policy, trade, finance, environment, human rights, the oceans, and diplomacy and covering all aspects of the life of states, which affects and alters international relations. Students who do not meet course prerequisites may seek permission of instructor.

POLS 3418. Nationalism. 4 Hours.

Explores contending theories of identity and nationalism—a powerful force in international and domestic politics. Examines topics such as the process of identity creation, the choice of national symbols, how group boundaries are established, the role of identity in conflict and state building, and the debate over nationalism's constructed or primordial nature. POLS 3418 and CLTR 3418 are cross-listed.

POLS 3420. U.S. National Security Policy. 4 Hours.

Analyzes U.S. national security policy, with an emphasis on traditional and nontraditional threats, including threats from state and nonstate actors. Studies the national security policy process with special attention to developing countermeasures as well as resilience.

POLS 3423. Terrorism and Counterterrorism. 4 Hours.

Examines some of the core debates over terrorism and counterterrorism. Topics include what constitutes terrorism, why people become terrorists, which targets they attack, whether nuclear terrorism is a serious threat, the extent to which terrorism helps the perpetrators, and their motives. From there, the course introduces the student to viable counterterrorism strategies. Permission of instructor required for students who do not meet prerequisite.

POLS 3425. U.S. Foreign Policy. 4 Hours.

Examines the formulation and conduct of U.S. foreign and national security policy, with major emphasis on the period following the end of the Cold War.

POLS 3430. Revolution, Civil War, and Insurrection. 4 Hours.

Explores various types of conflict settlements and their implications for peace and reconciliation. Why do civil wars break out in some places but not others? What does it take to start a revolution? Why do some conflicts last decades, and what can be done to mitigate their costs? Examines why civil conflicts begin, how they are fought, and how they end. Substantive topics include strategies of insurgency and counterinsurgency; the role of ethnicity, religion, and gender; and the relationship between economic factors and conflict. Students leverage fundamental concepts and theories in comparative politics to analyze civil conflicts in a wide range of country contexts.

POLS 3435. Politics and Governance of Europe and the European Union. 4 Hours.

Examines contemporary political and governance issues in Europe and their impact on Europe's present and future. In addition to considering the values and institutions underlying the European Union's regional structure, including political, economic, military, social, monetary, and financial issues, the course also examines the issue of European identity and the impact of globalization on Europe.

POLS 3465. Government and Politics in the Middle East. 4 Hours.

Examines political, economic, military, and ideological factors within the Arab states and Israel, inter-Arab politics, pan-Arabism, the Arab-Israeli conflict, and the great power rivalry in the region.

POLS 3470. Arab-Israeli Conflict. 4 Hours.

Explores the history and politics of the Arab-Israeli conflict, examining the origins of the conflict, its development over time, the key events that have shaped it, and the different narratives and perceptions of these events. Offers students an opportunity to learn about the conflict from the emergence of Zionism and Arab nationalism up to present day. Emphasizes the Israeli-Palestinian dimension of the conflict.

POLS 3487. Politics of Developing Nations. 4 Hours.

Examines the political, governmental, social, economic, cultural, environmental, and geopolitical dimensions of change in nations regarded as "developing" by international standards. Covers a broad spectrum of types of nations including those in Eastern and Central Europe but pays particular attention to those in Asia, Africa, and Central and South America.

POLS 3500. Sexuality, Gender, and the Law. 4 Hours.

Examines the legal regulation of gender and sexuality. Investigates concrete legal cases to study the history of constitutional interpretation and the current status of rights for women and sexual minorities. Focuses on important theoretical issues emerging in the writings of diverse feminist and queer legal scholars. Addresses debates over the value of conventional equality approaches in legal doctrine; equality vs. difference perspectives; ways in which legal language constructs gender and sexuality; the incorporation of sexuality and gender in ideologies of law; and the intersections of gender, sexuality, and race in legal doctrine and legal theory. PHIL 3500, POLS 3500, and WMNS 3500 are cross-listed.

POLS 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

POLS 4500. U.S. Constitutional Law. 4 Hours.

Uses U.S. Supreme Court decisions and other reading materials to analyze theoretical, structural, and substantive issues inherent in, and relevant to, the American constitutional system.

POLS 4505. U.S. Civil Liberties. 4 Hours.

Uses United States Supreme Court decisions and other reading material to examine the substantive and procedural guarantees of the Bill of Rights and the Fourteenth Amendment and their relation to a liberal democratic society.

POLS 4575. Special Topics: U.S. Politics. 4 Hours.

Analyzes the constitutional, political, economic, and societal dimensions of selected contemporary public issues in U.S. politics. May be repeated without limit.

POLS 4580. Special Topics: Comparative Politics and International Relations. 4 Hours.

Analyzes the constitutional, political, economic, and societal dimensions of selected contemporary public issues in comparative politics and international relations. May be repeated without limit.

POLS 4701. Political Science Senior Capstone. 4 Hours.

Integrates and assesses the concepts and skills developed by students throughout the political science curriculum, including both experiential and classroom-based components. Requires extensive reflection by students on their various educational experiences as well as research projects involving individual and group presentations. Topics include contemporary political issues and relevant literature in the discipline of political science. Consideration is also given to career options for political science students. Required for political science majors and fulfills part of the experiential education requirement.

POLS 4702. Senior Thesis Preparation. 4 Hours.

Offers students an opportunity to conduct a significant research project under faculty supervision on a topic within the discipline of political science. Research question is formulated and analyzed through data gathering and a review of relevant literature in political science and related fields. This is the first semester of research for the senior thesis.

POLS 4703. Senior Thesis. 4 Hours.

Offers students an opportunity to conduct a significant research project under faculty supervision on a topic within the discipline of political science. Research question is formulated and analyzed through data gathering and a review of relevant literature in political science and related fields.

POLS 4910. Model United Nations. 4 Hours.

Introduces students to model simulations as a means of learning about international relations, diplomacy, and international organizations. Offers students an opportunity to conduct research and represent countries in current and historical simulations of the United Nations, U.N. organizations/agencies, regional international organizations, and joint cabinet crisis scenarios. Participating students have an opportunity to be selected for an off-campus competitive conference experience. May be repeated without limit.

POLS 4915. Model Arab League. 4 Hours.

Offers students an opportunity to participate in teams that research assigned nations and represent those nations in a model Arab League role-playing exercise. Students may be selected to represent Northeastern University at the regional or national Model Arab League conferences in Washington, D.C., and different states. May be repeated without limit.

POLS 4918. Model NATO. 4 Hours.

Offers students an opportunity to participate in teams that research assigned nations and represent those nations in a model role-playing exercise of the North Atlantic Treaty Organization (NATO). Students may be selected to represent Northeastern University at the National Model NATO program in Washington, D.C. May be repeated up to two times.

POLS 4937. Dialogue of Civilizations: Government and Politics Abroad. 4 Hours.

Examines government and politics in another country or region of the world through faculty-led travel to that country or region. Offers students an opportunity to enhance their knowledge of government and politics by attending and participating in various educational activities in the country of study. The course begins in the United States with an introduction to the country or region and concludes with activities that facilitate reflection and learning related to the experience abroad. May be repeated without limit.

POLS 4938. Dialogue of Civilizations: International Politics Abroad. 4 Hours.

Examines issues in international politics through faculty-led travel outside the United States. Offers students an opportunity to enhance their knowledge of international politics by attending and participating in various educational activities in another country. Course topics cover a range of interconnected global issues that go beyond states' borders, possibly including armed conflict, terrorism, organized crime, poverty, environmental degradation, the spread of nuclear weapons, and others. The course begins in the United States with an introduction to the relevant topics in international politics and concludes with activities that facilitate reflection and learning related to the experience abroad. May be repeated without limit.

POLS 4942. Internship in Politics. 4 Hours.

Gives students the opportunity to engage in a political or governmental internship under the supervision of a faculty member with departmental approval. Requires prior completion of 64 SH toward degree. May be repeated without limit.

POLS 4970. Junior/Senior Honors Project 1. 4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student's major field. Combined with Junior/Senior Project 2 or college-defined equivalent for 8-credit honors project. May be repeated without limit.

POLS 4971. Junior/Senior Honors Project 2. 4 Hours.

Focuses on second semester of in-depth project in which a student conducts research or produces a product related to the student's major field. May be repeated without limit.

POLS 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

POLS 4991. Research. 4 Hours.

Offers an opportunity to conduct research under faculty supervision. May be repeated once.

POLS 4992. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

POLS 4993. Independent Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

POLS 4996. Experiential Education Directed Study. 4 Hours.

Draws upon the student's approved experiential activity and integrates it with study in the academic major. Restricted to those students who are using it to fulfill their experiential education requirement. May be repeated without limit.

POLS 5976. Directed Study. 1-4 Hours.

Offers assigned reading under the supervision of a faculty member. May be repeated without limit.

POLS 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

POLS 6964. Co-op Work Experience. 0 Hours.

Provides eligible students with an opportunity for work experience. May be repeated without limit.

POLS 7200. Perspectives on Social Science Inquiry. 4 Hours.

Explores the philosophy of science and the scientific method as applied to the social sciences and political analysis. Considers individualist perspectives (that is, rational choice), group perspectives (pluralism), structural/institutional perspectives (class analysis), and postmodern critiques.

POLS 7201. Research Design. 4 Hours.

Provides an overview of research methods and tools used by social scientists including survey research, elite interviews, statistical approaches, case studies, comparative analysis, use of history, and experimental/nonexperimental design.

POLS 7202. Quantitative Techniques. 4 Hours.

Teaches the use of social science quantitative techniques, emphasizing applications of value to public sector analysts and scholars alike. Includes descriptive statistics, hypothesis testing, cross-tabulation, bivariate regression and correlation, and multiple regression. Examines how to generate and interpret statistical analyses through use of SPSS.

POLS 7204. Seminar in Public Policy. 4 Hours.

Provides a comprehensive introduction to key theoretical perspectives in the study of public policy. Includes different perspectives on policy change, policy formation, policy design, and policy implementation. Seeks to prepare students to apply a policy theory to their own research question.

POLS 7205. Seminar in American Government and Politics. 4 Hours.

Focuses on major research approaches and corresponding academic literature in U.S. politics. Examines the scholarly analysis of key actors in U.S. politics, including the presidency, Congress, the judiciary, and political parties.

POLS 7206. Seminar in Comparative Politics. 4 Hours.

Focuses on major research paradigms within comparative politics, including political culture, structuralism, and rational choice. Examines major research fields in the discipline, including democratization, nationalism, ethnic politics, political economy, and political parties.

POLS 7207. Seminar in International Relations. 4 Hours.

Focuses on major research approaches and corresponding academic literature in international relations. Examines major fields of study, including international security, international regimes, international organizations, globalization, and international political economy.

POLS 7257. The U.S. Judicial Process. 4 Hours.

Studies the judicial process in the United States, emphasizing federal courts. Focuses on theories and empirical research regarding judicial decision making, how and why judges decide what they do, and with what political effects.

POLS 7313. State Government. 4 Hours.

Appraises the problems of contemporary state government in the United States. Emphasizes the diversity of political institutions, political processes, and public policies in the states.

POLS 7325. Contemporary Issues in Third World Development. 4 Hours.

Examines the major themes in development studies today. Explores approaches to the development and production, population growth, equity and poverty, rural and urban development, health and nutrition, education, and the international context of development assistance. Students considering a development administration concentration should try to take this course as their first in the field of development.

POLS 7333. Science, Technology, and Public Policy. 4 Hours.

Discusses the impacts of breakthroughs in science and technology on politics and public policy making—and how politics in turn influences scientific research and technological development. Examines differences between scientific and democratic values, competing definitions of rationality, the nature of problems, policy-making processes, questions of intellectual property rights, and debates over risk assessment, including the "precautionary principle." Focuses primarily on the United States but with comparisons to the European Union and other areas of the world. Anchors discussion in such areas as (for example) biotechnology, nanotechnology, alternative energy sources, and artificial intelligence.

POLS 7334. Social Networks. 4 Hours.

Offers an overview of the literature on social networks, with literature from political science, sociology, economics, and physics. Analyzes the underlying topology of networks and how we visualize and analyze network data. Key topics include small-world literature and the spread of information and disease. Students who do not meet course prerequisites may seek permission of instructor.

POLS 7341. Security and Resilience Policy. 4 Hours.

Examines the post-9/11 evolution of security and the new emphasis on bolstering societal, infrastructure, system, and network resilience. Emphasizes the complex organizational; jurisdictional (international, federal, state, and local); private-sector; and civil-society issues associated with managing the risk of terrorism, cyber-attacks, and naturally occurring disasters. Topics include policy development and implementation of critical infrastructure protection, cybersecurity, supply chain security, disaster management, and community resilience.

POLS 7343. Counterterrorism. 4 Hours.

Examines the most important empirical and theoretical debates on counterterrorism. Analyzes the motives and strategies of key actors in the development of approaches to counterterrorism.

POLS 7344. Hard Power, Soft Power, and Smart Power. 4 Hours.

Examines different forms of power in an international context. Includes conceptual and empirical examinations of the various types of power, the actors who have power, and the contexts under which power is exercised.

POLS 7346. Resilient Cities. 4 Hours.

Examines the characteristics of resilient cities, especially those located in coastal regions. Investigates the capacity of cities to respond to major disruptions to their social and ecological systems. Includes extensive use of case studies, such as the 2004 Indian Ocean tsunami and Hurricane Katrina in 2005, as well as readings on cities and social systems. Offers students an opportunity to analyze an urban area and provide recommendations for improving its resilience. POLS 7346 and PPUA 7346 are cross-listed.

POLS 7362. Nationalism. 4 Hours.

Focuses on contending theories of nationalism and nationalist movements. Topics include cultural objectification and the establishment of group boundaries, ethnic elites and cultural hegemony, mass mobilization, intergroup socioeconomic disparities, nationalism and modernity, nationalist parties and their policy strategies, and the "constitution" of race, particularly in the Americas.

POLS 7366. Genocide in a Comparative Perspective. 4 Hours.

Takes an interdisciplinary approach (that is, history, political science, and sociology) to the study of genocide. Examines the meaning of the concept in historical and philosophical terms, the societal and psychological causes of genocide, and specific cases throughout history, with emphasis on more recent episodes.

POLS 7369. International Security. 4 Hours.

Examines key problems in international security that are faced by nation-states and international and nongovernment organizations. Examples include armed violence, terrorism, organized crime, nuclear proliferation, poverty, and energy security. Explores responses that include international cooperation and the establishment of international norms. Analyzes related literature and theoretical perspectives.

POLS 7370. Europe and European Union Governance. 4 Hours.

Surveys the institutions, processes, and value constructs that structure political, economic, military, monetary, financial, and cultural activity in Europe, with an emphasis on the effect of the European Union and the challenges it presents.

POLS 7376. Government and Politics of the Middle East. 4 Hours.

Examines the political and economic structures of the Arab states, Iran, Turkey, and Israel as well as inter-Arab politics and interstate conflict in the area. Emphasis is on Islam and politics, gender politics, and civil society.

POLS 7387. Global Governance. 4 Hours.

Introduces the concept of global governance and the core architectural elements of the current system of global governance. Examines the key policy purposes and tasks carried out by global governance processes.

POLS 7390. Topical Seminar in American Politics. 4 Hours.

Examines current issues in the area of American government and politics. May be repeated without limit.

POLS 7394. Topical Seminar in International Relations. 4 Hours.

Examines current issues in the area of international relations. May be repeated without limit.

POLS 7441. Cyberconflict. 4 Hours.

Examines the literature, policy reports, and important news stories about the domain of cybersecurity and conflict. Analyzes contending perspectives on the role and impact of cybersecurity. Utilizes social science theories and methods to explore this method of conflict.

POLS 7704. Critical Infrastructure Resilience. 4 Hours.

Explores the growing vulnerability of our human-made built environment to a range of risks. Using the new paradigm centered on the concept of resilience, examines how best to safeguard the critical foundations that provide transport, communications, water, energy, and other essential functions in the face of disasters, growing urbanization, climate change, and globalization. Identifies solutions that are scientifically credible, informed by data and sound engineering principles, while concurrently grounded in an understanding of social and policy imperatives. Offers students an opportunity to apply the skills and knowledge acquired in the course to a real-life example through a group project.

POLS 7962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

POLS 7976. Directed Study. 1-4 Hours.

Offers assigned reading under the supervision of a faculty member. May be repeated without limit.

POLS 7980. Capstone Project. 4 Hours.

Offers students an opportunity to complete a specialized research or applied project in political science or security studies as part of the master's degree. Designed to meet the specific learning and research interests of the student. Learning experience is based on group or individual activities that meet agreed-upon benchmarks with the instructor and may involve activities with government or nongovernment organizations. Scope of the project varies by credit hours earned.

POLS 7990. Thesis. 4-8 Hours.

Offers thesis supervision by individual members of the department. May be repeated without limit.

POLS 8407. Internship. 4,8 Hours.

Offers work experience (at least fifteen hours per week) that includes planning, research, policy development, and other administrative aspects in a government or nonprofit organization. May be repeated without limit.

POLS 8960. Exam Preparation—Doctoral. 0 Hours.

Offers the student the opportunity to prepare for the PhD qualifying exam under faculty supervision.

POLS 8986. Research. 0 Hours.

Offers an opportunity to conduct full-time research under faculty supervision. May be repeated without limit.

POLS 9000. PhD Candidacy Achieved. 0 Hours.

Indicates successful completion of the doctoral comprehensive exam.

POLS 9986. Research. 0 Hours.

Offers an opportunity to conduct full-time research under faculty supervision. May be repeated without limit.

POLS 9990. Dissertation. 0 Hours.

Offers dissertation supervision by individual members of the department. May be repeated once.

POLS 9996. Dissertation Continuation. 0 Hours.

Offers continued dissertation supervision by individual members of the department. May be repeated without limit.

Political Science - CPS (POL)

Search POL Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=POL>)

POL 1120. International Relations. 3 Hours.

Introduces students to the core ideologies and methodologies of the study of international relations. Examines critical topics in international relations, such as war and diplomacy, international cooperation, and the nature of the international system. Emphasizes the nature of the international sphere and key topics currently affecting politics among states.

POL 1200. Comparative Politics. 3 Hours.

Introduces students to the comparative study of political organization and behavior in a variety of political systems present in a range of countries around the world. Examines different structures of political systems, governing institutions, leadership, political participation, major issues in political change, and sources of instability.

POL 1300. American Government. 3 Hours.

Introduces students to the American system of government, how it functions, and its politics. Studies early American history and philosophy as the source of the American Declaration of Independence, the design of the U.S. Constitution, and major issues in the development of the American political system. Examines the roles of public opinion, political behavior and participation, political parties, and interest groups in shaping American politics and policy. Includes a detailed analysis of major governmental institutions, their structures, and their operation.

POL 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

POL 2315. State and Local Government. 3 Hours.

Examines the political and administrative context of state and local government in the United States. Surveys the structure, function, and politics of states and city/town government within the context of the U.S. federal system and studies comparatively the diversity of political institutions and practices. Examines the nature of local politics and political participation from a practical and theoretical standpoint.

POL 2320. Political Parties and Interest Groups. 3 Hours.

Examines the organization and role of political parties and interests groups within the American political system. Analyzes the historical and current establishment of political parties and interest groups, how they operate from state to state, and assesses their overall contribution to and value in the American political system.

POL 2430. Survey of Political Thought. 3 Hours.

Examines the most important writers and philosophical arguments relevant to main currents in political science today. Includes texts from ancient Greece up to the modern era.

POL 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

POL 3126. Global Governance. 3 Hours.

Introduces students to the concept of global governance. Summarizes the core architectural elements of global governance and examines the key issues related to international organization and regime formation. Analyzes global, regional, and issue-based international organizations and regimes.

POL 3135. International Conflict and Negotiation. 3 Hours.

Examines various manifestations of international conflict, including the nature of conflict; various degrees of conflict; and how conflicts evolve, are managed, and are resolved. Analyzes key concepts and practices in the conduct of diplomacy and negotiation.

POL 3140. International Security. 3 Hours.

Examines key issues in international security that are prevalent in the foreign policy agendas of states, international organizations, and nongovernment organizations. Discusses critical issues in security, including the role of armed violence, terrorism, organized crime, and nuclear proliferation. Considers emerging challenges in areas of disease, food security, and cybersecurity in light of traditional and nontraditional responses to international and domestic threats.

POL 3220. Democracy in Comparative Politics. 3 Hours.

Assesses the development of democracy in a variety of states and examines challenges facing states in the establishment and maintenance of democratic political systems. Examines the process of democratization and institutional differences in democratic political systems. Analyzes methodological options for evaluating democratic institutional performance and political development.

POL 3320. American Foreign Policy. 3 Hours.

Examines the formation and conduct of U.S. foreign and national security policy. Analyzes modern and historic cases in American foreign policy. Emphasizes the period following the end of the cold war.

POL 3330. Politics and Mass Media. 3 Hours.

Analyzes several facets of the mass media, including the role of newspapers, radio, television, and the Internet in public opinion formation. Examines their use and effectiveness in political campaigns, their impact on public policymaking, and the degree of objectivity and/or bias in reporting the news.

POL 3400. Political Science Research Methods. 3 Hours.

Explores the range of research methods and designs used in political science and examines the logic of social scientific inquiry. Offers students an opportunity to learn to apply various methodologies, including experimental research, comparative methods, case study analysis, and survey and interview research. Requires students to complete an intensive writing assignment as part of the course.

POL 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

POL 4850. Political Science Capstone. 3 Hours.

Integrates and assesses the knowledge and skills developed by students participating in the political science curriculum. Students conduct extensive research in a new area of analysis, culminating in the completion of a significant final paper or project. Students produce an intensive and scholarly written assignment as part of the capstone.

POL 4955. Project. 1-4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student's major field. May be repeated without limit.

POL 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

POL 4996. Experiential Education Directed Study. 1-4 Hours.

Draws upon the student's approved experiential activity and integrates it with study in the academic major.

Political Science - CPS Specialty (PLSC)

Search PLSC Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=PLSC>)

PLSC 1400. American Studies 1. 2 Hours.

Analyzes and explains the U.S. national government. Begins with the American Revolution and the development of the Constitution and the United States' federal system of government. Discusses civil rights and civil liberties as well as public opinion, political socialization, and the impact of interest groups. By the end of the course, the successful student should understand the general governing framework of the United States, U.S. politics and policy, and what influences the government's outputs and outcomes.

PLSC 1410. American Studies 2. 2 Hours.

Analyzes and explains the U.S. national government. Covers the structure and functioning of U.S. national government institutions. Discusses political institutions and parties as well as public and foreign policy. Reviews the roles and responsibilities of the Congress, the executive branch, and the federal court system. By the end of the course, the successful student should understand the governing framework of the United States, U.S. politics and policy, and what influences government decisions.

PLSC 1420. Introduction to American Government. 4 Hours.

Analyzes the system of politics and government in the United States. Topics include the philosophical basis, historical origins, design, and functioning of the Constitution as well as formal government institutions. Examines the influence of public opinion, political behavior and participation, parties, and interest groups.

Portuguese (PORT)

Search PORT Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=PORT>)

PORT 1101. Elementary Portuguese 1. 4 Hours.

Designed for students with very little or no prior knowledge of Portuguese. Presents essentials of Portuguese as it is spoken in Brazil through acquisition of basic skills in speaking, reading, writing, and aural comprehension.

PORT 1102. Elementary Portuguese 2. 4 Hours.

Continues the study of Brazilian Portuguese at the elementary level. Includes completion of basic grammatical usage, reading of contemporary Brazilian material, and increased emphasis on oral and aural skills.

PORT 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

PORT 2101. Intermediate Portuguese 1. 4 Hours.

Emphasizes further vocabulary building. Offers students an opportunity to master the fine points of grammar through written composition, prepared oral reports, and reading and discussion from contemporary Portuguese materials.

PORT 2102. Intermediate Portuguese 2. 4 Hours.

Builds on PORT 2101 and focuses on further development of vocabulary. Offers students an opportunity to continue to master grammar and conversation through written composition, prepared oral reports, and reading and discussion from contemporary Portuguese materials.

PORT 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

PORT 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

PORT 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

PORT 4992. Directed Study. 1-4 Hours.

Offers students a way of going beyond work given in the regular curriculum; may also enable students to complete major or minor requirements in certain situations. Priority is given to language majors and to juniors and seniors. May be repeated without limit.

Portuguese - CPS (PRT)

Search PRT Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=PRT>)

Project Management - CPS (PJM)

Search PJM Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=PJM>)

PJM 1100. Project Management Fundamentals - Project Initiation and Close. 3 Hours.

Explores topics including project management principles, project phases, project domains, project management process groups, and roles of the project manager. Offers students an opportunity to work specifically with tools, techniques, and processes throughout project initiation and project close. Utilizes case studies and real-world examples to demonstrate the inner workings of a project.

PJM 1400. Project Planning. 3 Hours.

Introduces the tools, techniques, and processes applied in project scope management, estimating, scheduling and resource allocation, and control. Offers students an opportunity to build a detailed work plan and integrate best practices resulting in a resource-balanced, time-sensitive schedule and project plan. Introduces additional topics, including estimating and scheduling tools, applied to student work.

PJM 2000. Project Monitoring and Control. 3 Hours.

Explores the role of the project manager during project execution and the tools, techniques, and processes used to monitor and control the project. Offers students an opportunity to utilize project baselines to monitor progress, resolve issues, and manage changes. Applies analytics and earned value to determine the health of the project and identify and implement actions to continue, revise, or terminate the project. Addresses additional topics, including performance reporting and dashboards, to highlight best practices in providing project information to key stakeholders.

PJM 2100. Quality and Risk. 3 Hours.

Covers management planning, risk identification, risk analysis, risk response planning and implementation, and risk monitoring. Offers students an opportunity to work with quality management planning, quality assurance, and quality control tools and techniques to ensure the project solution meets the quality standards it is designed to achieve. The key to project success is to be prepared to address risk as well as ensure that the project solution is fit for use. .

PJM 2200. Project Procurement and Contract Management. 3 Hours.

Offers an in-depth analysis of project procurement including resource identification (human, material, equipment); resource managing; control; and closing of procurement activities. Also covers key topics including how to work with different contract types and legal aspects of project management.

PJM 3000. Leading Agile Projects. 3 Hours.

Offers an overview of agile project methodologies. Introduces agile approaches, compares and contrasts these approaches to traditional project management, and considers how to tailor the two approaches to determine a project's best approach. Additionally, reviews agile-specific practices from an application perspective and investigates agile project management tools.

PJM 3100. Principles of Business Analysis Management. 3 Hours.

Offers a framework of business analysis and requirements management. Topics include the role of the business analyst in the current organizational environment, understanding the business need, working with key stakeholders to identify the benefits of the project, and strategies to lead the organizational change necessary to harvest that value. Offers students an opportunity to utilize case studies to focus on process improvement and writing requirements. .

PJM 4000. Program and Project Portfolio Management. 3 Hours.

Offers an overview of program and project portfolio management. Explores the role of project, program, and project portfolio management in supporting realization of an organization's strategy. Projects may be subsets of a program—reviews the role of the program manager and tools, techniques, and processes used to plan and manage a program. Projects and programs are subsets of a portfolio—discusses how the portfolio is selected and managed. Reviews case studies, current articles, and readings to reinforce student learning.

PJM 4850. Capstone. 3 Hours.

Offers students an opportunity to utilize all the project management tools, techniques, and skills they have acquired. Students explore the integration of the curriculum throughout the entire project life cycle, applying applicable integration concepts to achieve desired project outcomes. Reviews case studies, current articles, and readings to reinforce learning. This is the final course in the project management BS program.

PJM 5900. Foundations of Project Management. 4 Hours.

Examines the differences between general and project management responsibilities. Introduces the Guide to the Project Management Body of Knowledge (PMBOK), which provides a structured approach to understanding project process groups and knowledge areas needed to manage any size project through a complete project life cycle. Explains high-level distinctions between project, program, and portfolio management. Includes an introduction to Microsoft Project, which is one of the most widely utilized project management software tools. Strongly recommended for students with little or no formal project management experience.

PJM 6000. Project Management Practices. 3 Hours.

Provides an overview of the project management process. Emphasizes project definition, identification of project scope, project life cycle, and project planning. Uses case studies to examine best practices and common project management pitfalls.

PJM 6005. Project Scope Management. 3 Hours.

Offers insight into how projects are defined, evaluated, and ultimately translated into manageable project requirements and concrete deliverables. By learning how to identify stakeholder needs and convert those needs into viable, measurable project scope documentation, a project manager can successfully manage not only a project's scope but also make informed recommendations when trade-offs between project scope, cost, and schedule become necessary.

PJM 6015. Project Risk Management. 3 Hours.

Examines quantitative techniques for risk assessment and decision making, as well as the steps and elements of a risk management plan, including the ongoing monitoring of risk factors. The accurate identification of risks, and understanding of how to account for the potential impact of risks, can greatly impact the likelihood of project success.

PJM 6025. Project Scheduling and Cost Planning. 3 Hours.

Builds on the project schedule to explore cost estimation methods, break-even analysis, and earned value management. Studies effective tools and techniques that can allow project managers to translate specifications to realistic project plans that lead to a resource-loaded schedule and baseline budget. These tools and techniques can be used to minimize bottlenecks and downtime, identify and plan for resource needs, develop contingencies, and manage risk and scope creep. Topics include schedule development, cost estimating, and cost and schedule management through earned value management. A well-thought-out and well-managed schedule is critical to successful project management and is integral to the efficient management of project costs. Offers students an opportunity to learn to manage the project budget, revise cost estimates, and develop confidence levels.

PJM 6075. Project Finance. 3 Hours.

Explores real-world cases of project finance across industry sectors (e.g., energy, resource recovery, and mining) to examine how organizations structure their capital to mitigate various project risks and to secure scarce resources in the business environment. Topics include capital structure, discounted cash flow, financial instruments, capital budgeting, cost of capital, risk and return, project agreements, project cost accumulation, project cost allocation, and project investment ranking. Offers students an opportunity to develop a profound understanding of the principles of project finance.

PJM 6125. Project Evaluation and Assessment. 3 Hours.

Offers students an opportunity to learn to develop metrics for determining and reporting project performance. Examines both quantitative and qualitative approaches of evaluation, with an emphasis on earned value management. Examines stakeholder analysis and techniques for reporting performance results.

PJM 6135. Project Quality Management. 3 Hours.

Designed to provide detailed instruction in Project Quality Management (PQM) processes, one of the nine knowledge areas outlined in the Project Management Institute's Project Management Body of Knowledge. Discusses how to integrate PQM processes into the overall project plan and how to prepare a PQM plan. Encourages students to work together in a team environment to complete a PQM plan for a project.

PJM 6140. Managing Troubled Projects. 3 Hours.

Examines how to prevent failed and troubled projects, how to perform a project assessment/audit, how to develop a troubled project recovery plan, and how to develop a failed project shutdown plan. Includes team presentations of case study assignments to gain experience in managing and avoiding failed and troubled projects, one of the most significant assignments for a project manager.

PJM 6145. Global Project Management. 3 Hours.

Expands the detailed treatment of project management into the global areas of environmental factors, national differences, cultural differences, outsourcing, and virtual project management. The state of the art in project management has advanced to heavy use of global project management. Addresses the Project Management Institute's Project Management Body of Knowledge practices as applied in the organization and the future of project management.

PJM 6175. Project Resource Management. 3 Hours.

Offers an overview of procurement management and human resource management and studies how these two knowledge areas are key to a project's success. Describes the processes necessary to effectively purchase or acquire products, services, or results for a given project through the lens of the project manager and procurement office. Examines how to effectively acquire, develop, and manage human resources in various organizational settings.

PJM 6180. Project Stakeholder Management. 3 Hours.

Offers students an opportunity to learn the mechanisms necessary to effectively identify all stakeholders, including the people, groups, or organizations that are impacted or may have an impact on the project. Examines how to analyze stakeholder expectations and how to develop management strategies for effective stakeholder engagement throughout the project.

PJM 6205. Leading and Managing Technical Projects. 3 Hours.

Offers students an opportunity to learn about leadership and management skills and strategies needed to succeed in a demanding technical project environment. Many project managers understand the technical aspects of a particular project environment but lack these critical management and leadership skills. Topics covered include understanding the technical environment, managing and motivating team members, understanding organizational culture, interpersonal strategies, and developing a personal leadership approach.

PJM 6210. Communication Skills for Project Managers. 3 Hours.

Offers students an opportunity to learn strategies for communicating technical concepts in a clear, concise, and appropriate manner for both written and oral communication media. In all project environments, communication is critical for project success. The ability to craft project reports and to communicate with customers, clients, team members, and company executives is critical for anyone leading technical projects. Often, the project manager needs to communicate technical data to a nontechnical audience. Explores various communication models and approaches with a focus on applying those models in a real-world context.

PJM 6215. Leading Remote Project Teams. 3 Hours.

Offers students an opportunity to learn strategies for creating a cohesive, high-performing project team in a remote project environment. The challenges of leading a remote project team are apparent to anyone who has attempted it. The technological challenges are complicated by the reality that most teams have participants located around the world. Therefore, we face not only the standard fare of interpersonal challenges but also cultural challenges as well.

PJM 6220. Planning and Scheduling Technical Projects. 3 Hours.

Offers students an opportunity to learn to plan and schedule projects using a variety of techniques, such as agile, critical chain, and other appropriate methodologies. Technical projects can present unique challenges and opportunities. To meet these challenges and capitalize on the opportunities, a variety of planning and scheduling techniques can be applied. Students practice applying a variety of planning and scheduling techniques through the use of case studies and applied project assignments.

PJM 6610. Foundations of Project Business Analysis. 3 Hours.

Offers a framework of business analysis. Topics include the role of the business analyst in the current organizational environment, understanding the business need, working with key stakeholders to identify the benefits of the project, and strategies to lead the organizational change necessary to harvest value.

PJM 6620. Project Business Analysis: Needs Assessment. 3 Hours.

Focuses on specific approaches to understand the needs of customers who receive project solutions. Discusses techniques for uncovering and confirming the product scope that result in meeting project goals. Applies analytical thinking techniques to ensure solutions meet customer needs.

PJM 6630. Project Business Analysis: Requirements Planning and Analysis. 3 Hours.

Explores tools and techniques to convert customer needs into solution designs. Beginning with the current and future state of the project's product, applies tools and techniques to create, review, and prioritize requirements. .

PJM 6640. Leadership Strategies for the Business Analyst. 3 Hours.

Introduces the techniques applied by the business analyst to work with stakeholders in the requirements process. Emphasizes the processes of facilitation, communication, problem solving, consensus building, and negotiation. A central part of the course requires students to participate in and evaluate facilitated simulations. .

PJM 6705. Portfolio Management in the Enterprise Environment. 3 Hours.

Defines the strategies, processes, methods of information, analysis, and preferred deliverables of an effective portfolio management approach. An ever-increasing number of project managers are being asked to manage multiple, sometimes interrelated, complex projects. This is now a cornerstone skill for a senior project manager. Offers students an opportunity to learn how to identify, select, and de-select in order to develop a balanced and desirable mix of projects to nurture by means of project termination decisions and management, as well as to attain a knowledge of the components, significance, and challenges of implementing enterprise-level project portfolio management (PPM) based upon the organization's strategic business goals.

PJM 6710. Introduction to Program and Portfolio Management. 3 Hours.

Examines project, program, and portfolio management with a primary focus on the similarities and distinctions between program management and portfolio management. Offers students an opportunity to develop and evidence a foundational understanding of program and portfolio management and the critical role these play within today's global environment.

PJM 6715. Advanced Program Management. 3 Hours.

Offers students an opportunity to develop a deep understanding of program management and the program management life cycle. Covers best practices for developing and managing a program that is consistently aligned with the strategic direction of the organization, ensuring that stated benefits are realized. Uses case studies and real-world examples throughout to engage students in an experiential and applied manner.

PJM 6720. Advanced Portfolio Management. 3 Hours.

Offers students an opportunity to develop a mature understanding of portfolio management topics, techniques, and tools. Emphasizes learning to identify, prioritize, and oversee a portfolio of programs and projects that deliver value aligned with the strategic direction of the organization. Applied exercises and case studies used throughout the course are designed to ensure students are able to understand how to apply these competencies in a workplace-ready manner.

PJM 6725. Program and Portfolio Leadership. 3 Hours.

Discusses the leadership challenges and opportunities present to those who work in program and portfolio management roles, including engaging stakeholders effectively, communicating with senior-level executives, and managing the competing priorities associated with creating successful programs and a balanced and benefits-oriented portfolio. The ability to meet the leadership challenges inherent to program and portfolio management is essential for success in managing the dynamics of project management programs and portfolios.

PJM 6730. Program and Portfolio Evaluation. 3 Hours.

Offers students an opportunity to learn the skills and tools they need to evaluate and measure performance at the program and portfolio level with attention given to identifying and measuring benefits and their continued value to accomplishing the strategic goals of the organization. A key benefit of effective and impactful program and portfolio management is the ability to develop and utilize meaningful qualitative and quantitative metrics at the project, program, and portfolio level.

PJM 6735. Program and Portfolio Management Capstone. 3 Hours.

Offers students an opportunity to complete a capstone project that illustrates their mastery of competencies taught throughout the program. Capstone projects should evidence a student's ability to apply their learning in an experiential manner to solve a real-world challenge faced by program and portfolio managers.

PJM 6740. Managing Program and Portfolio Risk and Complexity. 3 Hours.

Examines program and portfolio management with a primary focus on the development of risk-management plans and risk-response plans at the program and portfolio levels. Explores techniques to recognize and address complexity factors as well as developed enterprise-level risk-management challenges and opportunities.

PJM 6750. Strategic Management and Decision Making for Program and Project Portfolio Managers. 3 Hours.

Explores strategic management frameworks and decision-making models that can be applied to the creation and management of programs and portfolios. Program and portfolio managers are challenged to ensure that their collection of projects and programs optimizes realization of organizational strategies. Emphasizes the role of globalization and virtualization, as well as working in increasingly dynamic strategic environments. Topics include environmental analysis; analysis of strengths, weaknesses, opportunities, and threats (SWOT); strategy formulation; development of business cases; and strategy implementation.

PJM 6810. Principles of Agile Project Management. 3 Hours.

Provides an overview of the fundamentals of agile project management. Topics include agile vs. traditional approaches, the agile manifesto, and the development of agile as a value-added business practice. Introduces key agile project management practices, including communication management planning and risk-management planning. Reviews agile-specific practices and method tailoring from an application perspective. Investigates agile project management tools.

PJM 6815. Advanced Agile Project Management. 3 Hours.

Constitutes an advanced offering focusing on specific approaches to executing projects in an agile environment. Seeks to provide the student with a firm grounding and an applied, experiential understanding of specific agile approaches. Offers students an opportunity to engage in real-world-oriented case studies to evidence a strong understanding of the methodologies in a practical, experiential manner by planning and simulating an agile project using a methodology taught in the course.

PJM 6820. Agile Implementation and Governance. 3 Hours.

Explores the implementation of agile within an organization and the governance structure to support agile projects. Studies the use of change management techniques to address stakeholder needs as the organization moves from a traditional to agile or blended approach to projects. Reviews and applies advanced topics in program/ portfolio management in agile environments. Offers students an opportunity to develop an implementation strategy and governance plan.

PJM 6825. Agile Lean Product Development. 3 Hours.

Offers a practical overview of modern lean/agile product exposure based on contemporary industry practice. To win in today's competitive market requires giving your business the ability to deliver highly profitable products faster than the competition. Covers the complete life cycle of product management, from identifying customers and users through to sales, marketing, and managing teams. Covers how to minimize investment and output while maximizing the information discovered in order to support effective decision making.

PJM 6910. Capstone. 3 Hours.

Offers students an opportunity to utilize all of the project management skills they have acquired in this master's certificate program to evaluate project processes and outcomes of a single project throughout the entire project life cycle. Examines both quantitative and qualitative methodologies, with an emphasis on tactical approaches and earned value management. Also examines stakeholder analysis and practical techniques for reporting performance results. Intended to be the final course in the project management curriculum after successful completion of all other courses.

PJM 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

PJM 6983. Topics. 1-4 Hours.

Covers special topics in project management. May be repeated without limit.

Psychology (PSYC)

Search PSYC Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=PSYC>)

PSYC 1000. Psychology at Northeastern. 1 Hour.

Introduces students to the major and to the professional and academic resources available to students at Northeastern University. Introduces students to their faculty, advisors, and fellow students; educates students about the cooperative education program; familiarizes students with undergraduate research and technological resources; and introduces problem-solving and leadership skills, which students need to succeed in school and in their professional endeavors. Students who do not meet course prerequisites may seek permission of instructor.

PSYC 1101. Foundations of Psychology. 4 Hours.

Surveys the fundamental principles, concepts, and issues in the major areas of basic and applied psychological science. Approaches the study of psychology as a method of inquiry as well as a body of knowledge. Introduces students to research methods and to psychological research on the biological bases of behavior, learning, sensation and perception, cognition and language, development, emotion, social psychology, personality, and psychological disorders.

PSYC 1200. Psychology of Women. 4 Hours.

Introduces students with little or no background in psychology to the current theories and research on the psychology of women. Critically examines psychological, biological, and social influences on gender differences, gender roles, and gender stereotypes in the light of scientific evidence and individual experience. Assesses their consequences for society. Uses the unique perspective generated in the field of the psychology of women to evaluate the traditional research methods in psychology as well as the major psychological theories formulated to explain women and the differences between women and men. Emphasizes critical thinking skills.

PSYC 1208. Psychology and the Law. 4 Hours.

Introduces the range of topics that are of concern both to psychologists and to members of the legal profession. Covers the legal and ethical issues inherent in the conduct and process of professional psychology. Topics include confidentiality, ethical competence, duty to warn, expert testimony, malpractice, and forensic matters, such as the insanity defense. Discusses professional practice issues revolving around ethical concerns as they relate to specific weekly topics. Specifically, discusses five ethical theories (egoism, utilitarianism, deontology, care ethics, virtue ethics) used in case analysis. Examines the role of ethical theory as it applies to the expert's self-interest and personal position, positive and negative consequences for the defendant and society at large, psychologist expert duties to themselves, and conflicts. Designed to help students think about the legal system and its role in society today through a psychological lens.

PSYC 1210. Sports Psychology. 4 Hours.

Studies the physical, affective, and cognitive behaviors associated with sport participation and also examines the psychological theories and research related to sport and exercise behavior. Introduces students to the field of sport and exercise psychology by providing a broad overview of the major topics in the area, including the history of sport and exercise psychology, leadership, self-confidence, youth sports, aggression, moral development, team dynamics, anxiety and arousal, goal setting, imagery, and motivation. Covers the psychological makeup of athletes, how psychological factors influence involvement and performance in sport, and helps students acquire the skills and knowledge about sport and exercise psychology that they can apply to their everyday lives.

PSYC 1214. The Moral Mind: The Science Underlying Ethical Decision-Making and Virtuous Character. 4 Hours.

Offers a scientific lens through which to analyze the mental mechanisms and processes that guide moral and ethical decision making. Although the majority of the evidence and perspectives covered stem from psychological and neuroscientific work, the course is interdisciplinary in nature by incorporating relevant perspectives from behavioral economics, evolutionary biology, and philosophy. The primary goal is to offer insight, not only into how the human mind automatically parses ethical issues in given situations but also how control can be gained over such mechanisms, thereby allowing greater efficacy in guiding morality according to consciously embraced principles.

PSYC 1220. Mind, Brain, and Expertise. 4 Hours.

Introduces students to the antecedents and consequences of expert behavior and performance from a psychological perspective. Considers the broad area of expertise, including sport and athletics, arts, music, chess, and academia. Examines antecedents of expertise, including motivation, nature/nurture, anxiety, beliefs, and attitudes. Consequences of expertise refer to psychological effects of performance on the individual. Examines basic research methods as well as intervention strategies for athletes and other performers. The course assumes no prior knowledge of the field of expertise research.

PSYC 1250. Drugs and Behavior. 4 Hours.

Offers beginning students a general overview of the effects of drug use/abuse in many segments of society with particular attention placed on the collegiate population. Describes historical aspects of drug use for treatments of clinical disease states along with psychological theories of drug abuse and strategies for prevention of drug use/abuse. Covers biological effects emanating from several drug categories and the clinical use of drugs to promote positive therapeutic outcomes.

PSYC 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

PSYC 2101. Love and Hate: Social, Psychological, and Literary Approaches. 4 Hours.

Studies materials that define and describe love and hate from the fields of literature and literary criticism, social psychology, and criminology and criminal justice. "Love" and "hate" are small words describing powerful emotions with profound effects on individuals and on social groups. Focusing largely on contemporary examples, offers students an opportunity to analyze the differences and areas of overlap in the above fields' approaches to love and hate, to discuss societal responses to these emotions, and to apply the methodologies of each field to research questions of their own. INSH 2101 and PSYC 2101 are cross-listed.

PSYC 2290. Inquiries in Psychological Science. 4 Hours.

Offers students an opportunity to learn to think like a scientist in the field of psychology. Science is not a static body of knowledge but rather a method for making new discoveries. Students consider a series of controversial issues in current psychology by reading and discussing primary research articles and reviews, critically assessing arguments on all sides, and coming to their own conclusions. Requires students to develop and present their own research proposals on topics of their choice, which encourages them to engage more deeply with the material.

PSYC 2306. Food, Behavior, and Eating Disorders. 4 Hours.

Investigates what starts and stops eating behavior. Examines taste, nutrition, metabolism, the brain, food experiences, and societal factors that control feeding behavior. Emphasizes the biological/psychological interaction in normal eating and in pathological eating, such as anorexia, bulimia, and extreme obesity.

PSYC 2320. Statistics in Psychological Research. 4 Hours.

Offers an overview of descriptive and inferential statistics with a focus on psychological applications. Covers standard material in undergraduate statistics including distributions, central tendency, variability, z-scores, the normal distributions, correlation, regression, probability, hypothesis testing (using the z, t, F, and chi-square statistics), and confidence intervals. Should be taken before the end of the sophomore year.

PSYC 2370. Cross-Cultural Psychology. 4 Hours.

Introduces students to the role of culture in psychological science. Discusses the relationship of culture to psychological theories and research. Investigates psychological research in WEIRD (western, educated, industrialized, rich, democratic) populations compared to those less frequently studied. Demonstrates possible psychological universals while accounting for cultural influences on psychology and behavior. Critically considers theoretical and methodological issues, accurate interpretation of cross-cultural findings, and practical applications.

PSYC 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

PSYC 3200. Clinical Neuroanatomy. 4 Hours.

Introduces students to the structure and function of the central nervous system (CNS) from spinal cord to cerebral cortex by using lesions of the human nervous system as a tool to reinforce and amplify learning of the structure and organization of the CNS. Assumes no prior knowledge of brain structures and begins with basic vocabulary, including directions, planes of dissection, and parts of brain cells. Seeks to provide the necessary anatomical foundation for further study in psychology and the neurosciences.

PSYC 3358. Behavior Therapies. 4 Hours.

Offers a study of successful projects that have provided effective remediation and rehabilitation in institutions for the mentally ill, the mentally retarded, and the developing human (schools).

PSYC 3400. Personality. 4 Hours.

Offers a systematic study of the normal personality and its development. Focuses on behavioral, dynamic, social, and cognitive determinants, assessment of personality, and current research topics; surveys the major theories of personality.

PSYC 3402. Social Psychology. 4 Hours.

Provides an introductory survey of social psychology. Topics include aggression, attribution, attitude formation; and change, attraction, gender and culture, conformity, impression formation, and group processes.

PSYC 3404. Developmental Psychology. 4 Hours.

Examines change throughout the life span in social relationships, emotional functioning, language, cognition, and other psychological domains, with emphasis on infancy through adolescence. Introduces major theories of development. Stresses the interaction of social and cognitive factors in development, and the interaction of the developing person with the environment. Also explores individual and cross-cultural differences in patterns of development, and research issues in developmental psychology.

PSYC 3406. Abnormal Psychology. 4 Hours.

Surveys patterns of psychological abnormality. Addresses diagnosis, theoretical perspectives, anxiety, and defense mechanisms. Examines the symptomatology, etiology, and treatment of a number of disorders including anxiety, dissociative, somatoform, affective (depression, mania), and schizophrenic disorders.

PSYC 3450. Learning and Motivation. 4 Hours.

Offers an introduction to the basic learning and motivational principles that permit humans and animals to adapt effectively to a changing environment. Emphasizes research and theories of operant and Pavlovian conditioning, with discussions of discriminations and generalization, avoidance and punishment, acquired motivational states (for example, addiction), concept formation, biological constraints on learning and behavior, animal cognition, and other related topics. Relates learning and motivational principles to the understanding and treatment of behavioral, affective, cognitive, and motivational disorders.

PSYC 3451. Learning Principles and Behavior Analysis. 4 Hours.

Introduces the basic concepts and theories of applied behavior analysis as they relate to learning and motivation. Topics include operant and classical conditioning, reinforcement, punishment, extinction, discrimination training, stimulus control, concept formation, and generalization. Throughout the course, offers students an opportunity to apply these principles to learning that occurs in their everyday lives as well as in the lives of individuals with developmental disabilities and other learning disorders.

PSYC 3452. Sensation and Perception. 4 Hours.

Discusses how our five senses work to aid us in perceiving states of the body and of the world, how our perceptions are modified by what we know and expect, and how sensation and perception develop (especially in infancy). Includes discussion of neural and anatomical bases of sensation and perception. PSYC 3458 is highly recommended.

PSYC 3458. Biological Psychology. 4 Hours.

Focuses on the relation between brain function and human behavior. Examines how nerve cells function individually and work together both in small networks and in the nervous system; the structure of the nervous system; how our sense organs provide the nervous system with information about the outside world; how the brain controls movement; and how psychological concepts from motivation to language and memory are represented in the brain.

PSYC 3464. Psychology of Language. 4 Hours.

Provides a basic introduction to psycholinguistics. Topics include the nature and structure of languages, processes involved in the production and comprehension of language, the biological bases of language, and aspects of language acquisition. Examines current theories of language processing and related experimental findings.

PSYC 3466. Cognition. 4 Hours.

Provides a basic introduction to human cognition. Topics include pattern recognition, attention, memory, categorization and concept formation, problem solving, and aspects of cognitive development. Examines current theories of cognitive processing and related experimental findings.

PSYC 3506. Neuropsychology of Fear. 4 Hours.

Explores our understanding of the physiological and cognitive aspects of fear, from early theories of emotion to current research in both humans and animal models. Emphasizes linking brain structure to function—how do different brain regions contribute to fear processing and expression? Also focuses on psychiatric illnesses whose symptoms suggest a maladaptive fear response, such as post-traumatic stress disorder and phobias. What causes these illnesses, and how does our understanding of the neural basis of fear inform our treatment strategies for these disorders? Students who do not meet course prerequisites may seek permission of instructor.

PSYC 3508. Behavioral Endocrinology. 4 Hours.

Presents an overview of the field of behavioral endocrinology from a psychological perspective. Examines how hormones influence brain structure and function; how hormones affect behavior and vice versa; sex differences in brain and behavior; and the role of hormones in mood disorders, cognition, and stress.

PSYC 3510. Brain, Behavior, and Immunity. 4 Hours.

Explores how our behavior is affected by (and how it affects) our immune system. The brain and the immune system regulate our behavioral responses to the world around us, which helps explain why we feel “down” when we’re sick and why we often catch a cold when we’re stressed. Offers students an opportunity to better understand how we have evolved to psychologically adapt to environmental challenges—and, importantly, how this can sometimes backfire with mental illness as an outcome. Students who do not meet course prerequisites may seek permission of instructor.

PSYC 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

PSYC 4505. Industrial/Organizational Psychology. 4 Hours.

Surveys the psychological fundamentals underlying performance in work settings. Topics include psychological testing; performance evaluation; training, motivating, and leading employees; and the social psychology of organizations. Emphasizes ethical and affirmative action issues.

PSYC 4508. Assessment and Data Collection in Applied Behavior Analysis. 4 Hours.

Offers an overview of methods used to identify, measure, and assess the behaviors of individuals using applied behavior analysis (ABA), including behaviors targeted for increase and decrease. In-depth topics include function-based assessment and treatment in behavior analysis; design and details of the assessment process, including selection of an appropriate assessment method; and the methodology, results, and recommendations derived from a functional behavior assessment.

PSYC 4510. Psychopharmacology. 4 Hours.

Examines interactions between drugs, brain, and behavior. Focuses on such topics as synaptic transmission, behavioral functions of specific neurotransmitter systems, pharmacological treatment of mental and neurological disorders, and drug abuse.

PSYC 4512. Neuropsychology. 4 Hours.

Examines the behavior of neurological patients and normal patients to develop an understanding of how the human brain works to produce higher mental functions. Topics include discussions of brain scans, human neuroanatomy, cerebral lateralization, language, memory, neurological disorders, and neural plasticity and recovery of function.

PSYC 4514. Clinical Neuroscience. 4 Hours.

Explores the neurobiological, genetic, and neurochemical etiology of mental illness as described and categorized according to the DSM. Discusses how psychology, neuroscience, pharmacology, and medicine come together to manage mental illness. Investigates, for each specific mental illness covered, how changes in physiology and biology might manifest in the aberrant behaviors that define psychopathology. Lastly, examines how pharmacology is often used to treat these various mental illnesses and how genetic expression is involved in predisposing some people to these disorders while sparing others.

PSYC 4520. Language and the Brain. 4 Hours.

Focuses on language behavior from a neuropsychological viewpoint. Examines models of how the brain controls the production and comprehension of language. Considers localization of cerebral functions and hemispheric lateralization; experimental and clinical evidence for functional models; aphasia, dyslexia, and other language pathologies; and evidence from neuroimaging studies.

PSYC 4522. Psychology of Reading. 4 Hours.

Provides an overview of issues in the psychology of reading. Topics include the nature of the reading process as a perceptual and cognitive activity, eye movement patterns in reading, stages of reading development, and dyslexia. Examines current theories of reading and text comprehension.

PSYC 4524. Cognitive Development. 4 Hours.

Explores cognitive processes in infancy and childhood, how those processes change with age, and theoretical explanations for those changes. Topics may include understanding the physical world, memory, categorization, reasoning, problem solving, social cognition, language and conceptual development, and individual and/or group differences in cognitive development. Emphasis may vary by semester.

PSYC 4540. Quantitative Topics in Psychology and Behavioral Neuroscience. 4 Hours.

Surveys key quantitative topics in psychology and behavioral neuroscience. Emphasizes theory and modeling, not statistics. Specific topics vary, but all are drawn from domains in which mathematics and computation play a significant role. Topics may include Fourier analysis with applications to vision and hearing, neural circuit computation, signal detection theory applied to human and nonhuman animals' decisions, measurement of sensory magnitudes in vision and hearing, the linear algebraic theory of color matching in humans, and analysis and models of human response time. Students complete weekly readings and a final project, typically involving use of software for data analysis.

PSYC 4550. Basic Principles of Magnetic Resonance Physics and Applications in Neuroscience. 4 Hours.

Offers students an opportunity to acquire firsthand experience in using magnetic resonance imaging to address neurological health issues, for example, traumatic brain injury, Parkinson's disease, Alzheimer's disease, and opioid addiction. Provides background in relevant physics, mathematics, psychology, and neuroscience concepts. Students read selections of the relevant scientific literature, collect and analyze data, and write experimental reports.

PSYC 4570. Behavioral Genetics. 4 Hours.

Explores the genetic basis of behavior. Behavioral genetics is considered to lie at the intersection of psychology and genetics and is a dynamic field with plenty of possibility. Offers students an opportunity to hone and develop a stronger foundation in the principles of Mendelian, population, and quantitative genetics. Studies the genetic basis for sleep, social behavior, responses to environmental stimuli, learning, memory, addiction, and the etiology of neuropsychiatric disorders.

PSYC 4600. Laboratory in Research Design. 4 Hours.

Addresses the theoretical concepts, design, execution, analysis, and communication of research in psychology. Provides students with various methods to acquire hands-on experience performing a research project of their own creation. Students move systematically through the research process, from refining their original idea in the context of existing literature to interpreting and communicating their results. Requires prior completion of research-area course.

PSYC 4606. Laboratory in Biological Psychology. 4 Hours.

Introduces the methods of research in psychobiology. Students work in small groups, conducting three to four hands-on laboratory exercises under supervised conditions. Students read selections of the relevant scientific literature, analyze the collected data, and write experimental reports.

PSYC 4610. Laboratory in Psycholinguistics. 4 Hours.

Provides students the opportunity to acquire firsthand experience in conducting research on issues in the psychology of language. Focuses on experiments and their implications for broader issues of language processing. Involves students in all aspects of each experiment including collecting and analyzing data and preparing lab reports.

PSYC 4612. Laboratory in Cognition. 4 Hours.

Provides students the opportunity to acquire firsthand experience in conducting research on issues in human cognition. Focuses on experiments and their implications for broader issues of cognitive functioning. Involves students in all aspects of each experiment including collecting and analyzing data and preparing lab reports.

PSYC 4614. Laboratory in Social Psychology. 4 Hours.

Provides an introduction to the methods of social-psychological research. Assists students in developing the ability to read published social research with a critical eye, to pose questions in a testable manner, to apply experimental methods to social research, and to express themselves in APA journal style.

PSYC 4616. Laboratory in Personality. 4 Hours.

Provides an introduction to the methods and areas of personality research. Discusses problems of measurement, control, and interpretation. Critically examines representative published experiments. Students design, collect data for, assess, and write up several experiments.

PSYC 4622. Laboratory in Sensation and Perception. 4 Hours.

Focuses on experiments using psychophysical methods in the various senses, typically including audition, vision, and others. Students collect data on themselves, analyze the data statistically, and write reports. Critical thinking is stressed.

PSYC 4624. Laboratory in Affective Science. 4 Hours.

Provides instruction in the methods of affective science (i.e., the study of what emotions are and how they work). Students are expected to become members of a functioning lab team, which uses a multimethod approach combined with various theoretical frameworks to guide research in affective science. Offers students an opportunity to develop the ability to read the scientific literature; think critically about research questions; design, conduct, and analyze experiments; and write in APA journal style, as well as to gain valuable interpersonal and organizational skills that come from working on a team.

PSYC 4626. Laboratory in Life-Span Emotional Development. 4 Hours.

Studies life-span development and how emotional experience, perception, and regulation changes across the life span. Lab teams use a multimethod approach and theoretical frameworks to guide research in emotional development. Offers students an opportunity to learn how to read the scientific literature; think critically about research questions; design, conduct, and analyze experiments; write in the journal style of the American Psychological Association; and gain interpersonal and organizational skills while working on a research team. PSYC 3402 highly recommended.

PSYC 4628. Laboratory in Developmental Psychology. 4 Hours.

Offers students an opportunity to acquire firsthand experience in conducting research on issues in human development. Focuses on experimental and observational research across the life span. Involves students in all aspects of each research project, including designing original research, collecting and analyzing data, preparing lab reports, and presenting findings.

PSYC 4654. Seminar in Behavioral Modification. 4 Hours.

Discusses topics in behavior modification in a seminar format.

PSYC 4656. Seminar in Biological Psychology. 4 Hours.

Offers intensive study, discussion, and practice in lab studies of physiological variables. Covers evolution of the nervous system, neurological disorders, motivation and emotion, sleep, attention and perception, learning, and memory.

PSYC 4658. Seminar in Psycholinguistics. 4 Hours.

Offers intensive study and discussion of issues in the psychology of language. Specific topics vary by semester.

PSYC 4660. Seminar in Cognition. 4 Hours.

Offers intensive study and discussion of issues in cognitive psychology. Specific topics vary by semester.

PSYC 4662. Seminar in Personality. 4 Hours.

Offers intensive study and discussion of issues in personality psychology. Allows students to examine selected topics and present their findings in class.

PSYC 4664. Seminar in Social Psychology. 4 Hours.

Provides an in-depth analysis of specific topics in social psychology. Students read original research and theory papers involving these topics, make presentations, and write papers related to their readings.

PSYC 4666. Seminar in Clinical Psychology. 4 Hours.

Focuses on psychotherapy: theory, methods, and outcome research. Provides an overview of clinical psychology: history, ethical and legal issues, the therapeutic relationship, cross-cultural counseling, the process of change. Students write and present papers on a topic of interest.

PSYC 4668. Seminar in Sensation and Perception. 4 Hours.

Expects students to present in class on topics such as how perceptions are organized, formed, and modified by sensory, attentional, motivational, and cognitive factors, how our sensory systems extract information from the environment in a consistent and logical manner, despite large changes in environmental conditions, and how to account for this in physiological terms.

PSYC 4674. Seminar in Cognitive Neuroscience. 4 Hours.

Offers intensive study and discussion of issues in cognitive neuroscience, the study of human cognitive processes, and their underlying neural substrates. Considers both theoretical and methodological issues, as well as applications to related fields of study. Specific topics vary by semester.

PSYC 4676. Seminar in Developmental Psychology. 4 Hours.

Offers intensive study and discussion of issues in developmental psychology, the study of how social, emotional, cognitive, and other psychological processes emerge and change over different periods of the life span. Considers both theoretical and methodological issues, as well as applications to real-world contexts. Specific topics may vary by semester.

PSYC 4678. Seminar in Social and Affective Neuroscience. 4 Hours.

Addresses fundamental questions about mind-brain mapping (e.g., distributed vs. modular processing, predictive coding, sensory integration, etc.), with a focus on social and affective processing. Offers intensive study and discusses issues in social and affective neuroscience. Considers both theoretical and methodological issues, as well as applications to real-world contexts. Specific topics may vary by semester.

PSYC 4965. Undergraduate Teaching Experience. 4 Hours.

Offers undergraduate teaching assistantships in psychology courses under the close direction of the course instructor. Assignments may include holding office hours and recitation/tutorial and review sessions, answering students' emails, moderating discussion boards, helping to proctor exams and quizzes, (very) limited lecturing, or leading class discussions (only under faculty supervision). Requires minimum overall GPA of 3.333, and grade of A–or higher in the course for which the student will be an undergraduate teaching assistant; permission to enroll is further subject to the availability of an appropriate course assignment and instructor; prior arrangements must be made with the instructor at least one term before registration. May be repeated once, but may not be repeated for the same course.

PSYC 4970. Junior/Senior Honors Project 1. 4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student's major field. Combined with Junior/Senior Project 2 or college-defined equivalent for 8-credit honors project. May be repeated without limit.

PSYC 4971. Junior/Senior Honors Project 2. 4 Hours.

Focuses on second semester of in-depth project in which a student conducts research or produces a product related to the student's major field. May be repeated without limit.

PSYC 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

PSYC 4991. Directed Study Research. 4 Hours.

Offers research experience on a chosen topic under the direction of a faculty member. Research content and requisites depend on the instructor. Prior arrangements must be made with the faculty member at least one term before registration. May be repeated up to three times.

PSYC 4993. Independent Study. 1-4 Hours.

Offers a reading course for the student who wants guidance in the archival exploration and in-depth study of a topic of interest. Conducts study through a series of individual tutorials or discussions with a faculty member that typically involve an extensive, analytical review of the literature. Interested students should consult directly with the relevant faculty member or with a department advisor for guidance in locating the most appropriate faculty person at least one semester before the study is undertaken. May be repeated without limit.

PSYC 4994. Internship in Psychology. 4 Hours.

Offers supervised experiences in the application of psychology in instructional, clinical, or other applied settings. May be repeated without limit.

PSYC 5100. Proseminar in Psycholinguistics. 3 Hours.

Serves as first-level graduate course in psycholinguistics, focusing on theoretical, experimental, and methodological issues. Includes faculty lectures, student presentations, and discussions. Requires permission of instructor for students who are not enrolled in the PhD program in psychology. May be repeated without limit.

PSYC 5110. Proseminar in Cognition. 3 Hours.

Serves as first-level graduate course in cognition, focusing on theoretical, experimental, and methodological issues. Includes faculty lectures, student presentations, and discussion. Requires permission of instructor for students who are not enrolled in the PhD program in psychology. May be repeated without limit.

PSYC 5120. Proseminar in Sensation. 3 Hours.

Serves as first-level graduate course in sensation, focusing on theoretical, experimental, and methodological issues. Includes faculty lectures, student presentations, and discussion. Requires permission of instructor for students who are not enrolled in the PhD program in psychology. May be repeated without limit.

PSYC 5130. Proseminar in Perception. 3 Hours.

Serves as first-level graduate course in perception, focusing on theoretical, experimental, and methodological issues. Includes faculty lectures, student presentations, and discussion. Requires permission of instructor for students who are not enrolled in the PhD program in psychology. May be repeated without limit.

PSYC 5140. Proseminar in Biology of Behavior. 3 Hours.

Serves as first-level graduate course in the biological basis of behavior, focusing on theoretical, experimental, and methodological issues. Includes faculty lectures, student presentations, and discussion. Requires permission of instructor for students who are not enrolled in the PhD program in psychology. May be repeated without limit.

PSYC 5150. Proseminar in Clinical Neuroscience. 3 Hours.

Serves as first-level graduate course in clinical neuroscience, focusing on theoretical, experimental, and methodological issues. Includes faculty lectures, student presentations, and discussion. Requires permission of instructor for students who are not enrolled in the PhD program in psychology. May be repeated without limit.

PSYC 5160. Proseminar in Personality. 3 Hours.

Serves as first-level graduate course in personality, focusing on theoretical, experimental, and methodological issues. Includes faculty lectures, student presentations, and discussion. Requires permission of instructor for students who are not enrolled in the PhD program in psychology. May be repeated without limit.

PSYC 5170. Proseminar in Social Psychology. 3 Hours.

Serves as first-level graduate course in social psychology, focusing on theoretical, experimental, and methodological issues. Includes faculty lectures, student presentations, and discussion. Requires permission of instructor for students who are not enrolled in the PhD program in psychology. May be repeated without limit.

PSYC 5180. Quantitative Methods 1. 3 Hours.

Presents first course in a two-course sequence that surveys a variety of quantitative methods used in experimental psychology. Requires permission of instructor for students who are not enrolled in the PhD program in psychology.

PSYC 5181. Quantitative Methods 2. 3 Hours.

Continues PSYC 5180. Presents second course in a two-course sequence that surveys a variety of quantitative methods used in experimental psychology. Requires permission of instructor for students who are not enrolled in the PhD program in psychology.

PSYC 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

PSYC 7210. Seminar in Cognition. 3 Hours.

Addresses current theoretical and empirical issues in cognition. Specific topics vary by semester. May be repeated without limit.

PSYC 7240. Seminar in Biology of Behavior. 3 Hours.

Addresses current theoretical and empirical issues in the biological basis of behavior. Specific topics vary by semester. May be repeated without limit.

PSYC 7250. Seminar in Clinical Neuroscience. 3 Hours.

Addresses current theoretical and empirical issues in clinical neuroscience. Specific topics vary by semester. May be repeated without limit.

PSYC 7270. Seminar in Social Psychology. 3 Hours.

Addresses current theoretical and empirical issues in social psychology. Specific topics vary by semester. May be repeated without limit.

PSYC 7300. Advanced Quantitative Analysis. 3 Hours.

Covers selected advanced methods of quantitative analysis used in experimental psychology. Specific topics vary by semester. May be repeated without limit.

PSYC 7301. Research Methodologies Psychology. 3 Hours.

Introduces students to a range of conceptual and methodological issues in the conduct of experimental psychology research by department faculty members. Specific course content depends on which faculty members conduct the course in a given semester. May be repeated without limit.

PSYC 7302. Ethics and Professional Issues. 3 Hours.

Identifies and investigates ethical issues (such as privacy, fairness, social responsibility, or animal use) that research psychologists face in acquiring and using scientific knowledge. Also addresses broader professional issues relevant to pursuing a career as a research psychologist in an academic, government, or industrial setting.

PSYC 7990. Thesis. 3 Hours.

Conducts theoretical and experimental research for the master's degree. May be repeated without limit.

PSYC 7996. Thesis Continuation. 0 Hours.

Continues research for the master's degree.

PSYC 8400. Research Lab. 1 Hour.

Offers laboratory work in experimental psychology. May be repeated without limit.

PSYC 8401. Research Project. 3 Hours.

Conducts research project in selected area of experimental psychology. May be repeated without limit.

PSYC 8402. Special Topics in Psychology. 3 Hours.

Offers in-depth analysis of critical topics in psychology. Specific topics vary by semester. May be repeated without limit.

PSYC 8403. Research Issues in Psychology. 3 Hours.

Offers in-depth analysis of research issues in psychology. Specific topics vary by semester. May be repeated without limit.

PSYC 9000. PhD Candidacy Achieved. 0 Hours.

Indicates successful completion of the doctoral comprehensive exam.

PSYC 9986. Research. 0 Hours.

Offers the student the opportunity to conduct doctoral research. May be repeated without limit.

PSYC 9990. Dissertation. 0 Hours.

Conducts theoretical and experimental research for the PhD degree. May be repeated once.

PSYC 9996. Dissertation Continuation. 0 Hours.

Continues research for the PhD degree. May be repeated without limit.

Psychology - CPS (PSY)

Search PSY Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=PSY>)

PSY 1050. Introduction to Behavioral Health Science Professions. 1 Hour.

Introduces students to the major and to the landscape of behavioral health professions. Offers students an opportunity to consider their professional track and to begin formulating goals. Acclimates students to the Northeastern network, including how to access the professional, interpersonal, and academic resources available. Introduces students to their faculty advisors and fellow students and describes available experiential learning opportunities. Familiarizes students with undergraduate research and technological resources. Introduces the mindsets, dispositions, and competencies to support academic, professional, and personal sustainability.

PSY 1100. Foundations of Psychology. 3 Hours.

Surveys the fundamental principles, concepts, and issues in the major areas of contemporary scientific psychology. Approaches the study of psychology as a method of inquiry as well as a body of knowledge. Offers students an opportunity to obtain a basis for more advanced study of the science of psychology. Examines origins and methods of psychology, including neuroscience, consciousness, cognition, development, nature and nurture debate, psychosocial development, learning and memory, language, motivation, personality, group dynamics, therapy, health psychology, and psychological disorders.

PSY 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

PSY 2110. Principles of Human Learning. 3 Hours.

Presents the basic learning principles that permit humans to adapt effectively to a changing environment. Covers the science of how humans learn and the research and techniques of classical and operant conditioning with discussions of discrimination and generalization, biological constraints on learning, and other related topics. Relates learning principles to the understanding and treatment of behavioral, affective, cognitive, and motivational disorders. .

PSY 2230. Stress and Its Management. 3 Hours.

Offers a research-experiential approach to understanding stress and its effects on human behavior and physiology. Stress is an aspect of everyday contemporary life. Discusses the work of researchers and practitioners in stress management and considers the causes of stress from a variety of theoretical and practice-based perspectives. Topics include the relation of stress to health, communication, relationships, and academic and work performance. Examines the techniques and implementation of stress management in personal and professional arenas. Considers perspectives of stress and coping from various social and cultural standpoints.

PSY 2240. Human Sexuality and Love. 3 Hours.

Focuses on the historical, biological, psychological, developmental, and social/cultural influences on human sexuality and its expression. Sexuality lies at the core of our identities as human beings, yet many adults are uninformed of basic aspects of sexual anatomy and function. Topics include sexual anatomy and physiology, contraception and abortion, pregnancy and childbirth, gender identity, role and expression, romantic love, sexual minorities, media impact on sexuality, and attitudes toward contemporary issues.

PSY 2500. Applied Behavioral Analysis 1. 3 Hours.

Focuses on how to facilitate significant behavioral change in applied settings using foundational principles of behavioral analysis to spur on effective, meaningful, and ethical change. Covers how to choose, identify, and effectively employ reinforcers, foundations of behavioral assessment, and development of function-based interventions. Applied behavioral analysis is a discipline that strives to understand and improve human behavior. .

PSY 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

PSY 3150. The Opioid Crisis. 3 Hours.

Focuses on the complexities of addiction across the life span, including the associated biological, psychological, and social factors. The exorbitant rise in rates of opioid addiction and overdoses world-wide require effective, evidence-based interventions to support the millions of individuals, families, communities, and societies affected. Examines the continuum of care model including promotion, prevention, treatment, and recovery. Topics include key risk and protective factors; co-occurring disorders; and evidence-based practices and methods of engaging diverse constituents through outreach, education, service delivery, capacity building, and systems change.

PSY 3200. Social Psychology. 3 Hours.

Surveys the socialization process, including social motives, interpersonal perception, group membership and structure, gender and culture, attitudes, prejudice, and leadership. Social psychology is embedded in our professional and personal roles. Identifies key theories and frameworks to apply in today's work and living arenas.

PSY 3210. Abnormal Psychology. 3 Hours.

Covers diagnosis, symptomatology, etiology, and therapy of anxiety, somatoform, and dissociative disorders. Introduces the major forms of psychotherapy, including psychoanalysis and client-centered, behavioral, and cognitive therapy.

PSY 3220. Cognition and Language. 3 Hours.

Offers an in-depth analysis of human cognition and language. Topics include pattern recognition, attention, memory, categorization and concept formation, problem solving, and aspects of cognitive development. Examines current theories of cognitive processing and related experimental findings. Introduces psycholinguistics, the nature and structure of language, its biological bases, acquisition, production, and perception.

PSY 3230. Development across the Life Span. 3 Hours.

Explores change throughout the life span. Focuses on the basic physical, perceptual, cognitive, and emotional capacities that develop from infancy through late adulthood. Emphasizes how biological inheritance interacts with the physical and social environment. Explores individual and cross-cultural differences in patterns of development.

PSY 3240. Sensation and Perception. 3 Hours.

Examines how our sensory organs—eyes, ears, skin, mouth, and nose—along with our sensory nervous system inform our awareness of the outside world and influence our internal perceptual world. Covers perception of light, space, form, motion, color, attention, speech, and music. Topics include visual and auditory perception, neural and anatomical bases, and early and ongoing influences on development of sensation and perception.

PSY 3330. Autism Spectrum Disorders. 3 Hours.

Focuses on the characteristics, theory, and teaching and intervention applications for individuals with autism spectrum disorders (ASD). Discusses approaches, trends, and etiological and diagnostic issues. By embracing an inclusionary, strengths-based approach, educational and behavioral professionals are better able to engage families through responsive instructional and intervention strategies across the life span.

PSY 3450. Research in Psychology. 3 Hours.

Explores research methods in psychology including observational, correlational, survey, and experimental methods. Uses the scientific method in the design, execution, analysis, and communication of psychological investigations. Discusses the ethics of research and evaluation methods. Offers students an opportunity to conduct psychological studies using a variety of methods and to write a substantial research paper.

PSY 3500. Applied Behavioral Analysis 2. 3 Hours.

Builds upon the basic principles of applied behavioral analysis presented in PSY 2500. Focuses on the necessary structures to build effective instruction and intervention for a wide range of clinical and school settings. Allows for varied applications for clients and students with addiction, developmental disabilities, autism and related disabilities, and learning disabilities.

PSY 3700. Behavior Measurement. 3 Hours.

Explores principles of quantitative behavioral analysis with an emphasis on applying research to practice. In accordance with the Behavior Analyst Certification Board Fourth Edition Task List, explores different methods in behavioral analysis. The need to analyze data and embark upon experiential design is a vital component of intervening with populations.

PSY 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

PSY 4220. Learning. 3 Hours.

Presents the basic learning principles that permit humans and animals to adapt effectively to a changing environment. Covers the research and techniques of classical and operant conditioning with discussions of discriminations and generalization, biological constraints on learning, and other related topics. Relates learning principles to the understanding and treatment of behavioral, affective, cognitive, and motivational disorders.

PSY 4230. Physiological Psychology. 3 Hours.

Explores the relationship between brain function and human behavior. Introduces how nerve cells function. Topics include localization of function in the brain, perception, learning, eating behavior, motivation, and the relation of emotion to nervous system activity.

PSY 4310. Personality. 3 Hours.

Focuses on behavioral, dynamic, and constitutional determinants. Includes concepts such as environmental and genetic contributions, assessment of personality, research, and a survey of the major personality theories.

PSY 4320. Motivation. 3 Hours.

Covers various aspects of motivation, a topic that concerns every area of society and living. Topics include primary and secondary reinforcement, unconscious motivation, avoidance and punishment, acquired motivational states such as addiction, the assessment of motives, and implications on everyday living.

PSY 4400. Behavior Assessment and Evaluation. 3 Hours.

Explores the methods used to identify, measure, and assess the behaviors of individuals using applied behavior analysis (ABA), including behaviors targeted for increase and decrease. In-depth topics include function-based assessment and treatment in behavior analysis; design and details of the assessment process, including selection of an appropriate assessment method; and the methodology, results, and recommendations derived from a functional behavior assessment. Explores assessments such as the DIBELS, ABLLS-R, and VB-MAPP, along with widely used instruments. The capacity to effectively analyze behavior and develop appropriate intervention strategies to bring about behavioral change is a fundamental competency for professionals.

PSY 4440. Human Development, Teaching, and Learning. 3 Hours.

Employs an applied approach to engaging a diverse range of populations in deep, experiential learning that promotes social-emotional, cognitive, and dynamic growth across the life span. Contemporary research on learning and human development is a multidisciplinary activity that draws on psychology, anthropology, sociology, education, and cognitive science.

PSY 4600. Advanced Practicum 1. 3 Hours.

Offers students an opportunity to apply behavioral principles and methods within organizational settings. Students engage in agency settings to bolster and demonstrate professional competencies needed to serve individuals, groups, organizations, and communities in our global 21st century.

PSY 4700. Advanced Practicum 2. 3 Hours.

Allows students to engage in a continuing and more advanced experience in applying behavioral techniques. For students who have successfully completed PSY 4600.

PSY 4850. Senior Research Seminar in Psychology. 4 Hours.

Offers students an opportunity to independently investigate a topic of interest and present their findings to their peers. This capstone course for the undergraduate curriculum should be taken as close as possible to graduation.

PSY 4955. Project. 1-4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student's major field. May be repeated without limit.

PSY 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

Public Health (PHTH)

Search PHTH Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=PHTH>)

PHTH 1120. Society and Health. 4 Hours.

Applies social scientific perspectives to the study of health, illness, and healthcare. Explores the ways that societal factors such as race, class, and gender interplay with health, healthcare, and health disparities. Studies neighborhoods and social networks in relation to health. Introduces basic sociological concepts relevant for the study of health and healthcare, such as social construction and medicalization. Offers students an opportunity to develop critical assessment skills while exploring a range of explanations for why, despite having the most expensive healthcare system, the United States ranks comparatively low in life expectancy and health and well-being outcomes. Uses lectures, case-based learning, and small-group workshops to explore the ways that our social environment shapes health in contemporary U.S. society. PHTH 1120 and SOCL 1120 are cross-listed.

PHTH 1260. The American Healthcare System. 4 Hours.

Introduces the organization and dynamics of the healthcare system and the role of consumers. Explores basic elements of healthcare including financing, personal insurance, high-risk status, and patient rights within the context of the U.S. system. Central to this exploration is an analysis of healthcare issues requiring informed consent from patients: patient bill of rights, healthcare directives, and the use of a proxy for decision making. Introduces the roles and responsibilities of various healthcare workers within the framework of an interdisciplinary model of healthcare.

PHTH 1261. Comparative Healthcare Systems. 4 Hours.

Designed to enable health profession students to develop a basic understanding of health-delivery systems and key issues confronting healthcare in the United States and in the study country in this study-abroad course. Explores issues such as the affordability of medical care, patient rights, health risks and behaviors, disease prevention, quality and access to care, the growth of managed care and corporate influence on healthcare, new medical technologies, the aging population, the impact of biotechnology, and trends in employment of health professionals. Incorporates self- and group-reflection exercises, Internet and contemporary media exploration, and in-class discussions. Compares and contrasts key healthcare issues in the study country with those in the United States using literature, Internet and contemporary media, observations in the study country, and discussions with guest speakers.

PHTH 1270. Introduction to Global Health. 4 Hours.

Introduces global health in the context of an interdependent and globalized world focusing on four main areas of analysis: infrastructure of global health; diseases; populations; and terms, concepts, and theories. While the focus is on lower-income countries, the course examines issues in a broader global context, underscoring the interconnections between global health disparities and global health policy response. Applies case studies describing interventions to improve healthcare in resource-poor settings in sub-Saharan Africa and elsewhere to help illuminate the actors, diseases, populations, and principles and frameworks for the design of effective global health interventions. AFRS 1270 and PHTH 1270 are cross-listed.

PHTH 2210. Foundations of Biostatistics. 4 Hours.

Introduces the fundamental concepts of biostatistics. Offers students an opportunity to learn to apply statistical thinking to practical problems across several health disciplines. Draws examples and readings from clinical and public health literature. Introduces the Stata statistical software package.

PHTH 2211. Recitation for PHTH 2210. 0 Hours.

Offers small group discussion format to cover material in PHTH 2210.

PHTH 2300. Communication Skills for the Health Professions. 4 Hours.

Offers students in the health professions an opportunity to learn how to communicate effectively with patients, colleagues, and other professionals. Covers interpersonal communication with patients and families from culturally diverse backgrounds, public speaking and presentations, and communicating as a leader. Requires students to create/prepare and deliver several presentations throughout the semester.

PHTH 2301. Communication Skills for the Health Professions—Global. 4 Hours.

Studies how to communicate effectively with patients, colleagues, and other professionals—regardless of race, culture, or ethnicity—on interpersonal, organizational, and global levels. Introduces traditional and new media health communication strategies, public speaking/presentation techniques, and communication as leaders in a global environment. Compares cultures and healthcare systems in the country of study with the American system by engaging with health professionals, patients, caregivers, and communications and other specialists. Introduces students to art and techniques of health communication for informing and influencing patients, caregivers, and the community-at-large. Offers students in the health professions an opportunity to learn interpersonal, organizational, mass media, and global communication skills to empower individuals to become health literate and participate in their own healthcare. May be repeated without limit.

PHTH 2350. Community and Public Health. 4 Hours.

Provides students with a basic familiarity with and appreciation of public health and community-based methods for improving the health of populations. Explores the purpose and structure of the U.S. public health system, contemporary public health issues such as prevention of communicable diseases, health education, social inequalities in health and healthcare, public health responses to terrorism, and control of unhealthy behaviors like smoking, drinking, drug abuse, and violence.

PHTH 2351. Community and Public Health - Global. 4 Hours.

Offers a basic familiarity with (and appreciation of) public health and community-based methods for improving the health of populations in a global context. Discusses the purposes and structures of the public health systems of the United States and the host country. Explores contemporary public health issues, including the global burden of disease; social determinants of inequalities in health and healthcare; communicable disease detection and management; environmental health risks; nutrition and physical activity; and unhealthy behaviors, such as substance use and violence. Analyzes the application of public health practices and principles to urban health concerns through the use of comparative case studies.

PHTH 2414. Environmental Health. 4 Hours.

Offers an overview of the field of environmental health, with focus on what the National Institute of Environmental Health Sciences terms "environmental public health." This broad field increasingly involves transdisciplinary approaches that use social science/environmental health collaborations, and it includes the physical, built, and social environments. Asks students to think critically about the economic, scientific, social, and political factors that shape environmental health and to consider how the field is relevant to other public health issues.

PHTH 2515. Healthcare Policy and Administration. 4 Hours.

Focuses on management and policy issues in healthcare. Discusses management and administrative structures in hospitals and other healthcare organizations, including community clinics and health organizations, both private and public. Introduces the financial systems, economic information, and payment mechanisms necessary to understand healthcare financing. Also explores the variety of factors that influence population health from a healthcare policy perspective. Offers students an opportunity to learn how to analyze, prepare, and write policy briefs based on understanding the various economic, legal, and political forces shaping healthcare in the United States.

PHTH 2949. Research Ethics Training. 0 Hours.

Indicates successful completion of research ethics training at the undergraduate level. .

PHTH 2991. Research in Public Health. 1-4 Hours.

Offers an opportunity to conduct introductory-level research or creative endeavors under faculty supervision.

PHTH 3210. Using Data in Health Research. 2 Hours.

Uses health data to explore and understand the underlying structures of widespread health issues. Accessing and understanding data is crucial to evaluate the impact of an intervention, to determine barriers to care, and to provide foundations for health recommendations and decisions. Introduces students to the principles and common techniques used to access, explore, interpret, and present health data. Offers students an opportunity to learn the essential concepts, techniques, and tools needed to work with data in health research. Focuses on the understanding of the core concepts and principles and their application to health data used in research. Uses Excel extensively to demonstrate these approaches. .

PHTH 3250. Fundamentals of Qualitative Research. 4 Hours.

Discusses the role of qualitative research in topics related to healthcare delivery and public health practice. Qualitative research aims to achieve in-depth and contextualized understanding of people, cultures, and societies and usually employs texts, interviews, archival materials, and focus group discussions as sources of data. Describes all stages of a research project, from the initial selection of a topic, through data collection, data analysis, and presentation of results. Surveys the research design approaches most commonly used in healthcare settings, public health agencies, and human service organizations. Students formulate a research question, develop an appropriate research plan, and describe how best to collect or access relevant data. Offers students an opportunity to learn how to assess the rigor and generalizability of qualitative research.

PHTH 4120. Global Perspectives on Discrimination and Health. 4 Hours.

Explores how discrimination can lead to population-level health disparities among marginalized groups globally. Topics include constructions of social categories, such as race and gender; differences in patterns of disease across populations, both intra- and internationally; how work from various disciplines, such as anthropology, medicine, and public health, inform understanding about how discrimination relates to health; and theoretical models from different disciplines that explain public health disparities.

PHTH 4202. Principles of Epidemiology in Medicine and Public Health. 4 Hours.

Introduces the principles of epidemiology necessary to critically evaluate the published research in medicine, public health, and related fields. Through careful reading of literature, class discussion, and lectures, familiarizes students with the study of design-related considerations that are an indispensable part of interpreting scientific literature. Offers students an opportunity to learn how to recognize critical elements of research design and execution (e.g., loss to follow-up in randomized clinical trials and other cohort designs, selection bias in case control studies, etc.); identify the strengths and limitations of different approaches to research questions; deepen their understanding of causal inference; and recognize the provisional nature of scientific knowledge. Covers issues of statistical methods and data analysis; however, there are no computational requirements. .

PHTH 4511. Healthcare Management. 4 Hours.

Provides an opportunity to develop skills and abilities related to management within the context of interdisciplinary study. Students explore issues in healthcare management in small-group, case-based educational experiences or problem-solving approaches. Within the context of small groups, students explore complex problems frequently encountered in clinical practice. Group projects related to leadership, management, or administrative issues are pursued and developed as classroom or poster presentations.

PHTH 4515. Critical Issues in Health and Public-Health Policy. 4 Hours.

Explores public policy issues and their relation to U.S. healthcare reform. Emphasizes passage of the Affordable Care Act (ACA) and ongoing challenges in the public health arena. Uses historical, political, ethical, and other critical lenses to analyze a century of evolving U.S. healthcare reform efforts and the status of ACA implementation and to assess tensions between scientific, government, and broader public perspectives about current public health policy concerns. Explores the role of harm-reduction strategies, the impact of bioterror and emergency preparedness, privacy and other challenges of disease surveillance and population health-data collection, conflict regarding alternative strategies for infectious and chronic disease management, and the implications of the ACA for the future of public health.

PHTH 4540. Health Education and Program Planning. 4 Hours.

Offers a writing-intensive course that introduces concepts central to health education and the program-planning process. Examines current public health issues that require intervention through health education or other types of prevention programs. Studies and applies models and theories used in health education and program planning. Offers students an opportunity to conduct a needs assessment; design and plan a program for a public health issue; create a mission statement for the program as well as goals, objectives, and strategies; and design the intervention, develop an evaluation plan, and create a budget and marketing plan.

PHTH 4993. Independent Study. 1-4 Hours.

Offers students an opportunity to carry out independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

PHTH 5120. Race, Ethnicity, and Health in the United States. 3 Hours.

Explores the role of economic, social, and individual factors in explaining racial and ethnic health disparities and examines intervention approaches to eliminate them. Topics include genetic and social constructions of race and ethnicity, measuring race and ethnicity, and the differences in prevalence and patterns of disease across groups; cultural and structural factors that affect healthcare delivery, such as discrimination, racism, and health status; and public health approaches to prevention and improving healthcare delivery.

PHTH 5202. Introduction to Epidemiology. 3 Hours.

Introduces the principles, concepts, and methods of population-based epidemiologic research. Offers students an opportunity to understand and critically review epidemiologic studies. Lectures and discussions aim to serve as a foundation for training in epidemiology, quantitative methods, and population-based health research. The course is a required introductory course for students in the Master of Public Health program and is appropriate for students who are interested in epidemiologic research. Students not meeting course restrictions may seek permission of instructor.

PHTH 5210. Biostatistics in Public Health. 3 Hours.

Offers public health students an opportunity to obtain the fundamental concepts and methods of biostatistics as applied predominantly to public health problems and the skills to perform basic statistical calculations. Emphasizes interpretation and comprehension of concepts. Topics include descriptive statistics, vital statistics, sampling, estimation and significance testing, sample size and power, correlation and regression, spatial and temporal trends, small area analysis, and statistical issues in policy development. Draws examples of statistical methods from the public health practice. Introduces use of computer statistical packages. Requires permission of instructor for students outside designated programs.

PHTH 5212. Public Health Administration and Policy. 3 Hours.

Offers students an opportunity to obtain practical knowledge concerning the planning, organization, administration, management, evaluation, and policy analysis of health programs. Surveys what we know and think about public health administration and policy and what we do in practice. Introduces the main components of public health policy and administration using notable conceptual frameworks and case studies. Requires permission of instructor for students outside designated programs.

PHTH 5214. Environmental Health. 3 Hours.

Introduces the field of environmental health, which encompasses concerns related to physical, built, and social environments. Discusses the tools used to study environmental exposures and diseases. Examines environmental health hazards, the routes by which humans are exposed to hazards, various media in which they are found, and disease outcomes associated with exposures. Offers students an opportunity to become familiar with methods used to conduct environmental health research and with the federal and state agencies responsible for protecting environmental health.

PHTH 5222. Health Advocacy. 3 Hours.

Seeks to educate students about the role of advocacy in public health while providing tools and support to address current healthcare issues. Provides information and theory about advocacy, education, and community organizing in public health practice and skills geared toward direct application. Covers various techniques related to developing and conducting an advocacy project within a community setting. Offers students an opportunity to develop, communicate, and refine a community-based advocacy program. Requires permission of instructor for students outside designated programs.

PHTH 5226. Strategic Management and Leadership in Healthcare. 3 Hours.

Focuses on management challenges facing healthcare organizations, particularly community-based agencies and their role in the public healthcare delivery system. Introduces strategic thinking and leadership approaches that must be considered for managing a successful healthcare organization. Selected topics include strategic planning; organizational development and the barriers to organizational change; relationship management with key internal and external constituencies; marketing, financial management, and contract negotiation; evolving principles of health insurance and the changing role of the consumer; and the key elements for effective organizational leadership in today's evolving healthcare marketplace. When appropriate, outside experts are used to supplement readings, case studies, and lecture and discuss practical real-world challenges in leading various healthcare initiatives. Requires permission of instructor for students outside designated programs.

PHTH 5230. Global Health. 3 Hours.

Presents an overview of global health issues and focuses on less economically developed countries. Covers measures of disease burden; demography of disease and mortality; Millennium Development Goals (under the auspices of the United Nations); infectious diseases such as HIV/AIDS, tuberculosis, and malaria and their prevention; vaccine utilization and potential implications; chronic diseases; tobacco-associated disease; nutritional challenges; behavioral modification; mother and child health; health human resources; and ethical issues in global health. LAW 7630 and PHTH 5230 are cross-listed.

PHTH 5232. Evaluating Healthcare Quality. 3 Hours.

Focuses on the conceptual and methodological foundations for evaluating the quality of care of healthcare providers—both individual providers and healthcare organizations. Aimed at students pursuing careers in public health, public policy, healthcare management, and the various health professions in the growing field of quality evaluation and improvement. Also designed to give healthcare providers an appreciation for how they may be evaluated. Examines scientific issues in the measurement of quality of care as well as key quality evaluation methods. Also covers the use of risk adjustment and other methodologies for comparing the quality of healthcare providers. Focuses on mechanisms that assess quality, including licensure, accreditation, and board certification.

PHTH 5234. Economic Perspectives on Health Policy. 3 Hours.

Uses basic economic concepts to illuminate the many factors that shape health, healthcare, and the healthcare system in the United States. Examines the role of these concepts in explaining the challenges faced in achieving three core goals of the healthcare system: increasing access, limiting cost, and improving quality. Explores how policy makers, market participants, and others can remedy access, cost, and quality deficiencies. Illustrates how economic concepts can be applied to the study of health and health behaviors.

PHTH 5236. Public Health Nutrition. 3 Hours.

Covers public health nutrition issues among individuals, communities, and populations living in urban settings. Emphasizes issues about vulnerable populations, such as ethnic minorities, women, children, and the elderly. Topics include food and nutrition science; evaluation of specific nutrition programs; and the understanding of the role of public health services, policies and legislation, funding, marketing, and communication strategies for the development, evaluation, implementation, and dissemination of nutrition programs. Briefly reviews international public health nutrition issues such as world hunger and food insecurity.

PHTH 5300. Project Management in Public Health. 1 Hour.

Presents principles of project management as applied to public health organizations and their programs. Offers students an opportunity to learn the components of the project management life cycle, including human resource components, material resources, and related components.

PHTH 5310. Budget Principles in Public Health. 1 Hour.

Details the public health revenue and funding environment, identifies key budget development functions, and describes the importance of utilizing the budget process for sound management of the programs. Public health programs in public agencies and nonprofit organizations require managerial skills to assure that programs are implemented efficiently and effectively. Funding for public health frequently comes from governmental revenue sources—federal and state budgets or grants from government or foundations. It is critical that the funds are utilized well and appropriate to the objectives of the agency and program. Advancing the environment for public health through effective budgeting and promotion of program impact is important to support the continued funding for public health. The course takes students through these topics and offers them the opportunity to gain the practical experience of developing a budget for a public health program as the central activity.

PHTH 5320. Grant Writing in Public Health. 1 Hour.

Explores the grant funding landscape, identifies different types of funders and grants, and identifies potential funders. Offers participants an opportunity to develop their skills in grant writing and in reviewing grants, to develop a grant proposal, and to understand the submission and peer review process.

PHTH 5330. Using Publicly Available Data in Public Health. 1 Hour.

Explores the sources of publicly available public health data and how best to utilize and communicate the data for public health programming. Good data provides the foundation for public health planning and evaluation. Finding data relevant to program planning, community assessment, and evaluation is made easier through use of the many public sources of data available. Offers students an opportunity to learn about the range of public data sources and apply the learnings to a public health topic.

PHTH 5340. Writing for Peer-Reviewed Journals in Public Health. 1 Hour.

Seeks to prepare public health students to develop and improve skills in scholarly writing and submitting manuscripts to peer-reviewed journals and to demystify the process of writing for publication. It is critical that program and policy interventions be reported for replication and contribution to the evidence base. Examines the process for preparing manuscripts for publication, types of publications, how to identify the appropriate journal, and navigating editorial decision and revision processes, including rules of the publishing process. Emphasizes journals focusing on public health practice and covers technical writing for other professional interests. Offers students an opportunity to bring ideas of programs and policy interventions or areas of timely professional interest for which they may be interested in developing a publication. .

PHTH 5350. Using SAS in Public Health Research. 1 Hour.

Introduces students to the SAS statistical software system to manage, report, summarize, and analyze public health data. The SAS suite can be used to provide a broad analysis of different types of data. Public health research often requires one to access, manipulate, and analyze data sets relating to individuals, groups, or healthcare systems. Explores approaches in SAS to accessing data sets, data manipulation, working with multiple data sets, summarizing and reporting data, and analytic results. Includes various statistical methods and testing procedures, such as t-tests, chi-square tests, and linear regression, to illustrate applications of SAS. The second part of the course explores more advanced programming methods including SAS macros, using the Output Delivery System (ODS), and data arrays.

PHTH 5440. Community-Based Participatory Research: Environmental Health. 3 Hours.

Aims to prepare students for community-based participatory research (CBPR) through historical, theoretical, and methodological materials. Through visits with experienced CBPR researchers, studies the need for, benefits of, and challenges to community-grounded research. Uses the lens of local environmental justice issues to emphasize the importance of CBPR to environmental health and justice work. Offers students an opportunity to engage in hands-on labs, to develop research tools to study their own community as students, to critically analyze CBPR cases, and to develop their own strategic plan to research a pressing environmental health and justice issue through CBPR. Introduces students to critical studies of science and technology.

PHTH 5540. Health Education and Program Planning. 3.4 Hours.

Focuses on underlying concepts of health education and explores current health education issues that require intervention. Covers program planning models and theories used in health education. Offers students an opportunity to develop a working knowledge of the planning process for health education through the analysis of case studies and by creating a program plan to address a health issue of their choice. Provides health science students with preparation for HSCI 4710, in which they may choose to implement and evaluate their program plan.

PHTH 6200. Principles and History of Urban Health. 3 Hours.

Focuses on the aspects of urban development and life that impact the health and well-being of city residents. Offers students an opportunity to learn about the impact of migration patterns, built environments, occupational stratification, and other cultural and community contextual factors that impact health status and healthcare access. Examines the level of overall health and healthcare found in urban populations, particularly the urban poor, and the disproportionate impact on racial and ethnic minorities in the United States and elsewhere. Considers public policy approaches for addressing the unique health issues of urban areas. Examines urban health issues both from a national and international perspective. Requires permission of instructor for students outside designated programs.

PHTH 6202. Intermediate Epidemiology. 3 Hours.

Offers an intermediate-level course covering key principles, concepts, and methods of population-based epidemiologic research. Topics include observational study designs, measures of disease occurrence and association, validity and bias, confounding, effect modification, multivariate analysis for stratification and adjustment, critical appraisal and meta-analysis, mediation analysis, missing data analysis, and concepts and methods for strengthening causal inference. Offers graduate students unique opportunities to engage in practical applications, including critical reviews of published epidemiologic journal articles, and to conduct hands-on analyses of empirical datasets using SAS statistical software. Designed to serve as a foundation for further advanced training in specialized branches of epidemiology, quantitative methods, and epidemiologic research.

PHTH 6204. Society, Behavior, and Health. 3 Hours.

Explores individual, interpersonal, and social influences on health. Offers students in public health an opportunity to learn the application of the social and behavioral sciences. Examines foundations of public health, including prevention and the prevention paradox, theories of disease causation, and public health ethics. In addition, multilevel influences on health are examined, including behavioral theories and social determinants of health. Throughout the semester, attention is paid to disparities in health. Finally, we examine strategies to reduce health disparities, such as education, interventions, and policy-level changes, and discuss their relative effectiveness. Requires permission of instructor for students outside designated programs.

PHTH 6208. Urban Community Health Assessment. 3 Hours.

Offers students an opportunity to develop a basic understanding of the complex public health issues confronting urban communities across the nation. Uses a community organization and development framework for public health practice. Seeks to provide skills, tools, and experiential learning opportunities that result in community assessments that may be used in public health planning, programming, and policy. Covers key principles and methods for conducting community health assessments utilizing a range of quantitative and qualitative methods, including community epidemiology, major data sets, surveillance data, behavioral risk and other population-based surveys, as well as other primary and secondary data sources. Includes collaborative and interactive exercises, including self- and group reflection, Internet and contemporary media exploration, and in-class discussions. Requires permission of instructor for students outside designated programs.

PHTH 6210. Applied Regression Analysis. 3 Hours.

Builds upon the fundamental concepts and methods of biostatistics with applications to health disciplines. Topics include hypothesis testing, analysis of variance, linear regression, multiple regression, and logistic regression. Examples and readings are drawn from the public health literature. The SAS statistical software package is introduced and used throughout the course.

PHTH 6224. Social Epidemiology. 3 Hours.

Focuses on social epidemiology, which is defined as the study of the distribution and determinants of health in populations as related to the social and economic determinants of health. Includes theories, patterns, and controversies, as well as programs and policies that can be applied to address health inequalities. Readings include articles that situate one dimension of social epidemiology with articles addressing the empirical patterns, address prevailing theories and controversies regarding the causes of the inequalities, as well as address interventions or policies that may be applied to address the inequalities.

PHTH 6320. Qualitative Methods in Health and Illness. 3 Hours.

Discusses qualitative inquiry in general and specifically in topics related to public health and experiences of self, health, illness, and the body. Qualitative research aims to achieve in-depth and contextual understanding of people, culture, and societies and usually employs texts, interviews, published materials, images, and focus group discussions as sources of data. The course integrates theoretical and methodological readings and discussions with designing and conducting a qualitative project. Offers students an opportunity to understand meanings of health, illness, and the body in a variety of "local worlds" and reflect on their importance for informing policy, public health, research, and practice. Requires prior completion of one undergraduate- or graduate-level course in research methods.

PHTH 6400. Principles of Population Health 1. 3 Hours.

Seeks to provide students with historical background and methodological and critical-thinking tools needed to perform high-quality, interdisciplinary research in population health. Using a problem-solving and interdisciplinary framework, offers students an opportunity to gain the skills to develop research hypotheses, design research strategies, analyze data to test study hypotheses, and communicate their findings both orally and in writing. Also offers students an opportunity to gain experience in research methodology and application of basic methods for population health research, including epidemiological and biostatistical concepts. Finally, students demonstrate their mastery of these skills through problem sets and through written proposals that include communication of preliminary data.

PHTH 6410. Principles of Population Health 2. 3 Hours.

Continues PHTH 6400, exploring additional population health research topics and methods and applying more advanced biostatistical and epidemiological analysis methods.

PHTH 6440. Advanced Methods in Biostatistics. 3 Hours.

Explores in detail the analysis of complex survey design, including adjustments for cluster sampling, weighting, and stratification. Designs that incorporate clustering of data are common in health science research. These designs are characterized by data that capture nonindependent repeated measurements on primary sampling units or that collect data with schemes more complex than simple random sampling. The statistical analyses of these types of data need to include appropriate adjustments to provide proper estimates and accurate testing. The second part of the course investigates the use of mixed regression models to analyze repeated measurements on individuals, multilevel data, and growth models.

PHTH 6450. Systematic Reviews of Scientific Literature. 3 Hours.

Offers students an opportunity to learn how to conduct a systematic review of scientific literature, including developing a question of appropriate scope and clinical relevance, development of abstraction tool, selection of articles, and drafting of all sections of the review including tables and figures. Students produce a systematic review in a topic area of substantive interest.

PHTH 6460. Analysis of Messy Data. 3 Hours.

Covers the foundations and application to messy data for various statistical approaches, including generalized additive models, robust regression, blocking and matching, propensity score analyses, bootstrap and resampling methods, and classification trees. General linear models are widely used for exploring and testing associations in cohort and observational studies. When assumptions hold and the models are correctly specified, these approaches provide unbiased estimates and powerful tests that have very desirable properties. However, in applied health science research, one often finds one's data are "messy" and usual approaches need to be modified and adapted to provide valid inferences. Highly confounded variables, strong nonlinear associations, incomplete or missing data, or highly interacted associations can require special considerations.

PHTH 6800. Causal Inference in Public Health Research. 3 Hours.

Exposes students to causal inference approaches, including causal diagrams and counterfactual theory. Students are also asked to draw upon their own research experiences and prior epidemiology training to evaluate public health studies. Covers how to apply the fundamental concepts of counterfactuals and causal diagrams; assess threats to validity in study designs and analysis, including confounding, selection bias, and measurement error/misclassification; evaluate the validity of a public health research study's design and analysis with respect to addressing causal questions; and critically analyze scientific literature and apply findings to clinical or policy decisions. Offers students an opportunity to think critically and rigorously about the implications of study design and analysis toward addressing public health questions.

PHTH 6910. Public Health Capstone. 3 Hours.

Offers students an opportunity for scholarly work on-site in a range of diverse public health settings reflective of their particular urban health focus. Students have an opportunity to integrate their theory and practice experiences in a major research, program planning, program implementation, policy development, management, service delivery, or evaluation project. Student-led and designed in consultation with community partners and faculty advisors, seeks to support students in the implementation and completion of their projects.

PHTH 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

PHTH 6966. Practicum. 3 Hours.

Provides eligible students with an opportunity for practical experience.

PHTH 7976. Directed Study. 1-3 Hours.

Offers the student the opportunity to bring individual, concentrated attention to a particular public health topic or competency area as arranged and agreed upon in advance by a faculty member and the student. This option is generally recommended when the student desires a more intensive analysis of a particular subject. May be repeated without limit.

PHTH 8960. Exam Preparation—Doctoral. 0 Hours.

Offers students an opportunity to prepare for the PhD qualifying exam under faculty supervision.

PHTH 8984. Research. 1-4 Hours.

Offers an opportunity to conduct research under faculty supervision. May be repeated without limit.

PHTH 8986. Research. 0 Hours.

Offers an opportunity to conduct research under faculty supervision. May be repeated without limit.

PHTH 9000. PhD Candidacy Achieved. 0 Hours.

Indicates successful completion of program requirements for PhD candidacy.

PHTH 9990. Dissertation. 0 Hours.

Offers doctoral students an opportunity to work with their advisors and doctoral research committees to perform their doctoral research and to write their dissertation. Restricted to Bouvé doctoral candidates only. May be repeated once.

PHTH 9994. Dissertation Continuation—Part Time. 0 Hours.

Offers continued dissertation supervision by members of the department. May be repeated without limit.

PHTH 9996. Dissertation Continuation. 0 Hours.

Offers continuation of dissertation research to doctoral students. Restricted to Bouvé doctoral candidates only. May be repeated without limit.

Public Policy and Urban Affairs (PPUA)

Search PPUA Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=PPUA>)

PPUA 4701. Food Systems Sustainability, Health, and Equity Practicum. 4 Hours.

Offers students an opportunity to work in teams under faculty guidance on applied projects in food systems sustainability, health, and equity. Course readings focus on the design of applied analysis and on information needed to assess a given problem and provide solutions. Open to students who have completed at least two courses that satisfy the minor in food systems sustainability, health, and equity or who have permission of the instructor.

PPUA 4992. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

PPUA 5225. The Open Classroom: Public Debates on Public Policy. 4 Hours.

Offers special topics built around a series of public debates on selected issues of public policy. May be repeated without limit.

PPUA 5226. Open Classroom Recitation. 0 Hours.

Accompanies PPUA 5225. Provides a small-group discussion format. May be repeated without limit.

PPUA 5260. Ecological Economics. 4 Hours.

Introduces methods and tools of ecological economics, an interdisciplinary field that draws on theories, concepts, and tools from the physical, life, and social sciences; unites the relevant aspects of different disciplines; and generates new knowledge that can serve as a basis for investment and policymaking that is responsive to biophysical constraints on economic processes. Illustrates the use of ecological economics with empirical applications. Offers students an opportunity to apply ecological economics to a variety of environmental issues.

PPUA 5261. Dynamic Modeling for Environmental Decision Making. 4 Hours.

Introduces the theory, methods, and tools of dynamic modeling for policy and investment decision making, with special focus on environmental issues. Makes use of state-of-the-art computing methods to translate theory and concepts into executable models and provides extensive hands-on modeling experience. Topics include discounting, intertemporal optimization, dynamic games, and treatment of uncertainty.

PPUA 5262. Big Data for Cities. 4 Hours.

Investigates the city and its spatial, social, and economic dynamics through the lens of data and visual analytics. Utilizes large public datasets to develop knowledge about visual methods for analyzing data and communicating results. Offers students an opportunity to develop a critical understanding of data structures, collection methodologies, and their inherent biases.

PPUA 5263. Geographic Information Systems for Urban and Regional Policy. 4 Hours.

Studies basic skills in spatial analytic methods. Introduces students to some of the urban social scientific and policy questions that have been answered with these methods. Covers introductory concepts and tools in geographic information systems (GIS). Offers students an opportunity to obtain the skills to develop and write an original policy-oriented spatial research project with an urban social science focus.

PPUA 5264. Energy Transitions and Climate Resilience: Technology, Policy, and Social Change. 4 Hours.

Explores the renewable energy transition with an emphasis on social innovations in energy systems, climate resilience, and the interconnections among technology, policy, and social change. The transition away from fossil fuels toward more efficient, renewable-based energy systems includes much more than a technological substitution; this transition also involves social, institutional, and cultural change in how individuals, households, communities, and organizations relate to and use energy. The emerging concept of energy democracy provides an innovative lens to explore the transformative potential of the renewable energy transition. Explores tensions associated with systemic vs. incremental change, centralized vs. decentralized systems, and infrastructural lock-in vs. flexibility through semester-long team projects in which students contribute to existing, ongoing, local energy transition initiatives.

PPUA 5265. Urban and Regional Policy in Developing Countries. 4 Hours.

Explores the issues facing rapidly growing cities in the developing world. By 2040, more than half of the world's population will live in cities. Analyzes the forces driving a country's economic development and social change. Focuses on urbanization in poorer countries by examining what causes rapid urbanization; why informal economies are so pervasive and how governments approach this issue; the implications increasing popular demands for involvement in decisions have for urban planning and policy; and how governments respond to globalization and with what distributional impacts. Addresses specific sectoral issues and approaches to urban planning and policy in such areas as housing, climate change and hazard preparedness, economic development, transportation, and urban design and public space.

PPUA 5266. Urban Theory and Science. 4 Hours.

Studies the evolution of urban science, looking at some seminal theories that seeded the field and the subsequent work they inspired, including the methodologies developed to examine them. For over a century, social scientists and policymakers have sought to better understand cities, asking important theoretical questions, such as: What is a neighborhood? How does a city grow? What is a city in the first place? Culminates in an examination of urban science in the digital age, exploring how modern technological trends, including "big data," are posing new questions and offering new ways to answer them.

PPUA 5268. International Environmental Policy. 4 Hours.

Explores key environmental challenges from an international perspective. Provides a history of international environmental politics, as well as discussion of contemporary issues. Presents key paradigms for understanding environmental challenges, and aims to equip students with the analytical tools to look critically at important debates, understand the role of different actors, and assess policy options from multiple perspectives. Focus areas include natural resource management, multi-stakeholder negotiations, and climate change. Themes addressed throughout the course include the role of science in environmental policy, tensions between environment and development in international environmental politics, and the scale and complexity of international environmental governance.

PPUA 5270. Food Systems and Public Policy. 4 Hours.

Explores the public policy dimensions of the contemporary food system. Utilizes scholarly readings and case studies to assess the role of governing institutions and political actors in shaping the food supply; the effects of energy, transportation, and urban policies on food access; the ecological dimensions of food production; impacts of international trade regimes on global food trade; and the potential impacts of climate change on food security. Compares the United States and other nations and explores alternatives to the dominant food system. Seeks to engage students in applied policy analysis of specific food system issues.

PPUA 5390. Special Topics in Public Policy and Urban Affairs. 4 Hours.

Covers special topics in public policy and urban affairs. Topics are selected by the instructor and vary from semester to semester. May be repeated up to three times for up to 12 total credits.

PPUA 5976. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

PPUA 6101. Environmental Science and Policy Seminar 1. 4 Hours.

Offers an integrated introduction to the intersection between environmental science and policy. Organized around the two central themes of sustainability transitions and climate resilience. Connects theoretical frameworks, including sociotechnical systems and coupled socioecological systems, to key science-policy issues related to transitioning to a more sustainable future and responding to a changing climate.

PPUA 6201. The 21st-Century City: Urban Opportunities and Challenges in a Global Context. 4 Hours.

Offers multidisciplinary examination of the wonders and challenges of urban life, focusing on current dynamics of urban location and prosperity in the context of a global economy. Examines forces that shaped the evolution of cities and metropolitan regions; assesses a range of policy issues confronting metro areas today and the respective roles played by public and private sectors in addressing those challenges; explores global forces that are transforming cities and regions throughout the world; and addresses key questions of urban well-being, civility, and civic engagement.

PPUA 6204. Urban Development and Politics. 4 Hours.

Analyzes the creation and implementation of urban development policies and programs. Explores subsidies and taxes, housing, commercial and industrial development, and job creation and training projects in terms of their historical, political, economic, and social dimensions.

PPUA 6205. Research Design and Methodology in Urban and Regional Policy. 4 Hours.

Examines and applies the methodology of social science research to urban and regional policy issues. Focuses on identifying and framing research questions; formulating hypotheses; and following through on the design, development, and implementation of policy-relevant research.

PPUA 6210. Research Toolkit for Urban and Regional Policy: Cost/Benefit Analysis. 2 Hours.

Develops and applies techniques of cost/benefit analysis and related techniques such as cost-effectiveness, economic impact, and social return on investment to urban and regional policy issues.

PPUA 6212. Research Toolkit for Urban and Regional Policy: Project Management. 2 Hours.

Introduces students to concepts of and tools used in project management as applied to urban and regional policy issues.

PPUA 6213. Research Toolkit for Urban and Regional Policy: Data Visualization. 2 Hours.

Focuses on how to interpret data visualization and assess the classic and emerging data visualization techniques and their strengths and weaknesses. Covers classic lessons learned from Edward Tufte to contemporary data visualization leaders such as Nicholas Felton and Jer Thorp. Offers students an opportunity to review and critique examples such as Hubway Data Challenge Visualizations to warm up for their own data visualization assignments.

PPUA 6216. Research Toolkit for Urban and Regional Policy: Grant Writing. 2 Hours.

Seeks to prepare students to pursue grant-based funding from a variety of funding agencies and foundations. Offers students an opportunity to develop practical skills in proposal writing and budget development. Examines all aspects of the proposal-writing process, from identifying high-potential funding opportunities to writing and submitting proposals. Assignments offer students an opportunity to apply their learning to real-world interests.

PPUA 6218. Real Estate Finance Toolkit. 2 Hours.

Introduces the basic skills in real estate finance and investment. Focuses specifically on the basics of the real estate pro forma. Begins with an overview of the real estate development process and then covers basic concepts in real estate finance, including interest, project revenues and costs, net cash flow, and the internal rate of return. Employs a case-based approach to offer students hands-on experience in constructing and interpreting pro formas for both a residential and commercial development. Finally, covers approaches to financing affordable housing. Assigns students problem sets over the course of the class that focus on learning the fundamentals of the pro forma.

PPUA 6407. Internship in Public Policy and Urban Affairs. 4 Hours.

Seeks to provide relevant professional experience, to include planning, research, policy development, or implementation of policy, of at least fifteen hours per week with a public, private, or nonprofit institution that focuses on urban and regional policy. May be repeated once.

PPUA 6408. Internship Continuation. 0 Hours.

Offers a continued internship supervised by the faculty internship instructor.

PPUA 6410. Urban Informatics Portfolio. 1 Hour.

Guides urban informatics students through the process of developing a portfolio of professional-quality work. Requires students to submit a three-project portfolio developed from projects completed within courses taken as part of fulfilling the degree requirements. The projects must be presented in high-quality and concise visualizations and text.

PPUA 6500. Principles of Public Administration. 4 Hours.

Introduces students to concepts and approaches to analyzing significant factors and relationships in government agencies and public-oriented nongovernmental organizations as they function in their environments. Examines the legal and constitutional foundations of public administration, bureaucratic structure and administrative power, managerial accountability and ethics, human resource management, economics of organization, decision making, budgeting, implementation and "street-level" bureaucrats, and more recent developments in public administration such as performance management and public management networks.

PPUA 6502. Economic Analysis for Policy and Planning. 4 Hours.

Introduces the fundamentals of macroeconomics and microeconomics as well as the role of key economic institutions, such as the Federal Reserve. Includes analysis of government's role in a market economy and introduces methods of economic analysis.

PPUA 6503. Managing People in Public and Nonprofit Sectors. 4 Hours.

Introduces students to the public personnel function from a managerial standpoint. Addresses methods of constructive leadership of government personnel, leadership that encourages a more competent, motivated, and representative public administrative work force. Employs case studies and films, along with assigned readings.

PPUA 6504. Organizational Theory and Management. 4 Hours.

Examines the general principles underlying organizational structures and processes. Topics include models and ideal types, open systems theories, organizational technologies, decision making, and organizational development and change.

PPUA 6505. Public Budgeting and Financial Management. 4 Hours.

Surveys governmental budgeting at the federal, state, and local levels. Surveys major revenue sources and expenditure responsibilities. Discusses budgetary processes and politics, as well as resulting policies. Considers both proposed and implemented reforms. Also introduces financial management practices including cash management, fund accounting, debt financing, endowment spending and control, cost allocation procedures, and tax expenditures.

PPUA 6506. Techniques of Policy Analysis. 4 Hours.

Provides a systematic approach to understanding the origins, formulation, implementation, and impact of government outputs. Reviews key analytical concepts and competing theoretical perspectives. Considers both the political dimensions of public policymaking and the technical aspects of program design within the natural history of the policymaking process. Draws on case materials from a spectrum of policy areas.

PPUA 6507. Institutional Leadership and the Public Manager. 4 Hours.

Examines the problems and techniques relevant to effective management of a public agency in a complicated and often turbulent political environment. Topics include legislative relations, media relations, role of the courts, unions and advocacy groups, policy implementation and evaluation, and setting and working with high standards of integrity.

PPUA 6509. Techniques of Program Evaluation. 4 Hours.

Reviews methodologies for assessing the impact of public policy. Includes experimental and quasi-experimental research design, the value and limits of case studies, political and organizational barriers to evaluation research, report writing, and procedures for instituting change.

PPUA 6510. Functions and Techniques of Public Management. 4 Hours.

Examines the problems and techniques relevant to management of a public agency, with an emphasis on internal issues that face public managers. Topics include planning and agenda setting; organizational design; agency budgeting; employee recruitment, selection, and development; and reporting, monitoring, and evaluation.

PPUA 6522. Administrative Ethics and Public Management. 4 Hours.

Analyzes ethical problems in American public administration including discussion of ethical dilemmas frequently faced by public managers.

PPUA 6523. Accountability, Performance Measurement, and Contracting in the Public Sector. 4 Hours.

Examines three important topics in public policy and administration: accountability, performance measurement, and contracting. These three topics are interrelated, and issues related to them often arise in contemporary public administration. Offers students an opportunity to explore these topics through assigned readings, cases, lectures, and class discussions.

PPUA 6525. Institutions and Public Policy. 4 Hours.

Blends theoretical literature and case studies to examine problems of policymaking and governance in contemporary political systems, emphasizing the policy impacts of political institutions. Studies systematic variations across types of political institutions and regimes in developed and developing nations and extends beyond the nation-state to address policy dynamics (e.g., harmonization, multilevel governance) in supranational and international systems. Establishes the broader political system contexts within which policy formation and implementation reside. Offers students an opportunity to learn to analyze, synthesize, and apply a range of theoretical literatures relevant to policy design and impact. PLS 6525 and PPUA 6525 are cross-listed.

PPUA 6530. State and Local Public Finance. 4 Hours.

Analyzes the fiscal dimensions of state and local governments in the United States. Examines the types and ranges of tax and nontax revenues available to local and state governments and factors shaping the types of revenue sources utilized. Also assesses local and state government spending trends, use of public funds for economic development and other goals, impacts of federal mandates on local and state budgets, distinctions between operating and capital budgets, and the overall legal and political factors shaping public finance.

PPUA 6551. Nonprofit Organizations and Social Change. 4 Hours.

Offers an overview of fundamental principles and practice in the nonprofit sector as they relate to social change. Topics include systems change and stakeholder identification, design thinking and human-centered design, theory of change and logic models, program design and evaluation, strategic and business planning, organizational structure and capacity building, governance, and communications and social media.

PPUA 6552. The Nonprofit Sector in Civil Society and Public Affairs. 4 Hours.

Examines the challenges facing the nonprofit sector, particularly as it relates to civil society and public policy concerns. Emphasizes current controversies in which the nonprofit sector is involved, such as the impact of changes in government spending and tax policy, the nature and legitimacy of nonprofit advocacy, the role of faith-based organizations in providing public services, accountability and oversight of nonprofit organizations, the growth of social entrepreneurship, and the work of nonprofits in fostering social capital and supporting civic engagement.

PPUA 6553. Nonprofit Financial Resource Development. 4 Hours.

Offers a comprehensive overview of resource development and financial management in nonprofit organizations. Topics include fund-raising and development planning, nonprofit budgeting and financial reporting, investments and earned income for nonprofits, and government contracting and grants.

PPUA 6861. Internship. 0 Hours.

Offers students an approved public- or nonprofit-sector internship that fulfills academic degree requirements. Students must complete minimum internship work hours as defined by academic program. Supervising faculty assign a final integrative or reflective project. May be repeated up to two times.

PPUA 6862. Internship with Research. 4 Hours.

Offers students who wish to pursue additional directed reading and independent research related to the internship placement an approved public- or nonprofit-sector internship. Students must complete minimum internship work hours as defined by academic program. Research project is determined in consultation with faculty. Supervising faculty assign a final integrative or reflective project. May be repeated once for up to 6 total credits.

PPUA 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

PPUA 6964. Co-op Work Experience. 0 Hours.

Provides eligible students with an opportunity for work experience. May be repeated without limit.

PPUA 6966. Practicum. 1-4 Hours.

Provides eligible students with an opportunity for practical experience. May be repeated without limit.

PPUA 6983. Topics. 4 Hours.

Covers special topics in public policy and urban affairs. Topics are selected by the instructor and vary from semester to semester. May be repeated up to three times for up to 12 total credits.

PPUA 7230. Housing Policy. 4 Hours.

Examines the economic, social, and legal underpinnings of housing policy in the United States across a variety of topics, including housing finance and production, public and affordable housing, home ownership, and fair housing. Housing is both an essential human need and a critical sector of the U.S. economy. Presents the complicated and evolving roles of all of those involved in housing policy, including federal, state, and local government, and the private and profit sectors. Guest speakers provide real-world insights into current housing policy challenges.

PPUA 7231. Transportation Policy. 4 Hours.

Examines the physical, technological, economic, social, cultural, and political underpinnings of transportation policy in the United States. Topics include intra- and interstate transportation, the comparative economics of different modes of transportation, the impacts of federal and state policies on transportation options, and the long-term effects of those choices on metropolitan development, housing, land use, energy, and the environment. Also involves comparisons with transportation systems in other countries.

PPUA 7232. Immigration and Urban America. 4 Hours.

Examines the policy impacts of legal and illegal immigration in the United States, emphasizing the ways immigration shapes urban America. Discusses trends in immigration; elements of U.S. immigration policy; impacts of immigration on labor markets, economic development, housing, education, healthcare, criminal justice, race relations, and social policy (e.g., welfare); and effects on broader mass culture. Also considers the range of policy tools available in addressing these impacts.

PPUA 7233. Contemporary Community Development. 4 Hours.

Explores the political and social dynamics of community development in urban America, with particular focus on the local politics of housing, economic development, jobs, healthcare, access to services, and community safety. Uses Boston and its region as a laboratory to examine the role of grassroots community groups in shaping their neighborhoods, set within the broader institutional contexts that affect their representation and impacts.

PPUA 7234. Land Use and Urban Growth Policy. 4 Hours.

Explores the evolution of land use and urban form in the United States and surveys different types of land-use and urban-growth management tools used by local, regional, and state governments. Examines the environmental, economic, spatial, and social impacts of different patterns of urban growth, including "sprawl" and "smart growth," and the different philosophies and legal and policy approaches employed to manage those impacts. Also explores how land-use and urban-growth policy interacts with related priorities, including housing, infrastructure, and fiscal policy. Focuses on current and emerging issues and debates in land-use and urban-growth management, such as New Urbanism, livable communities, and transit-oriented development.

PPUA 7236. Introduction to Real Estate Development for Urban Policy Makers. 4 Hours.

Introduces the basic skills and knowledge of real estate development used within public-private partnerships to address policy and planning issues. Through a series of problem sets, offers students an opportunity to learn basic real estate finance and computation, including the fundamentals of pro forma modeling. Covers the entire real estate development process, from preliminary market and financial analysis through to construction management and property management using case studies and guest lecturers. Explores how public-private partnerships shape the outcomes of urban redevelopment within specific topics that may include affordable housing provision, brownfield redevelopment, transit-oriented development, sustainable urban development, and others.

PPUA 7237. Advanced Spatial Analysis of Urban Systems. 4 Hours.

Builds on skills covered in PPUA 5263. Offers students an opportunity to obtain greater depth in the analysis of urban spatial data focused on several urban systems (including social, built, and natural systems). Focuses on understanding the spatial relationships between various new and large urban datasets relevant to current policy challenges within cities. This is a project-based class.

PPUA 7239. Problems in Metropolitan Policymaking. 4 Hours.

Examines the broad challenges that confront metropolitan areas-defined as including the center city, its immediate suburbs, and the broader periphery-including economic development, land use, transportation, housing, and the provision of basic services. Considers the array of tools available to policymakers, including planning, tax policy, pooling of services, and zoning.

PPUA 7240. Health Policy and Politics. 4 Hours.

Examines contemporary healthcare policies, programs, and politics. Discusses the structure of the healthcare system and its costs, efforts to develop universal health coverage, the spread of managed care, and related topics.

PPUA 7243. International Development Administration and Planning. 4 Hours.

Takes a "manager's eye view" of the formulation, implementation, evaluation, and improvement of development projects in less developed countries. Also focuses on the planning dynamics of host-government, bilateral, and multilateral organizations as they analyze and tackle such problem areas as agriculture, education, health, population, and land reform. Employs simulations and case studies.

PPUA 7245. Education Policy in the United States. 4 Hours.

Examines the major policies and political dynamics that shape the delivery of educational services in the United States. Reviews the historical role of public education in American society and examines the legal context and intergovernmental relationships that provide the political framework for public education. Explores school finance, accountability and assessment strategies, issues of race and poverty, as well as major reform initiatives. Focuses on elementary and secondary education.

PPUA 7247. U.S. Healthcare Reform: Past, Present, and Future. 4 Hours.

Reviews the history of healthcare reform in the United States and the various policymaking associated with it, including the recent Affordable Care Act. Analyzes the causes and consequences of U.S. health system change over the past century, covering events such as efforts for single-payer healthcare, the rise of the medical-industrial complex, employer-sponsored health insurance, and Medicare and Medicaid. Analyzes current system trends shaping future reform efforts such as the use of artificial intelligence and retail thinking in healthcare delivery. Introduces students to organizational, economic, and sociological theories for studying healthcare reform and offers students opportunity to apply course learning in practical ways. Of particular interest to doctoral and advanced master's degree students wanting to study and work in healthcare.

PPUA 7249. Urban Coastal Sustainability. 4 Hours.

Focuses on the challenges facing coastal cities and the ecosystems on which they depend by exploring both threats such as climate change as well as adaptation measures that promote resilience. Aimed at students interested in the interface of science and public policy and those who wish to gain a deeper understanding of how coupled human-natural ecosystems operate.

PPUA 7346. Resilient Cities. 4 Hours.

Examines the characteristics of resilient cities, especially those located in coastal regions. Investigates the capacity of cities to respond to major disruptions to their social and ecological systems. Includes extensive use of case studies, such as the 2004 Indian Ocean tsunami and Hurricane Katrina in 2005, as well as readings on cities and social systems. Offers students an opportunity to analyze an urban area and provide recommendations for improving its resilience. POLS 7346 and PPUA 7346 are cross-listed.

PPUA 7511. Sustainability and Resilience Research Seminar. 2 Hours.

Introduces students to the diversity of public policy research related to sustainability and resilience including climate resilience, food, energy, water, infrastructure, equity, environmental justice, urban sustainability, etc. Offers students an opportunity to learn about current sustainability and resilience research and consider future research possibilities. Faculty presentations are an integral part of this course, and research seminars from guest speakers are integrated. Explores a diversity of research questions, research methods, and research results in a way that informs research skills and research capacity. Offers students an opportunity to obtain professional development and research training skills to prepare them to develop their PhD research proposals.

PPUA 7521. Seminar in Urban Theory. 4 Hours.

Introduces students to foundational debates in the study of cities, urbanization, and urban planning and policy. Presents a broad interdisciplinary understanding of cities and urbanization, addressing questions related to the spatial development of cities and regions, governance and politics, economics, and social change. Offers students an opportunity to understand the connections between urban policy research and social theory, including concepts from human geography, sociology, urban planning, economics, and political science. Students read and discuss seminal texts, including classical concepts in social theory and contemporary debates on topics such as globalization, segregation, gentrification, sustainability, inequality, and questions of race and gender in urban policy.

PPUA 7673. Capstone in Public Policy and Urban Affairs. 4 Hours.

Offers an opportunity for student teams, in partnership with a local, state, or federal agency or nonprofit institution, to assess an urban or regional problem, produce a thorough policy analysis, and present it and recommended solutions to the agency or institution. Course readings focus on materials needed to assess the problem and provide solutions. This is a faculty-guided team project for students completing course work in urban and regional policy studies. May be repeated without limit.

PPUA 7962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

PPUA 7976. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

PPUA 7990. Thesis. 1-6 Hours.

Offers thesis supervision by members of the department. May be repeated without limit.

PPUA 8960. Exam Preparation—Doctoral. 0 Hours.

Offers the student the opportunity to prepare for the PhD qualifying exam under faculty supervision.

PPUA 8986. Research. 0 Hours.

Offers an opportunity to conduct full-time research under faculty supervision. May be repeated without limit.

PPUA 9000. PhD Candidacy Achieved. 0 Hours.

Indicates successful completion of the doctoral comprehensive exam.

PPUA 9980. Experiential PhD Research Residency. 0 Hours.

Comprises a research residency experience in an organization whose mission and activities are aligned within the School of Public Policy and Urban Affairs. The research residency is designed to help develop dissertation ideas or research papers or to obtain access to resources helpful to dissertation development or research. A faculty member serves as an advisor for the residency experience, but individuals within the organization in which the student is working are asked to serve as formal mentors for the student residency experience.

PPUA 9984. Research. 1-4 Hours.

Offers an opportunity to conduct research under faculty supervision. May be repeated without limit.

PPUA 9990. Dissertation. 0 Hours.

Offers dissertation supervision by individual members of the department. May be repeated once.

PPUA 9996. Dissertation Continuation. 0 Hours.

Offers continued dissertation supervision by individual members of the department. May be repeated without limit.

Public Relations - CPS (PBR)

Search PBR Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=PBR>)

PBR 6100. Introduction to Public Relations. 3 Hours.

Introduces the ideas, skills, and principles that underlie the public relations craft. Designed for career changers and those new to public relations. Offers students an opportunity to study the role and contributions of public relations practitioners in contemporary society; to learn about potential legal and ethical aspects of the practice of public relations; to study the communication process and how persuasion is used with various audiences; and to learn how to develop a strategic communication plan to achieve specific goals and objectives. Also introduces students to specialized practice areas within the public relations field, such as business and industry, government, nonprofits and associations, and healthcare.

PBR 6125. Community Relations and Corporate Social Responsibility. 3 Hours.

Explores why corporate social responsibility and strong community relations are increasingly important elements of business strategy. Considers the factors that enable an organization to build relationships with the broader community within which it operates. Offers students an opportunity to develop a corporate social responsibility campaign as a signature assignment that incorporates ethical considerations and multimedia methods of delivery.

PBR 6130. Public Relations Content Development. 3 Hours.

Focuses on how to conceptualize and generate communications content in support of brand awareness and key organizational objectives. Offers students an opportunity to understand when and how to use different content approaches as part of communications outreach. Also offers them a chance to create common public relations products such as online display ads, media pitches, social media calendars and posts, and webpages and online videos.

PBR 6135. Public Relations Strategy and Planning. 3 Hours.

Examines the role and responsibilities of public relations professionals in promoting brand identity and organizational reputation as a key element in an organization's business strategy. Explores the skills and knowledge required for ensuring that strategic messages resonate with target audiences, both domestic and global. Offers students an opportunity to develop a strategic public relations strategy as a signature assignment.

PBR 6140. Advanced Public Relations Content Development. 3 Hours.

Constitutes an advanced course that offers students an opportunity to broaden and deepen their knowledge of different types of public relations content. Focuses on the characteristics of different PR products and how to use them to reach key audiences and prompt desired reactions. Offers students an opportunity to create such public relations products as an email promotion, an online news center, a blog, and event marketing materials.

PBR 6710. Public Relations Research: Understanding External Audiences. 3 Hours.

Focuses on the important role of market research and the use of existing data to gain insights into the attitudes of a wide range of external stakeholders, including journalists, investors, and customers, as well as the role environmental conditions play in the overall media campaign process. Offers students an opportunity to gain in-depth knowledge of research steps—including surveys, focus groups, and psychographic data—and to identify and analyze attitudinal patterns in target audiences as the foundation for effective public and media relations campaign strategies.

PBR 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

PBR 7962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions.

Regulatory Affairs - CPS (RGA)

Search RGA Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=RGA>)

RGA 6000. Introduction to Food and Drug Administration (FDA) Pharmaceutical Regulation. 2 Hours.

Offers students an overview of pharmaceutical and biologic product clinical and regulatory development in addition to a description of the Food and Drug Administration's (FDA's) involvement in the process. Through course work and participation, offers students an opportunity to develop an understanding of fundamental pharmaceutical and biologic regulatory affairs from a U.S.-centric perspective. Reviews the historical development of U.S. pharmaceutical legislation and statute development, FDA and industry functions, as well as significant case law that has shaped the present state of regulation.

RGA 6001. Introduction to Food and Drug Administration Medical Device Regulation. 2 Hours.

Provides an overview of the medical device development process and the function of the Food and Drug Administration (FDA) as it relates to device product commercialization. Through course work and participation, offers students an opportunity to develop an understanding of fundamental medical device regulatory affairs from a U.S.-centric perspective. Reviews the historical development of significant U.S. medical device legislation, including the Medical Device Amendments of 1976. In addition, introduces the subject of quality system regulation (QSR) as it relates to device product design, clinical development, and compliance.

RGA 6002. Regulatory Compliance Culture. 2 Hours.

Offers a general overview of imperatives for regulatory compliance (judicial, economic, and public health, to name a few). Offers students an opportunity to gain competencies in the areas of agency, advocacy, ethics, mitigation laws, and corporate social responsibility. The various state, federal, and international agencies; their authorities; and how they became established help students understand the scope and scale of the regulatory landscape.

RGA 6100. Introduction to Drug and Medical Device Regulation. 4 Hours.

Provides an overview of drug, biologics, and device development and the FDA. Through course work and discussion, offers students an opportunity to gain the foundations necessary to build a strong understanding of regulatory affairs. Topics include the historical development of U.S. drug laws, law vs. regulation, FDA and industry functions, policy-guided science, and cases shaping history into the present state of regulation.

RGA 6101. Therapeutic Product Development: A Regulatory Overview. 4 Hours.

Examines every step of the therapeutic development and regulation process within the Center for Biologic Evaluation and Research (CBER) and Center for Drug Evaluation and Research (CDER), from preclinical testing through postmarketing adverse experience reporting. Offers students an opportunity to conduct a comprehensive and up-to-date analysis of the complete U.S. pharmaceutical and biological products approval processes. Considers FDA standards for nonclinical testing-quality assurance issues and good laboratory practice, investigational new drug (IND) applications, therapeutic market applications and review process initiatives designed to speed therapeutic product review, as well as current good manufacturing practice regulations to assure quality of marketed products.

RGA 6112. Biomedical Intellectual Property Management Strategy: Patents and Trade Secrets. 4 Hours.

Emphasizes the practical uses and financial benefits of sound patent, licensing, and trademark practices. One of the primary functions of the biomedical industry is to produce intellectual property (IP) in the forms of drugs, biologics, and medical devices. To protect these resources, industry leaders must make prudent IP decisions at the beginning of any product development. Through a careful examination of case studies and through multiple group projects, offers students an opportunity to become familiar with the relevant legal issues (e.g., pertinent case law and statutes), the "how-to-gets" involving IP protection, and the strategies employed to license proprietary technology.

RGA 6200. Biologics Development: A Regulatory Overview. 4 Hours.

Offers students an opportunity to conduct a comprehensive and up-to-date analysis of the post-reform FDA Center for Biologics Evaluation and Research (CBER) and the complete U.S. biological product approval process, from preclinical testing to postmarketing regulatory requirements. Includes both CBER official and industry expert perspectives on quality assurance issues and related regulatory topics in successfully bringing biologics to market, as well as current good manufacturing practice regulations to assure quality of marketed products.

RGA 6201. New Drug Development: A Regulatory Overview. 4 Hours.

Examines every step of the drug development and regulation process, from preclinical testing through postmarketing adverse experience reporting. Considers FDA standards for nonclinical testing-quality assurance issues and good laboratory practice, investigational new drug application (NDA) and review process initiatives designed to speed drug review, and the Prescription Drug User Fee Act (PDUFA).

RGA 6202. Medical Device Development: A Regulatory Overview. 4 Hours.

Analyzes U.S. medical device development and approval requirements. Features detailed analysis of quality assurance issues and recent regulatory reforms implemented under the Food and Drug Modernization Act (FDAMA), in addition to providing a step-by-step guide through the Center for Devices and Radiological Health (CDRH). Covers CDRH's reengineering initiatives and evolving investigational device exemptions, premarket approval, 510(k) application process, and product development protocol and review processes. Provides practical, in-depth analyses on how emerging developments and trends are reshaping medical device regulation in the United States. Offers students an opportunity to demonstrate an appreciation of the subjective and interpretive aspects of the regulations and an ability to think critically about the interaction between regulatory and development processes.

RGA 6203. Pharmaceutical and Medical Device Law: Topics and Cases. 5 Hours.

Analyzes current food, drug, and medical device laws. Reviews legislation and landmark cases, as well as laws governing development, manufacture, and commercial distribution of drugs, biologics, and medical device products and how they relate to the biotechnology, pharmaceutical, and medical device industries.

RGA 6204. Legal Issues in International Food, Drug, and Medical Device Regulation. 5 Hours.

Explores international laws related to the regulation of food, drugs, and medical devices with a focus on the European Union. Draws comparisons between international laws and corresponding U.S. laws, as well as considerations necessary for international biotechnology, pharmaceutical, and medical device industries.

RGA 6205. Emerging Trends and Issues in the Medical Device Industry. 4 Hours.

Focuses on trends expected to have a significant effect on the future of the medical device industry, including the aging population; the need for devices that treat chronic illnesses such as renal failure, congestive heart failure, heart abnormalities, arthritis, and diabetes; reimbursement issues arising from the huge financial burden placed on Medicare and insurance companies in picking up the increased cost of healthcare; lifestyle changes with an increased demand for devices that improve one's quality of life or appearance; reuse of single-use disposable devices to cut costs; group purchasing practices, outpatient treatment; telemedicine, regulatory/legal requirements; and the movement of devices into new areas, such as coating stents with pharmaceutical/biological agents and using patches to deliver pharmaceutical agents.

RGA 6206. Practical Aspects of Regulatory Compliance. 4 Hours.

Uses a series of practical exercises and discussions designed to offer students an opportunity to develop the ability to translate regulatory requirements for pharmaceutical, biologic, and medical device products into practical documents and broadly applicable research solutions. Topics include how to create practical documents based on regulations and guidelines; how to complete production batch records; how to conduct product testing and perform inspections; and, in general, how to effectively utilize Current Good X Practices (cGxP) requirements. Includes assignments that require students to research applicable regulatory and industry information as well as activities designed to aid in the comprehension of the regulations and in the review of real-life industry issues.

RGA 6207. Global Impact of Electronic Common Technical Document (eCTD) Submissions. 4 Hours.

Examines the structure of the Common Technical Document (CTD) format through study of both regulatory requirements as well as example submissions. Offers students an opportunity to develop an understanding of FDA's geographically specific eCTD submission requirements. Also reviews the basic structure and format of an eCTD submission and the differences between the electronic format and former paper-based CTD submissions.

RGA 6210. Strategic Planning and Project Management for Regulatory Affairs. 4 Hours.

Introduces the core concepts of strategic planning and project management. Seeks to equip regulatory professionals with the skills needed to join upper corporate management in choosing which products to pursue and how best to pursue them. Offers students an opportunity to learn how to guide medical device teams through the design and development stages. Emphasizes the role of product classifications in demonstrating the safety, efficacy, and performance of medical devices for human use. The curriculum and assignments offer a chance to carefully study the function and format of presubmission meetings with U.S. and other global regulatory agencies, as well as understand their role in gaining regulatory approval for market sale.

RGA 6211. Combination Products and Convergence. 4 Hours.

Examines the development of combination products, with an eye toward understanding FDA and international agency oversight, regulatory classifications, and interpretations of guidance documents. Medical products, no matter how well designed, can only do so much to address clinical problems today. In order to satisfy the therapeutic needs of the future, medical devices will be used in combination with drugs and biologics. This category of products covers everything from transdermal patches to drug-eluting stents. Tissue engineering, for example, employs cells (biologics) producing proteins (biotech drugs) growing on polymer substrates (medical devices). Through a detailed study of real-world case studies, offers students an opportunity to weigh the larger economic, social, political, and clinical dimensions of combination products.

RGA 6212. Introduction to Safety Sciences. 4 Hours.

Introduces safety and surveillance regulations and principles for drugs, biologics, and medical devices. Offers students an opportunity to become familiar with the U.S. and global safety regulations, as well as related guidance from FDA, ICH, WHO, and CIOMS. Adopts a life-cycle perspective, beginning with use of preclinical data to anticipate human safety issues and continuing through clinical development and postmarketing. Examines combination products, safety information in regulatory documents (INDs, clinical study reports, NDA submissions), safety data analysis, quality management and CAPAs, and global safety initiatives (e.g., the WHO Uppsala Monitoring Centre).

RGA 6215. Project Management in Early Drug Discovery and Development. 4 Hours.

Provides an overview of the processes common to researching and developing a new drug. Focuses on the early stages of this progression, from identifying active molecules to completing Phase 1 safety trials. Surveys the predominant biological and chemical techniques used in these efforts. Offers students an opportunity to prepare standard operating procedures and a pre-IND package. The lectures and reading materials focus on how to incorporate key data in writing the IND. Examines the procedures used to execute a Phase 1 safety study and the strategies available to prepare a persuasive clinical study report. Throughout the term, course material highlights the applicability and utility of project management tools.

RGA 6216. The Medical, Social, and Financial Dimensions of Orphan Drugs. 4 Hours.

Examines the orphan drug development process, from discovery to FDA regulatory approval to postapproval marketing and distribution. Using selected case studies, offers students an opportunity to gain a strong understanding of how novel biomedical discoveries are translated into products used to treat relatively rare diseases. Topics include the role of patient advocacy groups in lobbying for research and development, the influence of gender and racial considerations on policy decisions, and the capacity of the federal government to support the research and commercialization of orphan drugs. The course situates its study of orphan drugs within the context of pharmaceutical firms' reluctant shift away from big blockbuster drugs in favor of more personalized medicines.

RGA 6217. Biomedical Product Development: From Biotech to Boardroom to Market. 4 Hours.

Examines the evolution of the medical device and pharmaceutical landscape from a technological, regulatory, and financial perspective, as well as from a societal and cultural framework. Begins by recognizing that significant differences exist between small and mid-to-large medical device and pharmaceutical companies with regard to key variables in the current business environment. These differences extend to the opportunities available as well as the limitations and challenges faced by each. Discusses the symbiotic and potentially synergistic relationship that has developed between small, yet established, biotechnology companies and large medical device and pharmaceutical firms, as well as the impact of these relationships on the general economic environment.

RGA 6219. Advanced Topics in Advertising and Promotion of Drugs and Medical Devices. 4 Hours.

Covers current trends, regulations, and issues in digital advertising, including mobile applications, social media, and Twitter; FDA's and FTC's role in the regulation of OTC products and certain mobile digital applications; patient engagement; FDA regulation of advertising and promotion of veterinary drugs; recent FDA and government enforcement actions and court cases; proactive communications about medical products between manufacturers and payers, including use of real-world evidence; global perspective on regulation of advertising and promotion, including Canada, Latin America, Asia, and the European Union; decision making and risk assessments in advertising and promotion.

RGA 6220. Global Biotechnology Product Registration: E.U., U.S. Product Regulation. 5 Hours.

Provides a comprehensive and up-to-date analysis of the biotechnology product approval process within each of the world's three most critical biopharmaceutical markets. From preclinical product development to postmarketing approval, explores aspects of biopharmaceutical regulatory analyses in the three regions of the world that together represent more than 75 percent of the global market for biopharmaceuticals.

RGA 6221. European Union Compliance Process and Regulatory Affairs. 4 Hours.

Provides a clear-cut picture of the European Union (EU) and how EU directives impact international business. By illustrating how companies need to approach compliance, offers students an opportunity to be guided through compliance issues and to gain an understanding of the relationship between compliance and CE marking. Discusses the risks and rewards of CE marking and an overview of liability laws in the EU.

RGA 6222. European Medical Device Regulations. 4 Hours.

Covers European Commission directives and guidance documents; European Agency for the Evaluation of Medicinal Products, medical device guidance documents, and notified body guidelines and recommendations; Global Harmonization Task Force final reports; and mutual recognition agreements. Topics include biological and biotechnological products, CE marking, conformity assessment and notified bodies, the Global Harmonization Task Force, clinical trials, and standardization.

RGA 6223. Introduction to Australian, Asian, and Latin American Regulatory Affairs. 4 Hours.

Covers the applicable regulatory agency guidance and GMPs associated with biopharmaceutical and medical device product design, quality assurance, and commercialization specifically in Australia, Asia, and Latin America. Examines multinational documents from Asia-Pacific Economic Cooperation (APEC), Association of Southeast Asian Nations (ASEAN), MERCOSUR, and Pan American and World Health Organizations. Discusses Latin American government regulations and guidance, as well as the guidance and regulations from the General Agreement on Tariffs and Trade (GATT/WTO).

RGA 6224. Regulation of Biomedical Product Commercialization by Health Canada. 4 Hours.

Studies the regulatory requirements associated with all phases of biomedical product commercialization in the Canadian market by manufacturers. The Canadian market represents a significant opportunity for biomedical product manufacturers to export their goods into foreign geographies. Several factors have led patients in Canada to seek treatment modalities for their clinical symptoms and disease from both Canadian and non-Canadian sources. Reviews the Common Technical Document format for market approval applications, general Health Canada Guidances, good manufacturing practices (GMPs), and Global Harmonization Task Force documents. Examines multinational requirements and recommendations, including those issued by the North American Free Trade Agreement, the World Health Organization, and the U.S. Food and Drug Administration. Reviews the requirements of submissions to Health Canada by biomedical product manufacturers.

RGA 6225. Japanese Medical Device Regulations and Registration. 4 Hours.

Offers new and experienced regulatory professionals the opportunity to gain the knowledge and insight needed to successfully obtain Japanese medical device approvals. Japan is the second largest medical device market in the world, generating more than US\$18 billion in device sales per year. As Japanese regulations and guidelines become more transparent, U.S. and EU manufacturers are flocking to this lucrative market.

RGA 6226. Canadian and Australian Medical Device Regulations. 4 Hours.

Explores the Common Technical Documents, General Guidance, GMPs, and Global Harmonization Task Force (GHTF) documents for medical device requirements in Canada and Australia. Offers students an opportunity to learn how to put together a medical device submission, identify two key submission pathways per product classification, and outline the postmarket requirements in both the Canadian and Australian markets.

RGA 6227. Emerging Medical Device Markets. 4 Hours.

Covers the Common Technical Documents, General Guidance, GMPs, and Global Harmonization Task Force (GHTF) documents for medical device requirements in emerging markets. The United States., European Union, Japan, Canada, and Australia comprise the five founding member countries of the GHTF. Yet, the most vibrant and challenging regulatory arenas of medical device development are those in emerging markets (e.g., the Pacific Rim, East Asia, the Middle East, and South America). Offers students an opportunity to practice putting together a medical device submission, identify two submission pathways per product classification, and outline the postmarket requirements. These practical lessons and regulatory skills are an asset to any regulatory professional in the global marketplace.

RGA 6228. Managing International Clinical Trials. 4 Hours.

Focuses on initiating, collecting, and managing data from multicountry clinical trials. The assigned material documents the growing internationalization of clinical research in biomedicine. For example, even trials carried out under the aegis of the U.S. FDA are likely to involve investigators in the European Union, China, India, Africa, or Latin America. The global nature of this research is due to the advantages that certain countries offer, including lower costs, flexible health infrastructures, and the presence of treatment-naïve populations. Multisource studies, however, present their own practical, legal, and ethical challenges. Offers students an opportunity to study the steps needed to conduct regulatory-compliant international trials. Through case studies and group projects, examines strategies to integrate clinical sites along common protocols and deadlines.

RGA 6229. Biomedical Product Regulatory Affairs in Emerging Markets: Russia and Kazakhstan. 4 Hours.

Studies basic requirements that medical device and other types of biomedical product manufacturing companies need to commercialize products in the Russian and Kazakhstan markets. Today Russia, together with other former Soviet countries such as Kazakhstan, remain some of the world's fastest-growing export markets. In spite of recent economic difficulties, these geographic areas present many opportunities for biomedical product manufacturing companies that seek to expand into new markets. Offers students an opportunity to develop a practical understanding of the associated regulatory processes, through focus on real-world examples, the types of obstacles that companies may face, as well as how to overcome them.

RGA 6230. Clinical Laboratory Management in Clinical Trials. 4 Hours.

Provides an overview of the management elements of the clinical laboratory aspect of clinical research. Offers students an opportunity to study the configuration of visits and identify the differences between safety-related testing, esoteric testing, and end-point testing. Identifies the challenges of qualifying a clinical laboratory and managing a clinical laboratory during the conduct of a clinical trial: protocol kits, logistics, local laboratory data, reference ranges, inspections, and regulatory requirements. Covers global aspects, such as data and method harmonization, blinding of data, transmission of data, and data amendments.

RGA 6233. Application of Quality System Regulation in Medical Device Design and Manufacturing. 4 Hours.

Introduces the Food and Drug Administration's (FDA) Quality System Regulations (QSRs) and describes how these regulations can improve the safety and efficacy of medical device products. Discusses the legislative origins of QSRs, their historical evolution, as well as the details of how they are implemented. Examines case studies and empirical examples of QSRs that have been employed by individual medical device manufacturers during the product commercialization process. Offers students an opportunity to develop an understanding of FDA's expectations for product design control; the structuring of quality system documentation; and principles of practical QSRs within the context of medical device manufacturing, packaging, and distribution. Encourages students to develop strategies for customizing QSRs to particular companies, device products, and manufacturing environments.

RGA 6234. Drug and Device Supplier Risk Management: Compliance and Processes. 4 Hours.

Seeks to provide a comprehensive overview of current supply chain risk-management practices and their impact on patient safety, product quality, and clinical effectiveness. Analyzes supplier oversight guidance documents, demonstrates how life-science companies strive to ensure compliance, and discusses the responsibilities of regulatory professionals in supply chain risk-management systems and regulatory issues stemming from poor supplier performance and management. Using case-based investigations and real-world examples, examines how to evaluate supply chain management systems as they relate to particular categories of biomedical products manufactured in specific contexts. Offers students an opportunity to obtain the skills and knowledge they need to customize effective supply chain risk-management methods within various global settings.

RGA 6235. Emerging Product Categories in the Regulation of Drugs and Biologics. 4 Hours.

Examines the development and commercialization pathways for several product categories, including new over-the-counter (OTC) products, nutraceuticals, nanotechnology products, and personalized medicine-based therapies. These emerging categories of drug and biologic products are not formally classified by FDA from a regulatory perspective. Evaluates the reasons why the regulatory paradigms for these products are not well established and analyzes how the relatively amorphous nature of these paradigms has impacted commercialization of these product categories in the U.S. market. Offers students an opportunity to gain a better understanding of how and why new product categories continue to emerge as existing regulatory classifications continue to evolve.

RGA 6241. Working in Multicultural Environments: Challenges and Opportunities. 2 Hours.

Offers a general overview of and guidelines for working in multicultural teams with particular reference to the pharmaceutical industry. There is an increasing need for pharmaceutical companies to not only seek international marketing rights but to conduct international clinical trials. This quest does not come without obstacles. Examines the challenges and opportunities of various cultural models. Defines culture, studies working behaviors, and sheds light on cross-cultural misunderstandings, relationship building, and verbal and nonverbal communications in various cultures.

RGA 6242. Preparing EU Medical Device Clinical Evaluations. 2 Hours.

Examines the process of writing European Union medical device clinical evaluations. Clinical evaluations are complex regulatory documents that are needed for every class of medical devices in Europe. These evaluations have a strong component of research and technical writing. This course offers students hands-on experience with the stages involved in performing a clinical evaluation (scoping, identification, appraisal, analysis of clinical data, and report creation). The term assignment is a completed clinical evaluation.

RGA 6243. Medical Device Product Development in Canada. 4 Hours.

Explores the general requirements for medical device regulation globally and the details of medical device regulation in Canada. Familiarizes students with the International Medical Device Regulatory Forum goals and objectives, and explores the medical device regulatory model developed by Global Harmonization Task Force that is in use in many countries today. Studies the Canadian medical device regulations, covering topics such as postmarket topics of adverse event reporting, recalls and inspections, classification, device licensing, establishment registration, design change, license amendments, and annual renewal processes. Explores the use of standards globally and in Canada related to the regulation of medical devices. Offers students a project-based learning opportunity to learn how to prepare portions of a sample submission for Canada.

RGA 6244. Therapeutic Product Development in Canada. 4 Hours.

Examines every step of the Canadian drug development and regulation process, from preclinical testing through postmarketing drug adverse reaction (DAR) reporting. Considers Canadian standards for nonclinical testing-quality assurance issues and good laboratory practice, good clinical practices, GMP, and use of ICH guidelines. Examines various Canadian drug submissions and their timelines, including New Drug Submission (NDS), Abbreviated New Drug Submission (ANDS), and Clinical Trial Applications (CTA).

RGA 6245. Regulation of Generic Pharmaceutical and Biosimilar Products. 4 Hours.

Describes the contrasting history and implementation of generic drug and biologic legislation in the U.S. market. Explores the specific technical differences between drug and biologic products and highlights areas where regulatory approval of generic products must differ between the two categories. Offers students an opportunity to better understand how the nonclinical and clinical development programs of generic drug and biologic products are constructed. Examines the relatively advanced state of the regulatory paradigm for biosimilars in the European Union.

RGA 6247. Medicines Regulatory Harmonization in Africa. 2 Hours.

Examines the regulatory landscape on the continent of Africa and focuses on the progress made in Medicines Regulatory Harmonization efforts. Africa's emerging economic powerhouse on the world market has been brought to the limelight. The value of Africa's pharmaceutical industry is estimated to increase from \$20.8 billion (2013) to between \$40.0 and \$65.0 billion (2020). In essence, Africa has become the "new global pharmaceutical giant," making the continent an attractive emerging market for pharmaceutical companies seeking to expand their market base.

RGA 6248. Global Regulatory Operations. 2 Hours.

Explores the fundamentals of various operational aspects of regulatory professional responsibilities. Regulatory operations is a vital function within biomedical product manufacturing organizations. Global regulatory operations professionals have responsibility for a diverse set of FDA and other global regulatory agency requirements, ranging from premarket submissions to maintenance of postmarketing compliance standards. Includes, but not limited to, the electronic Common Technical Document (eCTD) submission format, structures of Clinical Trial Applications (CTAs) from various geographical regions, EU Marketing Authorization Applications (MAAs), as well as documentation management and publishing compliance standards. Project work includes development of a regulatory document based on current guidelines for submission of FDA- and/or EMA-compliant marketing approval or postmarket surveillance standards.

RGA 6249. Chinese Food and Drug Administration Regulation of Biomedical Product Commercialization. 4 Hours.

Studies the biomedical product commercialization regulations and compliance standards implemented by the Chinese Food and Drug Administration (CFDA). As many of these regulations and compliance standards have been developed or updated within the past two to three years, case studies illustrate how the CFDA enforces these regulations. Additionally, examines how the regulatory documentation submission processes set up by the CFDA are operationalized. Reviews the impact of the eCTD standard utilized by ICH and other non-ICH geographies on CFDA submissions.

RGA 6250. Financing and Reimbursement in Biomedical Product Development. 4 Hours.

Introduces the complex discipline of market access and pricing strategy for medical device, drug, and biologic products. As cost and relative efficacy drivers become increasingly important to market biomedical products successfully, life-sciences regulatory professionals must evaluate regulatory compliance criteria in relation to reimbursement and product pricing concerns. Regulatory professionals must also be involved in demonstrating that utilization of new biomedical products is comparatively cost-effective when measured against standards of clinical care. Using specific case studies from the United States and abroad, offers students an opportunity to analyze these market developments, as well as their resulting implications for biomedical product development, manufacturing, and commercialization, with an overall objective to develop comparatively and financially informed regulatory systems.

RGA 6255. Global Convergence of Regulatory Science and Reimbursement/Market Access. 2 Hours.

Studies the evolution of convergence drivers between global regulatory science and reimbursement/market access paradigms. Outlines the similarities and differences between "safety and efficacy" and "reasonable and necessary" and explores how cost-effectiveness variables can be evaluated concomitantly during the biomedical product marketing approval process. Students explore both the opportunities, as well as the mechanistic challenges, associated with the ongoing global requirement for biomedical product manufacturers to obtain marketing approvals from specific geographic regulators, along with associated payer organizations, to obtain full market access for new healthcare products.

RGA 6270. Patient-Centered Regulatory Policy at FDA. 4 Hours.

Examines FDA's policies related to patient-centric medical product development. Reviews relevant legislation, FDA patient-centric regulatory policies, and the medical product industry's response to these policies. Offers students an opportunity to review literature related to patient engagement, patient preference, and patient experience in order to understand the subtle methodological and policy-specific differences between these concepts. Also covers basic methods of eliciting patient preferences and address challenges faced by the medical product industry in implementing FDA's patient-centric guidance. Provides students with thoughtful discussion about the impact of these patient-centric policies on medical product development and regulatory approval.

RGA 6275. Product Development and Process Validation. 2 Hours.

Studies the compliance standards associated with commercializing new biopharmaceutical and medical device products. Focuses on U.S. regulations, although discusses compliance with standards in other major geographical areas as well, including those in Canada and the European Union. Offers practical instruction in the product design control process, setup of small-batch manufacturing processes, scale-up to large-scale manufacturing processes, as well as the regulatory requirements for manufacturing process validation. Includes a detailed analysis of process flow, incoming raw material and work-in-progress testing, stability testing, sterility testing, and handling requirements. Other topics include creation of design history files, establishment of master validation plans, and compliance with ongoing facility and manufacturing equipment standards.

RGA 6280. Advanced Writing on International Biomedical Topics. 4 Hours.

Seeks to hone the research and composition skills of regulatory affairs professionals. Offers students an opportunity to develop a highly efficient ability to craft accurate and detailed summaries, analytic essays, and research papers. Each term the course focuses on a particular country or region of the world. Specific topics include healthcare epidemiology; healthcare delivery and financial systems; progress in biomedical research; government involvement in the healthcare industry; regulatory systems governing drugs, biologics, and medical devices; and the conduct of clinical trials. Concludes by asking students to provide recommendations on how to improve biomedical research and markets in the focused country or regions.

RGA 6300. Practical Applications in Biomedical Product Global Regulatory Affairs. 4 Hours.

Uses a series of practical exercises and discussions designed to offer students an opportunity to exercise their ability to translate global regulatory requirements for pharmaceutical, biologic, and medical device product commercialization into submission-ready documents and broadly applicable regulatory science solutions. Topics include creating practical documents based on regulations and guidelines, completing production batch records, conducting product testing, performing inspections, and effective utilization of GxP requirements. Incorporates both group and/or individual assignments that require students to research applicable regulatory and industry information, as well as activities designed to aid in the comprehension of global regulatory issues. Uses case-based methodologies to enable real-world application of topics and regulatory issues discussed during the course.

RGA 6310. Regulatory Documentation Processes. 4 Hours.

Examines the nexus of professions, practices, and institutions that constitute the field of biomedicine. Explores the historical roots and cultural foundations of biomedicine. Maps the industrial terrain and identifies opportunities and issues for professional communicators. Students research and report on current changes in the biomedical industry, focusing on identifying new opportunities for writers in biomedicine. Offers students an opportunity to acquire research and writing skills and to develop the ability to think in terms of complex institutions so as to locate and articulate opportunities for professional communication.

RGA 6370. Advanced Regulatory Writing: Medical Device Submissions. 4 Hours.

Examines the process of writing medical device submissions for regulatory agencies both nationally and internationally. Topics include device regulations, the device development process, and clinical study documents. Offers students an opportunity to practice communicating complex scientific information in various documents, including investigators' brochures, clinical trial reports, and investigational device exemption (IDE) 510(k) submission components.

RGA 6380. Advanced Regulatory Writing: New Drug Applications. 4 Hours.

Examines the process of writing drug submissions for regulatory agencies both nationally and internationally. Topics include drug regulations, the drug development process, and clinical study documents. Offers students an opportunity to practice communicating complex scientific information in various documents, including investigators' brochures, clinical trial reports, and Investigational New Drug (IND) application submission components.

RGA 6385. Operational Aspects of Electronic Common Technical Document (eCTD) Submissions. 4 Hours.

Studies the processes and specific software programs utilized to compile FDA-compliant Electronic Common Technical Document (eCTD) submissions. Reviews the IT security issues that manufacturers must comply with when submitting INDs and marketing applications for new products in the eCTD format. Through detailed study of the operational aspects of the FDA eCTD submission process, offers students an opportunity to master the submission of similar regulatory documentation to regulatory agencies in several other key global markets.

RGA 6405. Nonclinical Regulations in Biomedical Product Commercialization. 4 Hours.

Examines the nonclinical regulatory processes involved in commercializing biomedical products within FDA's CBER, CDER, and CDRH. Offers students an opportunity to conduct a comprehensive analysis of FDA's quality standards for biomedical products, including gene and cellular-based therapies, with respect to ICH Common Technical Document (CTD) Module 4. Provides an overview of preclinical investigational new drug (IND) requirements and good manufacturing practice (GMP) regulations that must be fulfilled by biomedical product manufacturers in support of CTD Module 3. Additionally, offers students an opportunity to study biocompatibility testing requirements for medical devices according to FDA guidance and ISO 10993 standards to support 510(k) and PMA submissions.

RGA 6410. Fundamentals of CMC Regulations and Methods. 4 Hours.

Discusses components of the Common Technical Document Module 3 and describes how regulatory affairs professionals support compliance with CMC regulation. Offers students an opportunity to design and evaluate core elements of an effective CMC compliance strategy, ensuring alignment with ICH guidelines, FDA Guidances, pharmacopeia, and 21 CFR. Chemistry, manufacturing, and controls (CMC) regulatory affairs professionals must use technical, analytical expertise and problem-solving abilities to ensure only quality product is distributed to patients.

RGA 6420. Global IVD Regulations and Submissions. 4 Hours.

Examines in-depth regulations governing in vitro diagnostic medical devices. Covers the IVD regulations for the four major economic markets—United States, European Union, Australia, and Canada—as well as other markets that have specific IVD regulations—these countries could include China, Brazil, Mexico, etc. Topics include IVD classification schemes, regulatory strategy, regulatory submission routes (including harmonization), regulatory review processes, performance evaluation, clinical trial requirements, labeling, and postmarketing. Also explores IVD testing methodologies. Covers emerging trends in IVDs, such as the advent of companion diagnostics and their relationship to personalized medicine.

RGA 6423. Medical Device Product Development in Canada. 4 Hours.

Explores the general requirements for medical device regulation globally and the details of medical device regulation in Canada. Familiarizes students with the International Medical Device Regulators Forum goals and objectives and explores the medical device regulatory model developed by the Global Harmonization Task Force that is in use in many countries today. Studies Canadian medical device regulations, covering topics such as postmarket topics of adverse event reporting, recalls and inspections, classification, device licensing, establishment registration, design change, license amendments, and annual renewal processes. Offers students an opportunity to participate in a project to learn how to prepare portions of a sample submission for Canada.

RGA 6430. Clinical Trial Quality Oversight. 2 Hours.

Examines systemic reviews of audits in regions and trends in reported issues across regions, including evaluating previous experiences with investigators as well as other approaches. In the ever changing world of conducting clinical research, there is a need for quality oversight of activities. Offers students an opportunity to learn how all of this information collates and reports out to be used in the full quality oversight of a research study.

RGA 6431. Clinical Trial Agreements and Other Key Contracts in the Life Sciences. 4 Hours.

Describes the legal principles involved with clinical trial agreements and contracts in the life sciences of all types. Clinical trial agreements address high-risk legal areas like subject injury, indemnification, confidentiality, ownership of data, patent rights, and publication rights. Other important contracts used in the life sciences industry include manufacturing and supply agreements, sponsored research agreements, services agreements, consulting agreements, and licensing agreements. Clinical trials typically involve a complex matrix of roles and responsibilities defined by the different contracts entered into by the sponsor, investigator, contract research organization, and clinical trial site. Explores the meaning of different clauses and reviews the key issues faced in negotiating these contracts. Discusses some of the pitfalls to look out for when structuring agreements with healthcare professionals and academic institutions.

RGA 6432. Real-World Evidence in Biomedical Research. 2 Hours.

Provides an overview of real-world evidence (RWE), discusses challenges in implementing an effective RWE strategy, and reviews the implications of RWE on regulatory decision making. Topics include observational studies/pragmatic clinical trials, comparative effectiveness research, registries, patient reported outcomes, primary vs. secondary data collection, medical claims and electronic health record data, social media, wearable devices, and artificial intelligence.

RGA 6460. Intellectual Property in the Life Sciences. 2 Hours.

Reviews each of the main types of intellectual property (patents, trademarks, copyrights, and trade secrets) and explains the role they have in protecting the intellectual assets of life science companies. Intellectual property is at the heart of all products in the life sciences and plays a central role in the business strategy used by companies developing their pipeline of products. Also explains how regulatory affairs professionals can assist with the creation and protection of intellectual property and ways for them to work collaboratively with intellectual property counsel to ensure that the intellectual property delivers maximum value.

RGA 6461. Cybersecurity and Regulation of Digital Health Technologies by the FDA. 2 Hours.

Explores the increasing reliance on electronically based media to warehouse patient clinical data, as well as the need to protect it and maintain individual privacy with respect to patient healthcare data. Includes detailing the specifics of what types of patient clinical data new cybersecurity compliance regulations are designed to address, as well as a study of how these regulations impact the development of new biomedical products. Offers students an opportunity to study how these issues are addressed in other geographies, including the European Union, Canada, and the Asia-Pacific nations.

RGA 6462. Regulatory Compliance in the Pharmaceutical Industry: A Collaborative Approach. 4 Hours.

Offers students a historical overview of the compliance function in the pharmaceutical industry, covers the basic components of an effective compliance program, and describes the consequences associated with a weak compliance culture. In addition, advocates for compliance to become a collaborative partnership to different stakeholders in the business and help achieve important goals at the individual, department, and company levels. The rapid evolution of regulatory changes at the U.S. Food and Drug Administration (FDA) and foreign counterpart agencies like the European Medicines Agency (EMA) have increased the importance of regulatory compliance management for pharmaceutical companies. Companies must continuously adapt their compliance practices to conform to the changing regulatory landscape.

RGA 6463. Regulatory Strategy for Product Development and Life-Cycle Management. 4 Hours.

Examines the preparation of regulatory strategies to support product development and life-cycle management while providing students the opportunity to examine domestic and international processes relevant to regulatory strategy. In developing target product profiles, strategic regulatory plans, and life-cycle management plans, students appraise key components of regulatory strategies, evaluate core elements of product life cycle in the generation of those strategies, and integrate business needs into regulatory planning. Upon completion of the course, successful students should possess the fundamentals to formulate regulatory strategies supporting product development and life-cycle management and be equipped with a stronger understanding of the high-visibility role regulatory professionals serve in developing sound regulatory strategy.

RGA 6470. Research Ethics. 2 Hours.

Covers many of the ethical and regulatory issues that must be considered when conducting a clinical trial. Reviews the history and tragedies of conducting human experimentation and how such events shaped the regulatory framework we have today. Students analyze and discuss current and specific ethical research topics such as trials concerning pediatrics, women, elderly and the terminally ill, prisoners, embryos and fetuses, stem cell research, and genetic testing.

RGA 6920. Internship Reflection. 1 Hour.

Offers an independent study designed to allow students to reflect on both the theoretical knowledge that they have learned while pursuing their degree at Northeastern University and the practical experience that they have gained in an internship. Students should aim to create a unique, original, and ultimately applicable project that demonstrates an in-depth understanding of current markets, future trends, and global shifts in regulatory affairs.

RGA 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

RGA 7962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions.

RGA 7978. Independent Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic.

RGA 7983. Topics. 1-4 Hours.

Covers special topics in regulatory affairs. May be repeated without limit.

Regulatory Affairs of Food - CPS (RFA)

Search RFA Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=RFA>)

RFA 6100. Introduction to Regulatory Affairs of Food and Food Industries. 3 Hours.

Introduces some of the diverse challenges with food regulation on a global scale. Offers students an overview of how food manufacturers and food products are regulated in the United States. Introduces the basic statutes governing food regulation and the mission, structure, and authority of the agencies responsible for implementing and enforcing food regulation. Studies how the regulatory process is shaped by bureaucratic constraints; scientific and policy concerns; and input from industry, consumers, and advocacy groups, as well as how regulatory developments influence food issues, in order to provide a solid foundation for other courses in the program. Covers the program goals pertaining to specialized knowledge, broad and integrative knowledge, applied and collaborative learning, civic and global learning, and experiential learning.

RFA 6110. From Farm to Family Table: Understanding the Food Regulatory Life Cycle. 3 Hours.

Studies the life cycle (stages such as preharvest, harvest/slaughter, processing, packaging, distribution, and retail) of different categories of food. This "farm-to-table" process requires the alignment and collaboration of diverse industry and regulatory stakeholders—often with very divergent interests. Offers students an opportunity to begin developing specialized knowledge, broad and integrative knowledge, applied and collaborative learning, and civic and global learning as they examine the dominant food distribution channels as well as the economic, scientific, and regulatory compliance considerations of big agribusinesses.

RFA 6120. Economic and Social Aspects of Food. 3 Hours.

Introduces students to the cause-and-effect relationship of geographic, political, economic, and social/cultural aspects of food. Offers students an overview of the forces that govern changes in policies as well as the demand, supply, cost, and perceived value of food in the United States. Explores societal factors in terms of their cause-and-effect relationship with the evolution of food throughout the 20th century in America. Studies the emerging and dominant trends in food purchasing and consumption and the roles of the government, industry, and consumers/citizens.

RFA 6130. Food Law in the United States. 3 Hours.

Studies key areas of food law, regulation, and policy that empower (and limit) the powers and jurisdictions of federal and state government regulatory agencies in the United States. Offers students an opportunity to practice specialized knowledge, broad and integrative knowledge, civic and global learning, and experiential learning through their study of food safety preventive controls, labeling, inspection/auditing, import/export, recent criminal cases, as well as contemporary food law issues (such as additives and coloring, claims and advertising, nutrition labeling, food defense, food fraud, intentional adulteration, and genetically modified organisms).

RFA 6200. Comparing U.S. Regulatory Systems and Agencies. 3 Hours.

Explores the history, the legal basis of regulatory authority, structures, and limitations within food regulatory environments. Reexamines the Food and Drug Administration (FDA) and the U.S. Department of Agriculture (USDA) from a comparative perspective and with a look at other federal and state agencies, as well as nongovernmental organizations (NGOs) and the role of advocacy groups.

RFA 6210. Food Safety and Modernization. 3 Hours.

Examines the central provisions of the Food Safety Modernization Act (FSMA), noting where the Food and Drug Administration (FDA) has assumed new authority and activities in order to prevent food safety problems before they damage the health of consumers. Students evaluate multiple aspects of FSMA implementation, such as the challenges faced by states, mandatory registration of food production facilities, the requirement that food facilities adopt hazard analysis critical control point (HACCP) plans, third-party auditors, the creation of food product tracing systems, and increased produce inspection.

RFA 6215. Risk Analysis and Hazard Analysis in the Food Industry. 3 Hours.

Studies the application of risk analysis and hazard analysis methods to the food industry. Topics include basic concepts and applications of risk analysis, the use of risk and hazard modeling, hazard and risk characterizations, risk management and risk communication, and the utility of adopting the hazard analysis critical control point (HACCP) system. Students practice applied and collaborative learning by creating a food industry training plan that reflects major concepts of this course. Offers students an opportunity to practice experiential learning through the analysis of discipline-specific content, classifying food risks (contaminants), listing potential risks to humans, and evaluating recent food adulterant events for gaps in risk hazard analysis.

RFA 6220. Food Safety and Surveillance: Concepts and Applications. 3 Hours.

Examines concepts and methods for conducting surveillance of food-borne diseases, both in humans and in animals. Topics include methods from epidemiology and public health to address problems that have often been kept within the Food and Drug Administration's and U.S. Department of Agriculture's domains; ways to improve coordination among human health organizations and food regulatory professionals; the relationship between municipal, state, and federal agencies governing food-borne disease; and the best means to enlist the food industry as partners in health surveillance.

RFA 6225. Introduction to Food Science. 3 Hours.

Offers students an opportunity to gain the requisite knowledge and skill sets to become proficient in the major elements of food science. Explores topics such as food chemistry, food nutrition, food microbiology, food drying, heat preservation, freeze preservation, food packaging, and irradiation. Studies these methods as they apply to different commodities. Designed for students with or without a strong scientific background.

RFA 6235. Regulatory Differences and Similarities: An International Investigation. 3 Hours.

Offers a cross-national comparison of regulatory environments. Examines various regulatory touch points along the food production life cycle; the legislative and bureaucratic basis of inspection and enforcement practices in several nations; and various governments' interventions to protect against contamination, adulteration, or loss. Offers students an opportunity to begin developing specialized knowledge, broad and integrative knowledge, and civic and global learning.

RFA 6300. Capstone: Regulatory Affairs of Food. 3 Hours.

Serves as the capstone course for students in the MS-RFA program at the College of Professional Studies (CPS). Uses practical exercises and discussions designed to offer students an opportunity to demonstrate that they have achieved program goals pertaining to specialized, broad, and integrative knowledge; applied and collaborative learning; civic and global learning; and experiential learning. Incorporates group and individual assignments that require students to extend and reflect upon their completed research of food industry, food regulatory policy, and food law on national and international levels. Emphasizes the comprehension of current global regulatory issues. Uses case-based methodologies to enable real-world application of topics and regulatory issues discussed throughout the RFA program. This course is taken in a student's final term.

RFA 6310. Food Across International Borders: The International Food Trade. 3 Hours.

Analyzes key topics in international food trade, such as globalization and international agricultural commodity markets, food seizures at international borders, the imposition of tariffs and domestic support policies, the power and limits to the World Trade Organization and free trade agreements, country-of-origin labeling, and the relationship between cultural preferences and food imports.

RFA 6350. Political, Social, and Economic Influences on Food Law, Regulation, and Policy. 3 Hours.

Analyzes the food legal landscape, specifically the political, social, and economic influences that shape food regulations, laws, and policies. Offers students an opportunity to apply current case law to contemporary situations with topics that intersect with various themes present throughout core and elective courses.

RFA 6410. Landmark Changes in International Food Policy. 3 Hours.

Analyzes key U.S. food policies with international implications, as well as partnerships, agreements, organizations (such as the U.N., WTO, and WHO), and other international food policies that impact the regulation and inspection of exported foods. Examples include NAFTA, TPP, FSMA, C.O.O.L., and EFSA.

RFA 6411. International Surveillance and Regulation of Food. 3 Hours.

Builds upon earlier learning by guiding students as they analyze international issues behind the surveillance and regulation of food. Offers students an opportunity to research how food and food industries are regulated, examining the challenges faced by regulators as they attempt to monitor the production and distribution of food and food ingredients from dramatically different agricultural settings. Focuses on a geographic region of their choice for their analysis.

RFA 6412. FDA Model Food Code: Implications for Industry. 3 Hours.

Examines the industry implications of the FDA model Food Code, used for safeguarding public health and ensuring food is unadulterated and honestly presented when offered to the consumer. It represents FDA's best advice for a uniform system of provisions that address the safety and protection of food offered at retail and in food service. This model is offered for adoption by local, state, and federal government jurisdictions for administration by the various departments, agencies, bureaus, divisions, and other units within each jurisdiction that have been delegated compliance responsibilities for food service, retail food stores, or food vending operations.

RFA 6413. Total Food Protection from Farm to Fork. 3 Hours.

Examines best practices that encourage vigilance throughout the entire food chain, with particular emphasis on epidemiological implications. The 2016 implementation of the FDA's Food Safety Modernization Act (FSMA) has created landmark changes in regulation of food on both the domestic and international fronts. As emphasized by the seven key FSMA regulatory policy changes, total food protection is the combination of food safety and food defense. Often overlooked is the fact that the resources utilized to grow and produce food are perpetually susceptible to food terror.

RFA 6430. Food Safety and Commercialization in Emerging Economies. 3 Hours.

Analyzes international issues behind the surveillance and regulation of commercialized food in emerging economies. Offers students an opportunity to analyze how food-related disease outbreaks impact commercial development, as well as economic and political stability in regions where government institutions have frequently faltered.

RFA 7995. Project. 1-4 Hours.

Focuses on an in-depth project in which a student conducts research or produces a product related to the student's major field. May be repeated up to five times for up to 24 total credits.

Remote Sensing - CPS (RMS)

Search RMS Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=RMS>)

RMS 5105. Fundamentals of Remote Sensing. 3 Hours.

Introduces remote sensing principles, datasets, and basic interpretation/analysis. Covers four general categories: physical processes/theories involved in remote sensing, e.g., the nature and properties of electromagnetic radiation and how it is affected by interactions with the atmosphere and earth's surface; different sensor types and platforms, including optical, thermal, and microwave systems, from UAVs to environmental satellites; different applications of remote sensing such as land-use, land-change, vegetation, natural hazards, precision agriculture, and military; and starting methods of remote sensing to analyze images and extract desired information. Software used includes ArcGIS Pro, ArcGIS Online, GIMP, and FOSS.

RMS 6110. Introduction to Machine Learning for Image Data. 3 Hours.

Explores a range of machine learning routines, including image classifications and clustering, PCAs, and data reduction. Students perform exercises corresponding to concepts introduced in weekly lessons. Focuses on computer thinking, algorithms involved in preprocessing, spectral and spatial enhancement, spatial analysis, and linear transformations. Utilizes a variety of data types and an opportunity to experience the journey of geospatial image data from its origin (raw data) to its end (transformation) in the context of the process, scope, and real-world scenarios. Examples provided with GBDX notebooks and customized work flows as entry to Python, cloud-based analytics, and web-based GUI software: ENVI, ArcGIS, and GBDX.

RMS 6215. Unmanned Aerial Systems for Geospatial Analysts. 3 Hours.

Covers the concept of unmanned aerial systems (UAS), CubeSats, and LiDAR for collision avoidance. Offers students an overview of the components of a command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) network. Focuses on new technologies (UAS and CubeSats) and their applications in remote sensing, including the skills needed to recognize, evaluate, and develop systems and overall networks for a range of functions in the military, security, scientific, and commercial applications in government and market ventures. Software utilized includes PixElement (Platform as a Service); DroneMapper (free version); DroneDeploy (for flight planning); Photogrammetry (TBC).

RMS 6225. Value of Information and Geospatial Analytics. 3 Hours.

Focuses on Value of Information (VOI) theory as applied to solving geospatial intelligence problems. Introduces students to VOI theory by working with a series of case studies where various types of data are introduced at different times in the problem-solving process. Offers students an opportunity to develop an understanding of the value of numerous data types (satellite, airborne, terrestrial; LiDAR; existing maps and GIS data; open source data including social media), the incremental value of each piece of data, and how to quantify the incremental value. Analyzes VOI theory as it relates to geospatial intelligence and demonstrates how to set up an analytic problem to calculate the value of data within that analytic problem construct. Software: GIS and remote sensing analytic software; VOI analytic framework (e.g., SAS).

RMS 6230. Remote Sensing and Global Change. 3 Hours.

Analyzes various components of the Earth systems and how those components are changing. Offers students an opportunity to make extensive use of observations and measurements from space. Focuses on global environmental change and climate change, that is, on the human impact on the planet and the modification of environments by human activity. Among the topics covered are ozone, SST, glacier distribution, and terrain impacts of human activity. Requires a research paper that includes elements of remote sensing data analysis.

RMS 6240. Introduction to Radar and LiDAR Remote Sensing. 3 Hours.

Introduces the techniques and methods of active imaging used in radar and Light Detection and Ranging (LiDAR). Covers the underlying principles of the measurement techniques and the interaction of microwaves and LiDAR signals with natural surfaces and the atmosphere. Regarding radar, the course focuses on the role of synthetic aperture radar (SAR) systems and their application to monitoring aspects of the Earth's surface, including 3-D. Regarding LiDAR, the course introduces the different airborne and satellite systems and applications in terrestrial surfaces, principally for urban applications. Students complete a weekly lab project related to the processing and analysis of these data. Software: ArcGIS; ENVI; LIDAR Analyst; ESA SNAP Toolbox; ASF MapReady; ASF SAR Training Processor; USDA FS FUSION; FugroViewer. .

RMS 6250. Spatial Analytics for Vegetation and Precision Agriculture. 3 Hours.

Explores a range of Earth observation and geospatial statistical routines required for vegetation analysis ranging from forests to precision Ag. Synoptic perspectives allow spatial patterns of surface phenomena to be studied, vegetative features extracted, and base maps created. Students perform exercises to create derived products, such as normalized difference vegetation indices and soil maps used to track the length of growing seasons or as operational and business data for day-to-day farm operations. Includes high to low spatial and spectral data from CubeSats, UAVs, and airborne and terrestrial LiDAR. Software: Desktop Analyst software (Arc or Q), GeoMesa, rapidlasso, and GeoDa.

RMS 6260. Remote Sensing for Archaeology and Cultural Resource Management. 3 Hours.

Provides an overview of the application of remote sensing to archaeological research (survey and analysis) and archaeological heritage/cultural resource management. Remote sensing is complementary and integrative to other geospatial disciplines utilized in archaeology and cultural resource management. Includes utility of single-band, multispectral, hyperspectral, RADAR, LiDAR data, and DEMs obtained from airborne and space-borne platforms. Includes a brief survey of allied geospatial disciplines (GIS, GPS, CAD, surveying, etc.); types of data most often used; and GIS integration for contextual analysis. Students complete a final project of their choosing. Software used includes FOSS and proprietary.

RMS 6270. Remote Sensing for Disaster Management. 3 Hours.

Offers students an opportunity to understand the use of spatial information in disaster management and to acquire a comprehensive overview and hands-on skills in the application of remote sensing. The course is in five modules: (1) remote sensing theory, sensor/platform combinations, spectral imaging theories, atmospheric and radiometric correction, as well as sources for data download and analysis; (2) the use of remote sensing and GIS tools for use in wildfire management; (3) the use of remote sensing for flood mapping and analysis; (4) man-made disasters, such as oil spills, and consequence management of terrorist attacks or prevent planning to mitigate effects of a terrorist attack; and (5) a final project in which students analyze a set of data and produce a final report.

RMS 6280. Automated Feature Extraction for the Geospatial Professional. 3 Hours.

Introduces machine learning and automated feature extraction software and how it is utilized for image interpretation. Explores a variety of techniques and work flows associated with collecting features of interest from multiple data sources, e.g., aerial and satellite imagery, LiDAR, and elevation data. Students use AFE software to solve real-world problems in exercises corresponding to concepts introduced in weekly lessons. Offers students an opportunity to learn how to use feature extraction to create industry-standard analytical products and develop processing models for automation. Discusses the fundamentals of machine learning, supervised and unsupervised classification, hierarchical learning, postprocessing, cleanup, automation, modeling, and publication. Software: Esri ArcGIS 10.5; Feature Analyst for ArcGIS; LiDAR Analyst; ENVI; ENVI LiDAR.

RMS 6290. Spectroscopic Image Analysis. 3 Hours.

Explores the various techniques and work flows associated with nonliteral imagery analysis using hyperspectral data from numerous airborne and space-borne hyperspectral imaging (HSI) sensors. The course is divided into four modules: (1) basic theoretical concepts that underpin HSI analysis; (2) data preparation and other ancillary concepts such as spectral libraries and atmospheric correction that are critical to nonliteral analysis but are preprocessing steps; (3) nonliteral exploitation techniques, covered in sufficient depth to give the students an opportunity to understand the different methods and procedures used; (4) a final project where students are expected to conduct nonliteral analysis of a hyperspectral image from pre- through postprocessing. The ENVI software system is used extensively each week.

RMS 6293. Allied Technologies in Remote Sensing. 3 Hours.

Includes an overview of unmanned aerial systems (UAS), small satellites (CubeSats), and photogrammetry and GPS. Includes a review of digital elevation models, datums, projections, coordinate systems and scale for integration with components of a command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) network. Focuses on various technology applications and skills to recognize, evaluate, and develop systems and overall networks for a range of functions. These include military, security, scientific, and commercial applications in government and market ventures. Software used includes PixElement (Platform as a Service), DroneMapper (free version), DroneDeploy (for flight planning), and drone2map.

RMS 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

RMS 6983. Topics. 1-4 Hours.

Covers special topics in remote sensing. May be repeated without limit.

Respiratory Therapy - CPS (RPT)

Search RPT Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=RPT>)

RPT 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

RPT 6970. Seminar. 1-4 Hours.

Offers an in-depth study of selected topics.

RPT 7200. Advanced Cardiopulmonary Physiology. 4 Hours.

Covers advanced in-depth integrated physiology of the cardiovascular, renal, and pulmonary systems. Discusses the physiological dynamics, control mechanisms, and system interrelationships of the cardiovascular, pulmonary, and renal systems. Offers students an opportunity to make applications of advanced cardiopulmonary and renal physiology concepts to the management of neonatal, pediatric, adult, and geriatric patients requiring cardiovascular, pulmonary, and renal diagnosis and treatment.

RPT 7205. The Evolving Roles of Respiratory Care Professionals. 4 Hours.

Presents current and projected trends in respiratory therapy. Focuses on elaborating traditional and emerging roles for respiratory therapists, thereby highlighting numerous career opportunities in education, management, research, and other areas. Provides in-depth study related to a quality improvement project in a respiratory care department or educational program. Offers students an opportunity to develop three, five, and 10-year career and professional service plans.

RPT 7210. Research Design. 4 Hours.

Covers different types of designs used in medical research. Emphasizes the evaluation of research designs in peer-reviewed medical journals. Discusses the quality of published research articles and evaluation of levels of evidence produced by clinical research. Attention is given to review of medical literature to identify evidence for current or new standards of practice. Discusses development of research protocols, proposals for research funding, and the management of research projects.

RPT 7215. Applied Research in Respiratory Care. 4 Hours.

Offers a review and discussion of student research protocols and data analysis. Discusses how to prepare research abstracts, posters, and manuscripts under the guidance of departmental faculty. Integrates research outcomes to support clinical practice.

RPT 7300. Development of Clinical Practice Guidelines and Respiratory Care Protocols. 4 Hours.

Offers students an opportunity to gain the foundations necessary to build a strong understanding of how to complete systematic state-of-the-art reviews to summarize evidence based on a thorough literature search, critically appraise individual studies, and use statistical techniques to combine valid studies. Topics include meta-analysis, evidence-based clinical practice guidelines, and the GRADE (Grading of Recommendations, Assessment, Development, and Evaluation) approach to evaluate the supporting evidence and the strength of recommendations in healthcare. Also covers the criteria for establishing the scientific basis for protocol-directed respiratory care, evaluation of respiratory protocols efficacy in providing ICU care, and the use of respiratory protocols in providing non-ICU care.

RPT 7302. Respiratory Therapist Education. 4 Hours.

Offers students an opportunity to gain the foundations necessary to build a strong understanding of administration, fiscal planning, curriculum development, and outcomes assessment for baccalaureate or graduate respiratory therapist programs. Topics include preparation of a self-study for Committee on Accreditation for Respiratory Care (CoARC) accreditation; organization of clinical practice rotations; the role of advisory committees; and integration of didactic, laboratory, and clinical experiences. Covers the use of online instruction, clinical simulations, and other strategies to support learning outcomes.

RPT 7400. Pulmonary Diseases and Disorders. 4 Hours.

Offers students an opportunity to gain the foundations necessary to build a strong understanding of the pathophysiology of pulmonary diseases and disorders. Topics include obstructive airway diseases, infectious pulmonary diseases, pulmonary vascular diseases, chest and pleura trauma, disorders of the pleura and chest wall, environmental lung diseases, neoplastic disease, and chronic noninfectious parenchyma disease.

RPT 7401. Cardiopulmonary Assessment and Diagnostics. 4 Hours.

Describes patient evaluation and implementation of evidence-based respiratory care plans. Reviews and applies evidence-based practice and critical diagnostic thinking to the review of the medical record, patient interview, physical assessment, and evaluation of diagnostic studies. Reviews assessment of oxygenation, ventilation, and arterial blood gases. Discusses laboratory studies, imaging studies, and ECG monitoring and interpretation. Describes pulmonary function testing, diagnostic bronchoscopy, and other diagnostic studies. Also reviews acute- and critical-care monitoring, sleep studies, and maternal and perinatal/neonatal patient assessment.

RPT 7402. Adult Critical Care. 4 Hours.

Offers students an opportunity to gain the foundations necessary to build a strong understanding of how to manage airways, administer specialty gases, manage mechanical ventilation, and deliver pharmacologic agents. Topics include assessment of patient status and changes in status and anticipating care based on laboratory results and reports on imaging. Offers students an opportunity to build a strong understanding of the effects of pharmacologic agents, how to anticipate care needed based on nutritional status, how to prevent ventilator-associated pneumonia, recognize and manage patients with infections and sepsis, manage end-of-life care, and prepare for disasters.

RPT 7403. Neonatal and Pediatric Care. 4 Hours.

Covers evaluation of maternal history; neonatal assessment; patient history; physical examination; and results of laboratory studies, imaging, and other diagnostic tests. Topics include assessment and management of nine airways, administration and monitoring of specialty gases, management of ventilation and oxygenation, prevention of ventilator-associated pneumonia, and delivery of pharmacologic agents. Offers students an opportunity to build a strong understanding of how to assess patient status and to anticipate care based on laboratory results, nutritional status, and imaging reports. Other topics include anticipating the effects of pharmacologic agents, management of end-of-life care, preparing for disasters, and evaluating patient and family understanding of education on medications, equipment, and procedures.

RPT 7405. Development of Patient Management Plans. 4 Hours.

Offers students an opportunity to gain the foundations necessary to build a strong understanding of how to evaluate ER patients for admission, assess hospital floor or emergency department patients for transfer and admission to ICU, manage complicated (complex) ventilator patients, manage upper-airway obstruction postextubation, manage and remove chest tube, airway assessment, documentation and airway management, endotracheal tube placement and associated tasks, and evaluate and manage obstructive disorders (asthma, chronic obstructive pulmonary disease). Topics include appropriate use of history and physical findings and diagnostic studies to formulate a differential diagnosis, making informed decisions about diagnostic and therapeutic interventions based on patient information and preferences, up-to-date scientific evidence, and clinical judgment.

RPT 7962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions.

Russian (RSSN)

Search RSSN Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=RSSN>)

RSSN 1101. Elementary Russian 1. 4 Hours.

Explores the essentials of grammar, practice in pronunciation, acquisition of basic vocabulary, and idiomatic expressions of everyday Russian.

RSSN 1102. Elementary Russian 2. 4 Hours.

Continues RSSN 1101. Studies grammar and spoken and written forms of the language. Covers more advanced features of the language.

RSSN 1301. Elementary Russian Immersion 1. 4 Hours.

Designed for students who are in a Russian-speaking country, this is an off-campus immersion course. Offers students an opportunity to develop grammatical and conversational competence. Focuses on oral and aural skills that are enhanced by the immersion environment.

RSSN 1302. Elementary Russian Immersion 2. 4 Hours.

Designed for students who are in a Russian-speaking country, this is an off-campus immersion course. Offers students an opportunity to continue to develop grammatical and conversational competence. Focuses on oral and aural skills that are enhanced by the immersion environment.

RSSN 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

RSSN 2101. Intermediate Russian 1. 4 Hours.

Emphasizes further vocabulary building. Offers students an opportunity to master the fine points of grammar through written composition, prepared oral reports, and reading and discussion from contemporary Russian materials.

RSSN 2102. Intermediate Russian 2. 4 Hours.

Builds on RSSN 2101 and focuses on further development of vocabulary. Offers students an opportunity to continue to master grammar and conversation through written composition, prepared oral reports, and reading and discussion from contemporary Russian materials.

RSSN 2301. Intermediate Russian Immersion 1. 4 Hours.

Designed for students who are in a Russian-speaking country, this is an off-campus immersion course. Offers students an opportunity to continue to develop grammatical and conversational competence. Focuses on oral and aural skills that are enhanced by the immersion environment.

RSSN 2302. Intermediate Russian Immersion 2. 4 Hours.

Designed for students who are in a Russian-speaking country, this is an off-campus immersion course. Offers students an opportunity to continue to develop grammatical and conversational competence. Focuses on oral and aural skills that are enhanced by the immersion environment.

RSSN 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

RSSN 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

RSSN 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

RSSN 4992. Directed Study. 1-4 Hours.

Offers students a way of going beyond work given in the regular curriculum; may also enable students to complete major or minor requirements in certain situations. Priority is given to language majors and to juniors and seniors. May be repeated without limit.

RSSN 4993. Independent Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated up to three times.

School of the Museum of Fine Arts (SMFA)

Search SMFA Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=SMFA>)

SMFA 3000. Museum of Fine Arts Studio. 2-12 Hours.

Offers course work at the School of the Museum of Fine Arts. May be repeated without limit.

SMFA 4000. Museum of Fine Arts Capstone. 2-12 Hours.

Offers capstone course work at the School of the Museum of Fine Arts. May be repeated without limit.

SMFA 6000. Museum of Fine Arts Studio. 1-12 Hours.

Offers course work at the School of the Museum of Fine Arts. May be repeated without limit.

SMFA 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

Science - CPS (SCI)

Search SCI Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=SCI>)

SCI 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

SCI 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

SCI 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

SCI 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

SCI 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

Sociology (SOCL)

Search SOCL Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=SOCL>)

SOCL 1000. Sociology at Northeastern. 1 Hour.

Intended for first-year students in the College of Social Sciences and Humanities. Introduces students to liberal arts; familiarizes them with their major; develops the academic skills necessary to succeed (analytical ability and critical thinking); provides grounding in the culture and values of the University community; and helps to develop interpersonal skills—in short, familiarizes students with all skills needed to become a successful university student.

SOCL 1101. Introduction to Sociology. 4 Hours.

Explores basic concepts and theories concerning the relation between individuals and society. Emphasizes the influence of culture, social structure, and institutions in explaining human activity. Discusses and analyzes social groups, socialization, community, class, power, and social change, among other substantive issues.

SOCL 1120. Society and Health. 4 Hours.

Applies social scientific perspectives to the study of health, illness, and healthcare. Explores the ways that societal factors such as race, class, and gender interplay with health, healthcare, and health disparities. Studies neighborhoods and social networks in relation to health. Introduces basic sociological concepts relevant for the study of health and healthcare, such as social construction and medicalization. Offers students an opportunity to develop critical assessment skills while exploring a range of explanations for why, despite having the most expensive healthcare system, the United States ranks comparatively low in life expectancy and health and well-being outcomes. Uses lectures, case-based learning, and small-group workshops to explore the ways that our social environment shapes health in contemporary U.S. society. PHTH 1120 and SOCL 1120 are cross-listed.

SOCL 1215. Understanding Russia. 4 Hours.

Focuses on contemporary Russian society. Emphasizes the current and recent social, economic, and political characteristics of Russia and the ways in which it has evolved in the post-Soviet period. INTL 1215 and SOCL 1215 are cross-listed.

SOCL 1228. Social Problems. 4 Hours.

Analyzes in both empirical and theoretical terms many of the social problems currently facing Americans. Among these are deepening inequality and poverty among working and middle-class Americans, particularly racial minorities, women, and youth; related problems of racism and sexism; growing unemployment; international ecological crisis; deterioration of the health system; crime; and war and militarism. Strategies and political options for solving these problems are considered.

SOCL 1241. Violence and Society. 4 Hours.

Examines the notion of violence and its pervasive presence in the social institutions we create and maintain every day. Conducts sociological analysis of the issues we address, borrowing from other disciplines as they prove helpful. Sociology tells us that beliefs, values, and norms that characterize the United States legitimize the preference for violence, largely through the obvious venues of the mass media that glorify violence but also in the subtler structural arrangements collectively constructed and maintained in our everyday behaviors. Offers students an opportunity to understand how the structure of our society and its social institutions inhibit or facilitate violent behavior.

SOCL 1245. Sociology of Poverty. 4 Hours.

Analyzes American poverty in historical perspective, drawing on comparisons with other countries. Critically evaluates sociological research and theories relating to poverty. Considers causes and effects of poverty as well as societal responses to poverty and its consequences. Suitable for students in applied fields, such as nursing, criminal justice, education, allied health, premed, and prelaw.

SOCL 1246. Environment and Society. 4 Hours.

Examines the social, political, and economic forces behind the global environmental crisis. Topics include such issues as global warming and climate disruption, world resource availability and the global economic crisis, environmental justice and social inequities in the exposure to ecological hazards, science and technology, environmental degradation in the Third World, globalization and unfair trade, state power and the role of the polluter-industrial complex in the United States, the history of the environmental movement, and exemplary environmental policies and programs. This theoretically oriented course also involves practical experience in environmental problem solving.

SOCL 1255. Sociology of the Family. 4 Hours.

Focuses on families historically and across cultures and classes. Considers changes in contemporary families in terms of gender, family composition; women's labor force participation, divorce, cohabitation, and other transformations. SOCL 1255 and WMNS 1255 are cross-listed.

SOCL 1260. Gender in a Changing Society. 4 Hours.

Considers why and how gender is socially constructed in U.S. society and looks at different theories of gender. Explores gender as an institution as well as different (cultural) expressions of masculinities and femininities. Includes topics of gender in everyday life as well as gender as an organizing principle in the institutions of families, education, workplaces, sexualities, religion, the media, politics, and forms of gender violence. SOCL 1260 and WMNS 1260 are cross-listed.

SOCL 1275. Social Stratification. 4 Hours.

Explores the causes and consequences of the unequal distribution of prestige, power, and wealth in human societies. Topics may include theories of social stratification; varieties of human stratification systems; various dimensions of stratification (race gender, class); and the ideologies used to justify (and criticize) inequalities. While the features of multiple societies are considered, primary emphasis is on the development and contemporary structure of the American class system.

SOCL 1280. The Twenty-First-Century Workplace. 4 Hours.

Analyzes dramatic changes occurring in the work lives of Americans and considers the future of American workers within the global economy. Explores emerging labor markets, gender, race, and technology in shaping contemporary American work settings.

SOCL 1290. Juvenile Delinquency. 4 Hours.

Examines the sociological and psychological approaches to juvenile delinquency and their implications for a typology of delinquency. Discusses problems of prevention, treatment, and rehabilitation.

SOCL 1295. Drugs and Society. 4 Hours.

Focuses on historical and contemporary drug issues through the lens of classic sociological concerns. Rather than looking at only the legal/illegal discourse or historical/contemporary production, distribution, and use of drugs, the course frames drug topics around issues of class, race and ethnicity, age, and gender, asking the question of which drugs are used by whom and why at certain life stages. Specific topics include the high incarceration rates for nonviolent drug offenders; the role of drugs in death and dying via death penalty drugs and/or hospice care; mental health and drug treatment; and the potential peridy of global drug testing and management.

SOCL 1346. Environmental Activism and Movements: An Open Classroom. 4 Hours.

Offers an open-classroom experience focusing on the role of environmental activists and movements in addressing the global ecological crisis, emphasizing how to evaluate the organizing strategies, political tactics, organizational forms, and policy goals adopted by various environmental movement organizations (EMOs). Offers students an opportunity to understand the most effective means for bringing about meaningful social and environmental transformation. Includes numerous guest presentations from prominent environmental scholars, activists, filmmakers, and journalists, and includes guest panels and new film showings; these presentations are open to the larger Northeastern community.

SOCL 1350. Feminist Resistance. 4 Hours.

Engages students in the study of a variety of forms of feminist resistance in recent history, emphasizing the US in the context of cross-cultural examples. Students examine key feminist texts and manifestoes and study feminist activism in coalition with other social movements. Students identify and analyze unique features of gender-based activism in itself and in its intersections with other social movements, including movements and activism focused on race, class, sexuality, and physical ability. WMNS 1350, SOCL 1350, and HIST 1350 are cross-listed. .

SOCL 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

SOCL 2225. Sociology of Disability. 4 Hours.

Examines how the social model of disability has challenged the predominant medical model defining disability as simply biological impairment and abnormality. Offers students an opportunity to explore how the sociological perspective contributes to understanding lived experiences of disability and how disabilities are deeply interlinked to experiences of racial-ethnic, gender, and class inequality. According to the World Health Organization, some 15 percent of the world's population lives with disability. Yet what exactly is a disability? Successful students are expected to become conversant with theories of the social-historical construction of disabilities, the differences between visible and invisible impairments, the contributions of disability rights activism, and the bioethical questions about difference raised by medical technologies.

SOCL 2268. Social Movements. 4 Hours.

Introduces the social, cultural, and political dynamics that surround social movements, both historically and in the contemporary world. Emphasizes theory and research on national and transnational social movements, including studies of revolutions and political upheavals, demands for civil and human rights, movements for gender equality, and other instances of movements for social and political change. Emphasizes how structural factors shape social movement emergence and development and how social movements in turn shape the structure of societies.

SOCL 2270. Race and Ethnic Relations. 4 Hours.

Focuses on racial and religious groups, particularly with reference to the United States. Places special emphasis on historical development, specific problems of adjustment and assimilation, and present-day problems and trends. SOCL 2270 and AFAM 2270 are cross-listed.

SOCL 2300. Social Theory. 4 Hours.

Reviews the dominant theoretical traditions in classical and contemporary sociology, showing the links between the social thought of the eighteenth and nineteenth centuries and current social thought. Requires prior completion of two sociology courses numbered 1000 or above.

SOCL 2303. Gender and Reproductive Justice. 4 Hours.

Introduces the social, legal, and economic barriers to accessing reproductive healthcare domestically and internationally. Draws on various theoretical and analytic tools including critical race theory, critical legal theory, sociology of science, human rights, feminist theory, and a range of public health methods. Access to reproductive health services, including abortion, is one of the most contested political, social, cultural, and religious issues today. Covers domestic, regional, and international legal and regulatory frameworks on sexual reproductive health. HIST 2303, SOCL 2303, and WMNS 2303 are cross-listed.

SOCL 2320. Statistical Analysis in Sociology. 4 Hours.

Offers students an opportunity to obtain knowledge and skills essential for understanding the theory and practice of social statistics commonly used in social research. Topics covered include the operationalization of abstract concepts; descriptive statistics; correlation; bivariate regression; central limit theorem; confidence intervals; hypothesis testing; and key concepts such as association, causation, and spurious relationships. Statistical software is used to complete assignments.

SOCL 2321. Research Methods in Sociology. 4 Hours.

Introduces students to the range of research methods used by sociologists. Covers experimental research, field research, survey research, and historical-comparative research. Sampling, the rules of evidence in empirical research, research ethics, and the place of values are discussed. Required for sociology majors.

SOCL 2358. Current Issues in Cities and Suburbs. 4 Hours.

Introduces students to pressing urban issues: urban sprawl, poverty, education, transportation, economic development, and housing, through an intensive analysis of the Boston metropolitan area. The course is cotaught by university faculty and practitioners in government, community, and nonprofit organizations throughout the metropolitan area. Offers students the opportunity to analyze Boston data, go on outings to see development in progress, talk with urban practitioners about what they do, and conduct research on an urban issue of their choice.

SOCL 2359. Current Issues in Cities and Suburbs Abroad. 4 Hours.

Introduces students to pressing urban issues—urban sprawl, poverty, education, transportation, economic development, and housing—through an intensive analysis of the metropolitan area. Taught by university faculty and local practitioners in government, community, and nonprofit organizations. Offers students an opportunity to analyze urban data, to go on outings to see development in progress, and to talk with urban practitioners about what they do in urban contexts outside of the United States. To be taken as part of a Dialogue of Civilizations. May be repeated without limit.

SOCL 2450. Class, Power, and Social Change. 4 Hours.

Focuses on theories of social inequality as applied to the exercise of power and large-scale social change. Examines contemporary events in order to understand power structures.

SOCL 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

SOCL 3100. Gender, Social Justice, and Transnational Activism. 4 Hours.

Introduces key issues, themes, and debates in feminist transnational theory, practice, and activism in contemporary contexts and how it has changed under socioeconomic, political, and cultural processes of globalization. Examines differences among women relating to race, class, sexuality, national identity, and political economy in reckoning with possibilities for sustainable social justice. Students interrogate the relationship between the local and global; the production of knowledge in different regional spaces; the pragmatics of political mobilization; the varying contours of “social justice”; and other key issues. Offers students an opportunity to discuss the impact of globalization, neoliberalism, and state and intimate violence on gendered politics and relations and to contend with the politics of difference, to debate its challenges, and to imagine possible futures for transnational gender justice. POLS 3100, SOCL 3100, and WMNS 3100 are cross-listed.

SOCL 3408. Sociology of Organizations. 4 Hours.

Examines sociological perspectives on the structures and processes of large-scale formal organizations in Western society and contemporary organizational theory and research, with illustrations from business, governmental, and other organizations.

SOCL 3414. The Sociology of Campus Life. 4 Hours.

Focuses on campus life through the lens of classic sociological concerns of race, class, and gender. Offers students an opportunity to address core contemporary issues in higher education; to develop an understanding of campus life from the perspective of learning that occurs both inside and outside the classroom; and to assess how that learning impacts their views of themselves and their larger context. Also offers students an opportunity to develop an understanding of student commitment to issues of social change and social justice. HUSV 3414 and SOCL 3414 are cross-listed.

SOCL 3440. Sociology of Human Service Organizations. 4 Hours.

Introduces selected theoretical perspectives on human service organizations, emphasizing defining organizational goals and effectiveness. Gives students the opportunity to become familiar with the nature of human service organizations, to compare these organizations to business and industrial organizations, to outline specific problems that human service organizations face, and to propose potential solutions.

SOCL 3441. Sociology of Health and Illness. 4 Hours.

Offers a substantial overview of the sociology of health and illness. Medical sociology is an important subfield of sociology with important links to public health, social psychology, psychology, and other medical fields. Emphasizes several critical areas: society and disease; theoretical understandings of health inequalities; medicalization and social control; healthcare professions and professionalization; and the American healthcare system. Offers students an opportunity to obtain analytical frameworks to explore other topics in medical sociology not covered in this course.

SOCL 3465. Globalization and the Evolution of Human Societies. 4 Hours.

Examines current issues of globalization from a sociological viewpoint, emphasizing the forces that create ties between societies and the consequences of these ties. Analyzes the structures of human societies, the ways in which they change over long periods of time, and the consequences of changes for people’s actions and beliefs. Stresses the importance of social “environments” in understanding social change and of the process of social adaptation. Uses sociological concepts to analyze current issues of globalization, their origins, and ways of dealing with them.

SOCL 3485. Environment, Technology, and Society. 4 Hours.

Focuses on the connections between the development of modern nation-states and the control of nature. Explores the role human societies play in such events as climate change, tsunamis, and droughts. Asks how industrialization and the process of science and technology development are related to our transforming environmental conditions, as well as how the social sciences, the sciences, and engineering are transforming to address these issues. Draws on social theory, environmental history, anthropology/sociology, art/design, and open-source technologies to investigate theoretically and methodologically the sources, experiences of, and solutions for environmental health questions.

SOCL 3487. Applied Sociology: Practice and Theory. 4 Hours.

Offers the academic component of the experiential education requirement for sociology majors; to be taken after students have completed the experiential component. Provides a seminar format in which students will reflect upon their approved experience (that is, co-op, internship, community service, and so on) and integrate it into a research project. Students who have completed study abroad or a service-learning course in the department may not have to take this course.

SOCL 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

SOCL 4514. "The Wire" and the Study of Urban Inequalities. 4 Hours.

Offers a seminar examining a range of topics related to the issue of urban inequality. Uses the HBO series *The Wire* (which aired from 2002–2008) as a vehicle to explore how crime and social control, labor markets, housing policies, local politics, and other urban institutions both reflect and contribute to systemic inequality in U.S. cities. The material for this class consists of academic readings and seasons one through three of *The Wire*.

SOCL 4518. Law and Society in a Digital World. 4 Hours.

Explores the ways in which the legal system shapes and is, in turn, shaped by ideological and political movements. For example, the bitter controversy over whether runaway juries have created "jackpot justice" by awarding huge sums to plaintiffs is a reflection of deep cultural and political divides over individual rights and corporate power. Also examines new legal principles that are currently evolving to deal with such misdeeds as systematic corporate misconduct, cyber crimes, and harassment.

SOCL 4520. Race, Class, and Gender. 4 Hours.

Considers the intersection of race, class, and gender in social structure, institutions, and people's lives. Utilizes an interdisciplinary approach to focus on the socially constructed nature of these concepts and how they shape and create meaning in individual lives. Difference with an emphasis on inequality and varying life chances is central for understanding our society and is central to our work. Requires a significant amount of reading. Class format is like a seminar; students are expected to participate, take responsibility, and write a paper. SOCL 4520 and WMNS 4520 are cross-listed.

SOCL 4522. Political Ecology and Environmental Justice. 4 Hours.

Engages advanced sociological research on topics relating to political ecology and environmental justice, with the goal of producing a publishable report(s) to be published and posted on the Northeastern Environmental Justice Research (NEJRC) website and circulated on various national environmental list-serves. Possible topics of investigation could include the power of the polluter-industrial complex in the American political system; the role of trade agreements in relation to the globalization and the export of environmental hazards; climate justice, with an analysis of the manner in which climate change is exacerbating social and environmental injustices, especially for the poorest and most politically powerless populations in the world system; or many other important issues.

SOCL 4523. Sexualities. 4 Hours.

Offers a primarily sociological overview of the field of sexuality studies. Explores the ways in which sexual behaviors and identities are in fact shaped by social norms, values, and expectations; the meanings and statuses ascribed to sexual acts, behaviors, identities, and communities; and the interactive processes by which sexualities are achieved. Also brings an intersectional framework to discussions by emphasizing how our understandings of sexuality interact with categories of gender, race, nation, and class. Examines a variety of topics, such as transgenderism, power, extreme and illicit sex, socialization, pornography, and politics. SOCL 4523 and WMNS 4523 are cross-listed.

SOCL 4528. Computers and Society. 4 Hours.

Focuses on the social and political context of technological change and development. Through readings, course assignments, and class discussions, offers students an opportunity to learn to analyze the ways that the internet, artificial intelligence, and other technological advances have required a reworking of every human institution—both to facilitate the development of these technologies and in response to their adoption.

SOCL 4580. Special Topics in Sociology. 4 Hours.

Designed as a specialized themes course for students with experience in sociology and/or anthropology. Takes advantage of unique opportunities—visiting guests, special thematic interests—which are not part of the regular curriculum. May be repeated without limit.

SOCL 4600. Senior Seminar. 4 Hours.

Offers students an opportunity to integrate and apply knowledge of the discipline by building on completed course work and conducting original research on a topic of their choice. Requires students to produce a research paper due at the end of the semester. This seminar operates as an intellectual workshop in which students share the process, as well as the results, of their research with the group. The class comes together to inform, guide, critique, and support one another's research efforts in a collaborative fashion. Students are expected to make constructive comments on the work of others and to freely exchange ideas.

SOCL 4970. Junior/Senior Honors Project 1. 4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student's major field. Combined with Junior/Senior Project 2 or college-defined equivalent for 8-credit honors project. May be repeated without limit.

SOCL 4971. Junior/Senior Honors Project 2. 4 Hours.

Focuses on second semester of in-depth project in which a student conducts research or produces a product related to the student's major field. May be repeated without limit.

SOCL 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

SOCL 4991. Research. 4 Hours.

Offers an opportunity to conduct research under faculty supervision.

SOCL 4992. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

SOCL 4993. Independent Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

SOCL 4994. Internship. 4 Hours.

Offers students an opportunity for internship work. May be repeated without limit.

SOCL 5400. Cities in Global Context. 4 Hours.

Examines the roots of the urbanization process, major ways of thinking about it, and the development of world cities and megacities. The twenty-first century will be a century in which urbanism is a central problem and opportunity. Considers the economic, political, cultural, and environmental dimensions of urbanism across the globe. Includes specific case studies from around the world. Encourages students to develop a knowledge of particular cities in order to examine the key themes of the course. INTL 5400, ANTH 5400, and SOCL 5400 are cross-listed.

SOCL 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

SOCL 7100. Queer Theory: Sexualities, Genders, Politics. 4 Hours.

Introduces the core texts and key debates that have shaped queer theory and examines the intersections between queer theory and feminism and critical race theory. Seeks to provide an understanding of expansive and radical contemporary queer politics by analyzing foundational queer and feminist texts, pushing beyond narrow constructions of identity politics, anti-discrimination policy, and rights-based reforms. Engages queer theory by means of a rich philosophical and political interrogation of the meaning and content of “queer.” SOCL 7100 and WMNS 7100 are cross-listed.

SOCL 7200. Foundations of Social Theory 1. 4 Hours.

Studies the classic theorists including Durkheim, Weber, Marx, and others.

SOCL 7201. Foundations of Social Theory 2. 4 Hours.

Reviews the dominant theoretical traditions in contemporary sociology, examining the key assumptions, terminology, weaknesses, and strengths of the pluralist, managerialist, neo-Marxist, feminist, and postmodern paradigms. Strives not only to expose students to the giants in the field but, more important, to give students the intellectual tools to situate entire theoretical traditions vis-à-vis one another. Introduces students to various schools of thought. Offers students the opportunity to learn “how to think” sociologically and theoretically—that is, to go beyond simplistic and descriptive accounts of social phenomena to offer more systematic and insightful explanations.

SOCL 7220. Seminar in Qualitative Analysis. 4 Hours.

Studies qualitative techniques of analysis. Examines social-structure process and meaning in interacting groups. Students study a face-to-face group by means of participant observation using symbolic interaction concepts.

SOCL 7221. Globalization, Development, and Social Justice. 4 Hours.

Explores the rise of neoliberal globalization and its impact on local and national communities around the world. Examines complex patterns of resistance, including place-based struggles and transnational social movements. Combines theoretical analysis of global capitalism, development, the politics of resistance, and reformist/radical alternatives with the study of concrete struggles in defense of land, labor and human rights, indigenous cultures and identities, and ecological sustainability.

SOCL 7225. Gender and Social Movements. 4 Hours.

Offers an in-depth examination of the sociological literature on the gender dynamics of social movements, both nationally based and transnational. Covers key questions, conceptual tools, and methodological frameworks in the study of social movements; the interplay of gender, the state, and social movements, including feminist and women’s movements; how social institutions and social norms may affect the course and outcomes of movements; and globalization, transnational social movements, and gender. Geared toward students who plan to do research on social movements or global social movements but also designed to be useful to those with interests in related fields.

SOCL 7227. Race and Ethnic Relations. 4 Hours.

Offers a graduate-level seminar in the sociology of race and ethnic relations. Explores the key social, economic, political, and ideological forces shaping race and ethnic relations in the United States, past and present, and the main theoretical, methodological, and substantive debates in the “race and ethnicity” subfield of sociology. Course topics include, but are not limited to, the conceptual and intellectual foundations of the study of race and ethnic relations; the sources and consequences of ethnic and racial identities; urban poverty and dynamics of racial residential segregation; the role of wealth in creating and perpetuating racial inequality; the “new black middle class”; and contemporary debates regarding racial prejudice, discrimination, and redistributive public policies in the United States.

SOCL 7235. Urban Sociology. 4 Hours.

Discusses theories of the development of urban life. Compares preindustrial and industrialized urban areas. Presents methods for the study of urban social structure and change, and evaluates contemporary metropolitan action programs.

SOCL 7243. Sociology of Health and Illness. 4 Hours.

Studies social aspects of illness and medicine, historically and cross-culturally. Focuses on illness and the medical profession in modern society and their structural settings: the community, the hospital, the medical school. Critically examines research studies in the field and specifies problems for future research.

SOCL 7257. Contemporary Issues in Sociology. 4 Hours.

Discuss contemporary issues in sociology. Include supervised readings and written reports on special problems. May be repeated without limit.

SOCL 7259. Contemporary Issues in Sociology. 4 Hours.

Discuss contemporary issues in sociology. Include supervised readings and written reports on special problems. May be repeated without limit.

SOCL 7263. Social Psychology of Stratification. 4 Hours.

Explores the social psychological dimensions of structured social inequality. Overviews the “social psychologies” embedded in the classical social theorists, then explores the literature on sociological social psychology (as opposed to its psychological cousin), identifying key theoretical frameworks and focusing on “social structure and personality” (or “social structure and attitudes”) research. Explores relevant literatures on various “subjective” responses to stratification including the self-concept, stratum (that is, race, class, or gender) identification and consciousness, the process of legitimation, stratification beliefs (or stratification ideology), racial attitudes, and links between these phenomena and various policy attitudes and preferences (support for affirmative action, wealth redistribution, and so on). Also explores the ways in which such responses may contribute to the maintenance and reproduction of the status quo (social reproduction), and social change.

SOCL 7265. Sociology of Gender. 4 Hours.

Examines the origins of feminist sociology, its contributions to gender studies and to sociology, and directions of research. Covers feminist critiques of mainstream sociology, i.e., Parsonian structural functionalism, as well as of critical or Marxist sociology. Theoretical debates include critique of “sex role” theory and its replacement by multilayered notions of gender. That is, we conceptualize gender as macro-institutional and ideological, as an interactional accomplishment, and an aspect of identity. Includes intersectional theories and research, global/transnational concerns, studies of masculinities, and the place of the body and sexuality studies. This is a graduate seminar.

SOCL 7267. Environment, Health, and Society. 4 Hours.

Studies contested illnesses, which are diseases or conditions in which there is dispute over environmental causation. For many diseases and conditions attributed to environmental and occupational exposure, the disease or condition and/or its causes are discovered by laypeople in workplaces and communities, with considerable attention to chemical exposures. This seminar synthesizes a diverse set of fields, encompassing environmental sociology, medical sociology, medical anthropology, science studies, history of medicine, history of science, environmental health, community-based participatory research, environmental justice, and environmental public health. Emphasizes both political economic and ideological factors as determinants of contestation. Also examines issues of interdisciplinary collaboration between social scientists and environmental health scientists.

SOCL 7268. Globalization and the City. 4 Hours.

Considers the conditions of cities and their residents in the era of globalization. Cities have always been located at the center of regional and global networks of trade, capital, and culture. Even so, urban sociology has tended to treat cities as closed systems, defined more by internal logics than by broader social and economic forces. Since the early 1990s, however, shifts under way in the global economy, information and communications technologies, political movements, and cultural processes have altered the way that scholars (and policy makers, planners, architects, urban residents, etc.) look at cities. Increasingly, the world’s cities are regarded as nodes in global networks; and correspondingly, urban social and spatial processes are being viewed through global lenses.

SOCL 7270. Sociology of Work and Employment. 4 Hours.

Examines the ways in which work organizations powerfully shape individual and social life. Traces such influences with particular emphasis on how organizations differentially affect the distribution of job rewards across class, gender and racial/ethnic lines. Topics include the historical evolution of the management/worker relationship, job segregation by both race and gender, the impact of new technologies on social inequality, the relation between gender and professional careers, governmental efforts to ensure equal opportunity, and the impact of workplace transformation on racial and gender inequalities at work.

SOCL 7273. Gender and Social Policy. 4 Hours.

Provides an introduction to gender and social policy, with emphasis on intersections of inequalities based on class, race, and sexuality. The focus is on equality policies in employment including family-friendly measures and antidiscrimination policies. Includes those focused on child care, poverty, reproduction, and sexuality. Examines the intersections of family, economy, sexuality, and state from a variety of perspectives including cross-national and comparative analysis.

SOCL 7287. Social Movements in Health. 4 Hours.

Offers a graduate seminar centering on health social movements. Also explores general social movement theory and research. Uses concepts from science and technology studies and covers some core medical sociology concerns such as health inequalities; personal experience of illness; and lay-professional disputes over disease identification, causation, prevention, and treatment. Among the movements covered are disability rights, breast cancer activism, medical activism, black health movements, environmental justice, community health centers, patients’ rights, and health access movements.

SOCL 7962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

SOCL 7976. Directed Study. 1-4 Hours.

Comprises reading and research directed by a faculty member. May be repeated without limit.

SOCL 7990. Thesis. 1-4 Hours.

Offers thesis supervision by members of the department. May be repeated without limit.

SOCL 8960. Exam Preparation—Doctoral. 0 Hours.

Taken while completing one of two PhD field statements under faculty supervision. .

SOCL 8984. Research. 1-4 Hours.

Offers an opportunity to conduct research under faculty supervision. May be repeated without limit.

SOCL 8986. Research. 0 Hours.

Offers the student the opportunity to conduct full-time research. May be repeated without limit.

SOCL 9000. PhD Candidacy Achieved. 0 Hours.

Indicates successful completion of the doctoral comprehensive exam.

SOCL 9986. Research. 0 Hours.

Offers the student the opportunity to conduct full-time research. May be repeated without limit.

SOCL 9990. Dissertation. 0 Hours.

Offers theoretical and experimental work conducted under the supervision of a departmental faculty. May be repeated once.

SOCL 9996. Dissertation Continuation. 0 Hours.

Offers continued thesis work conducted under the supervision of a departmental faculty. May be repeated without limit.

Sociology - CPS (SOC)

Search SOC Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=SOC>)

SOC 1100. Introduction to Sociology. 3 Hours.

Examines the basic theoretical perspectives, research methods, and concepts of sociology, including society, culture, institutions, status and role, socialization, social groups, and the role of the individual within society. Considers a number of specific topics to help explore these concepts, including crime, deviance, sexualities, gender, education, and the environment.

SOC 1210. Sociology of Boston. 3 Hours.

Examines Boston from the perspective of environmental development, neighborhood and intergroup relations, institutional services, and symbolic meanings. The city is a laboratory for exploring the people's search for a lifestyle and the satisfaction of their needs. Offers students an opportunity to learn about urban sociology by using Boston as the case study. Examines the social history and historical development of contemporary Boston and analyzes selected current sociological issues.

SOC 1220. Engaging Difference and Diversity. 3 Hours.

Introduces the issue of diversity in the United States and across the globe. All humans share the same basic capacity for thinking, feeling, and social and moral reasoning. This general capacity takes specific cultural shape as each group adapts to different environments and historical situations and over time constructs a cultural tradition. Offers students an opportunity to articulate this knowledge intellectually and to apply it to everyday living and practices.

SOC 1230. Race and Ethnicity. 3 Hours.

Examines race and ethnicity as constructed differences. Explores the reasons for their existence, the power dynamics behind constructions of difference, the impact of difference on identity, and ways that visual and other presentations influence perceptions of self and others. Because human beings belong to different racial and ethnic groups, the study of these constructs is important to sociology. Explores the history of race and ethnicity and how history has influenced the study of these topics.

SOC 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

SOC 2100. Popular Culture. 3 Hours.

Explores the significance of expressions of popular culture such as film, television, music, and literature. Examines media production, organization, technology, and audience consumption. Discusses countercultures and subcultures, moral and ethical considerations, high and low culture, independent and corporate business influences, and consumerism and consumption. Topics include the effects of popular culture on race, gender, and class. Covers the relationship between popular culture and existing socioeconomic institutions.

SOC 2200. Drugs and Society. 3 Hours.

Introduces the sociology of drugs. Examines social definitions of licit and illicit drugs, conditions of their use, and socialization into drug use. Surveys deviant drug use and the effects of social control on definitions and use of drugs. Applies the relevant sociological theories of deviance and social control.

SOC 2220. Sociology of Drinking. 3 Hours.

Explores how different groups and societies organize drinking as a social act and the consequences of that organization. Covers the cultural meaning assigned to drinking, the social elements found in all drinking situations, how members of social groups learn how to drink, the social and psychological functions of drinking, and the impact on the body as well as society. Investigates the etiology of alcoholism and the epidemiology of this licit substance.

SOC 2240. Death and Dying. 3 Hours.

Examines the treatment of death and dying, including problems faced by health-care professionals, family members, institutions, the funeral industry, and the dying themselves. Covers cross-cultural perspectives, the social distribution of mortality, the changing nature of death, and the ethical problems in determining life and death. Emphasizes abortion, suicide, and ceasing medical intervention.

SOC 2320. Family Functions and Dysfunctions. 3 Hours.

Studies the family as a social institution in several cultures. Investigates family interrelations with political, economic, and educational institutions and the changing nature of the family. Examines the physical, emotional, and sexual violence that occurs in families, emphasizing child and spouse abuse. Analyzes definitions, prevalence, causes, prevention, and treatment of specific cases of violence. Focuses primarily on social, policy, and legal issues.

SOC 2340. Gender and Work Roles. 3 Hours.

Considers the impact of the changing roles of men and women in a relational institutional context, including a combined focus on gender role performance in the workplace and traditional gender demands imposed by family structure. Examines how workplace organization contributes to social inequalities. Topics include women's voice, the men's movement, gender and historical analyses, education and professionalism, comparable worth, and leadership and management styles.

SOC 2350. Power, Poverty, and Social Change. 3 Hours.

Offers students an opportunity to analyze uses of power in society and how change is facilitated. Evaluates sociological research and theories relating to the causes and effects of poverty and societal responses to it. Discusses theories of social equality and inequality as applied to the exercise of power and to the growth and development of social movements and group conflict. .

SOC 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

SOC 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

SOC 4955. Project. 1-4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student's major field. May be repeated without limit.

SOC 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

SOC 4991. Research. 1-4 Hours.

Offers students an opportunity to conduct research under faculty supervision.

SOC 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

Spanish (SPNS)

Search SPNS Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=SPNS>)

SPNS 1101. Elementary Spanish 1. 4 Hours.

Designed for students with little or no knowledge of Spanish. Presents essentials of correct Spanish usage through acquisition of basic skills in reading, speaking, writing, and aural comprehension.

SPNS 1102. Elementary Spanish 2. 4 Hours.

Continues SPNS 1101. Includes completion of basic grammatical usage, reading of contemporary Hispanic material, and increased stress on oral and aural skills.

SPNS 1301. Elementary Spanish Immersion 1. 4 Hours.

Designed for students who are in a Spanish-speaking country, this is an off-campus immersion course. Focuses on standard Spanish. Offers students an opportunity to develop grammatical and conversational competence. Focuses on oral and aural skills that are enhanced by the immersion environment.

SPNS 1302. Elementary Spanish Immersion 2. 4 Hours.

Designed for students who are in a Spanish-speaking country, this is an off-campus immersion course. Focuses on standard Spanish. Offers students an opportunity to continue to develop grammatical and conversational competence. Focuses on oral and aural skills that are enhanced by the immersion environment.

SPNS 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

SPNS 2101. Intermediate Spanish 1. 4 Hours.

Emphasizes further vocabulary building. Offers students an opportunity to master the fine points of grammar through written composition, prepared oral reports, and reading and discussion from contemporary Spanish materials.

SPNS 2102. Intermediate Spanish 2. 4 Hours.

Builds on SPNS 2101 and focuses on further development of vocabulary. Offers students an opportunity to continue to master grammar and conversation through written composition, prepared oral reports, and reading and discussion from contemporary Spanish materials.

SPNS 2301. Intermediate Spanish Immersion 1. 4 Hours.

Designed for students who are in a Spanish-speaking country, this is an off-campus immersion course. Focuses on standard Spanish. Offers students an opportunity to continue to develop grammatical and conversational competence. Focuses on oral and aural skills that are enhanced by the immersion environment.

SPNS 2302. Intermediate Spanish Immersion 2. 4 Hours.

Designed for students who are in a Spanish-speaking country, this is an off-campus immersion course. Focuses on standard Spanish. Offers students an opportunity to continue to develop grammatical and conversational competence. Focuses on oral and aural skills that are enhanced by the immersion environment.

SPNS 2401. Intermediate Spanish 1 for Healthcare Professionals. 4 Hours.

Reviews the present tense of regular, irregular, *yo* form irregular, and stem-changing verbs. Explores the preterite and imperfect tenses and the command forms formal (*usted* and *ustedes*). Topics also include *por* vs. *para*. Offers students an opportunity to practice a number of different medical scenarios in the emergency room, medical center, hospital, laboratory, and the X-ray room. Reviews the parts of the body and conducting a physical exam with a patient. Students practice taking a medical history and doing an extensive physical exam in Spanish.

SPNS 2402. Intermediate Spanish 2 for Healthcare Professionals. 4 Hours.

Reviews all the preterite and imperfect tenses and introduces the present subjunctive. Offers students an opportunity to practice the command forms formal (*ud./uds.*) and different medical scenarios as well as to learn a variety of medical procedures and treatments for different illnesses. The course is designed to prepare students to converse with their patients at an intermediate level and discuss a variety of treatments for different medical conditions.

SPNS 2900. Specialized Instruction in Spanish. 1-4 Hours.

Designed for individuals whose language skills are at the intermediate level and who seek specially focused language instruction. Such instruction might be the use of the language in specific settings, or it might be focused on specific conversational nuances of the language. Students must have at least an elementary level of competence in the language. May be repeated without limit.

SPNS 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

SPNS 3101. Advanced Spanish 1. 4 Hours.

Continues further development of vocabulary. Offers students an opportunity to continue to master grammar and conversation through advanced reading, composition, grammar review, and listening skills. Whenever possible, offers students an opportunity to engage in local community activities to enhance communication skills and cultural knowledge.

SPNS 3102. Advanced Spanish 2. 4 Hours.

Builds on SPNS 3101 and continues further development of vocabulary. Offers students an opportunity to continue to master grammar and conversation through advanced reading, composition, grammar review, and listening skills. Whenever possible, offers students an opportunity to engage in local community activities to enhance communication skills and cultural knowledge.

SPNS 3301. Advanced Spanish Immersion 1. 4 Hours.

Designed for students who are in a Spanish-speaking country, this is an off-campus immersion course. Focuses on standard Spanish as well as the local dialect. Offers students an opportunity to continue to develop grammatical and conversational competence.

SPNS 3302. Advanced Spanish Immersion 2. 4 Hours.

Designed for students who are in a Spanish-speaking country, this is an off-campus immersion course. Focuses on standard Spanish as well as the local dialect. Offers students an opportunity to continue to develop grammatical and conversational competence.

SPNS 3501. Advanced Spanish Conversation: Global Communication. 4 Hours.

Designed for nonnative and native speakers whose language skills are at the advanced level and who seek specialized conversational language instruction. Focuses on current global issues, with particular attention paid to events in the Spanish-speaking world and Latinos in the United States. Offers students an opportunity to enrich vocabulary and enhance oral and written communication. Students who do not meet course prerequisites may seek permission of instructor.

SPNS 3800. Special Topics in Spanish. 1-4 Hours.

Focuses on a unique aspect of the Spanish language. The specific topics are chosen to reflect current developments in the language and expressed student interests. Focuses on the use of the language for specific purposes or its use in specialized settings (e.g., media, business, health). Requires at least an intermediate level of skill in the language. May be repeated up to three times.

SPNS 3900. Specialized Instruction in Spanish. 1-4 Hours.

Designed for individuals whose language skills are at an advanced level and who seek specially focused language instruction. Such instruction might be the use of the language in specific settings, or it might be focused on specific conversational nuances of the language. Requires at least an advanced level of competence in the language. May be repeated without limit.

SPNS 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

SPNS 4201. Advanced Proficiency Spanish 1—BSIB. 4 Hours.

Designed for international business students to enhance their ability to communicate effectively in Spanish. Seeks to reinforce grammatical concepts and aims to enrich students' vocabulary, with emphasis on business vocabulary. Focuses on drills, paired and group activities, dictations, role-playing, reading, translations, and listening to audio materials in order to achieve a living language experience. By engaging students in such activities, the course offers students an opportunity to further develop their cultural understanding and their use of Spanish for business purposes. Restricted to international business majors only.

SPNS 4202. Advanced Proficiency Spanish 2—BSIB. 4 Hours.

Designed for international business students. Offers students an opportunity to continue to develop their ability to communicate effectively in Spanish. Seeks to reinforce grammatical concepts and aims to enrich students' vocabulary, with emphasis on business vocabulary. Focuses on drills, paired and group activities, dictations, role-playing, reading, translations, and listening to audio materials in order to achieve a living language experience. By engaging students in such activities, the course offers students an opportunity to further develop their cultural understanding and their use of Spanish for business purposes. Restricted to international business majors only.

SPNS 4800. Special Topics in Spanish. 1-4 Hours.

Focuses on a unique aspect of the Spanish language. The specific topics are chosen to reflect current developments in the language and expressed student interests. Focuses on the use of the language for specific purposes or its use in specialized settings (e.g., media, business, health). Requires at least an advanced level of skill in the language. May be repeated up to four times.

SPNS 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

SPNS 4992. Directed Study. 1-4 Hours.

Offers students a way of going beyond work given in the regular curriculum; may also enable students to complete major or minor requirements in certain situations. Priority is given to language majors and to juniors and seniors. May be repeated without limit.

Spanish - CPS (SPN)

Search SPN Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=SPN>)

SPN 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

Specialty Study in Arts, Media, and Design (SSAM)

Search SSAM Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=SSAM>)

SSAM 5001. Summer Program. 0 Hours.

Offers students an opportunity to study in a summer program. May be repeated without limit.

Speech-Language Pathology and Audiology (SLPA)

Search SLPA Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=SLPA>)

SLPA 1000. College: An Introduction. 1 Hour.

Introduces the university, college, and the speech-language pathology and audiology major. Seeks to enhance students' understanding of self and the decisions they make personally, academically, and professionally as members of the university's diverse community. Designed to help students gain knowledge and experiences that will ease the transition to Northeastern University and assist in developing strategies for success in college and in life beyond. Group activities, individual assignments, and active participation in a learning community are designed to help students adjust to life on an urban campus; develop a better understanding of the learning process; acquire essential academic and co-curricular skills; and make connections with faculty, students, and across majors in Bouvé College.

SLPA 1101. Introduction to Communication Disorders. 4 Hours.

Offers an overview of disorders of speech and hearing and their treatment, and a review of normal speech and hearing development. Requires clinical observations of persons with speech, language, and hearing disorders.

SLPA 1102. Language Development. 3-4 Hours.

Provides an overview of the development of the language system from birth to adolescence. Students compare different theories of language acquisition and understand their implications for intervention approaches; become familiar with broad developmental stages in infancy and childhood in the domains of motor skills, cognition, social skills, and speech and language, and the connections among these domains; understand the social dynamics between parents and children from which early gestures and prespeech vocalizations emerge; utilize some informal measures of language development covering form, content, and use; and understand broad differences in development in multicultural populations including Asian, Hispanic, and African-American children.

SLPA 1103. Anatomy and Physiology of Speech and Hearing Mechanism. 3-4 Hours.

Offers an in-depth study of the static structure, musculature, and physiology of the speech and hearing mechanism. Emphasizes current research in speech and hearing physiology.

SLPA 1200. Phonetics. 3-4 Hours.

Introduces students to articulatory, perceptual, and linguistic aspects of speech sounds, and phonetic transcription of normal and disordered speech using the International Phonetic Alphabet. Utilizes lectures, discussions, laboratory exercises, demonstrations, readings, audiotape exercises, problem sets, quizzes, and examinations.

SLPA 1203. Introduction to Audiology. 3-4 Hours.

Offers the opportunity to gain knowledge of the physics of sound and the anatomy/physiology of the human hearing mechanism, and how these two areas are interrelated. Familiarizes students with some of the diagnostic tests performed by the audiologist in order to assess the integrity of the hearing mechanism. Concludes with a brief overview of amplification and the rehabilitation process for hearing-impaired individuals.

SLPA 1205. Speech and Hearing Science. 3-4 Hours.

Introduces facts and theories related to the physical bases of sound as relevant to speech acoustics; anatomy of the hearing mechanisms; psychoacoustics; and speech perception. While primarily concerned with normal communication, the course also includes discussion of communication disorders. Lab demonstrations and problem sets augment lectures and discussions.

SLPA 1555. Communication Disorders in Movies. 4 Hours.

Seeks to increase student understanding of communication disorders through film. By watching Oscar-awarded, Oscar-nominated, and other Hollywood movies, students are offered an opportunity to develop a heightened sensitivity for how society views specific communication disorders. Through related lectures, discussion, structured activities, and assignments, studies the etiology and diagnosis of a variety of communication disorders and how individuals with these disorders may be helped.

SLPA 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

SLPA 2000. Introduction to Co-op. 1 Hour.

Prepares students for all aspects of the cooperative education component of their curriculum by comparing the goals and expectations of co-op employer, co-op faculty, and students themselves. Through professional goal exploration, students gain an understanding of the policies and procedures of the Department of Cooperative Education. The spectrum of clinical settings for speech, language, and hearing professionals is examined as well as current trends in the job market. Effective job search strategies through developing rTsumTs, preparing for interviews, and making informed choices are targeted. Also examines on-the-job scenarios involving problem solving, ethical issues, and confidentiality, and discusses appropriate ways to handle difficult workplace situations.

SLPA 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

SLPA 2991. Research in Communication Sciences and Disorders. 1-4 Hours.

Offers an opportunity to conduct introductory-level research or creative endeavors under faculty supervision.

SLPA 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

SLPA 4651. Speech Disorders across the Life Span. 4 Hours.

Offers students an opportunity to obtain the foundation needed to work with adults and children who demonstrate delays and disorders of speech production across the life span. Discusses articulation and phonological development and disorders, phonological differences, disorders of fluency of speech, and disorders of resonance and voice. Presents formal and informal diagnostic and therapeutic intervention for each disorder/difference and discusses the impact of these communication problems in relation to the individual and family.

SLPA 4652. Seminar in SLP and Audiology Abroad: Achieving Cultural Competency. 4 Hours.

Offers students opportunities to improve their cultural awareness; to develop their knowledge of different cultures; to increase their appreciation of—and sensitivity to—cultural differences (e.g., healthcare, legal/political, musical, religious); and to experience rehabilitation-related, culturally diverse experiences while abroad. Rehabilitation services are provided in a variety of educational, medical, and community settings. Effectiveness of rehabilitation across these settings is impacted by many factors, including interactions between cultural influences of the healthcare and legal/political systems and of the clinician and the clients/patients with whom he or she is working.

SLPA 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

SLPA 4991. Research. 4 Hours.

Offers an opportunity to conduct research under faculty supervision.

SLPA 4992. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

SLPA 5100. Diagnostic Audiometry. 3 Hours.

Presents an in-depth examination of the various uses of pure tone, speech, and impedance measures as they relate to the standard audiological assessment. Covers case history and case reporting.

SLPA 5107. Clinical Procedures. 3-4 Hours.

Reviews principles and procedures of the functional analysis of behavior and focuses on the application of behavioral theory and research to speech, language, and hearing training. Emphasizes clinical investigation in the experimental analysis of the behavior of communication disorders and experiences in the application of experimental procedures in assessment and treatment programs.

SLPA 5109. Neurology of Communication. 3 Hours.

Provides students with the opportunity to acquire a basic understanding of human neuroanatomy and neurophysiology as related to normal aspects of speech, hearing, and language. Reviews central and peripheral nervous system anatomy and physiology developmentally from embryologic through the life span perspectives. Neurology of common speech-language pathologies are similarly addressed.

SLPA 5110. Language Disorders across the Life Span. 3-4 Hours.

Offers students an opportunity to obtain the foundation needed to work with children and adults with frequently referred language disorders that are typical consequences of congenital and acquired central and peripheral nervous-system impairments. Emphasizes the anatomy/etiology/neurology/physiology of common disorders, characteristics of these disorders, and intervention approaches (diagnostic and therapeutic). Addresses prevention, outcome, efficacy, and service-delivery considerations.

SLPA 5111. Anatomy and Physiology of the Auditory System. 3 Hours. Details the anatomy, physiology, and neurology of the outer, middle, and inner ear, as well as providing basic coverage of the higher peripheral and central auditory mechanisms.

SLPA 5152. Early Intervention: Planning and Evaluating Services. 3 Hours.

Comprises a systematic, family-centered, team approach to service delivery. Cases are used as a focal point for learning how to plan and evaluate individualized family services and group service plans. Covers important aspects of teamwork and leadership in early intervention with respect to service and coordination. Addresses practical approaches to assessing needs for group programs, and evaluating the implementation and outcomes of programs. Also considers the impact of legal and financial issues on service coordination and approaches to service delivery.

SLPA 5154. Early Intervention Practicum 1. 2 Hours.

Provides students from school psychology, special education, speech-language pathology and audiology, physical therapy, nursing, and related fields with supervised field work experience in team-oriented interventions for infants and toddlers with disabilities or at risk for developmental delays and their families from linguistically and culturally diverse backgrounds. The practicum class sessions are conceptualized as the linchpin training experience between what the theory addresses in didactic courses and the student's fieldwork. Students are expected to master early intervention and team participation core competencies to work effectively with infants and toddlers and their families, interdisciplinary team members, and administrative personnel.

SLPA 5155. Early Intervention Practicum 2. 2 Hours.

Provides students from school psychology, special education, speech-language pathology and audiology, physical therapy, nursing, and related fields with supervised field work experience in team-oriented interventions for infants and toddlers with disabilities or at risk for developmental delays and their families from linguistically and culturally diverse backgrounds. The practicum class sessions are conceptualized as the linchpin training experience between what the theory addresses in didactic courses and the student's fieldwork. Students are expected to master early intervention and team participation core competencies to work effectively with infants and toddlers and their families, interdisciplinary team members, and administrative personnel.

SLPA 5201. Diagnostic Testing in Speech-Language Pathology. 2 Hours.

Offers students an opportunity to review diagnostic tests and test manuals in the field of speech-language pathology and to practice their administration. Discusses information about test content, reliability, and validity. Principles of standardized testing, norm referencing, and test scoring are reviewed and practiced.

SLPA 5202. Evaluation and Diagnosis. 2 Hours.

Offers students an opportunity to review diagnostic tests and test manuals in the field of speech-language pathology and to practice their administration. Discusses information about test content, reliability, and validity. Reviews and practices principles of standardized testing, norm referencing, and test scoring. Offers a foundation in principles of diagnostics and diagnostic thinking as preparation for the Advanced Clinic 1 Practicum diagnostic teams. Students work in teams to rehearse all aspects of test administration.

SLPA 5976. Directed Study. 1-4 Hours.

Allows students to pursue topics of individual interest beyond the scope of formal course work under the direction of faculty. May be repeated without limit.

SLPA 6210. Psychosocial Aspects of Communication Disorders. 2 Hours.

Covers the psychological, educational, and social aspects of communication disorders, particularly auditory impairment.

SLPA 6211. Research and Evidence-Based Practice. 3 Hours.

Uses principles of evidence-based practice to prepare students primarily as consumers of clinically relevant research in the field of communication disorders. While consumers utilize research information in some shape or form in their daily practice, producers engage in the conduct of original or replicated research. Consumers and producers of research information should be concerned with internal and external validity of research. As consumers, for example, clinicians may consult research studies to determine suitable treatments for their clients. As producers, clinicians may document a treatment via the case study method or single-subject experimental research. Emphasizes the role of using research to guide practice, even though the role of clinicians as research producer is addressed as well.

SLPA 6215. Pediatric Audiology. 3 Hours.

Covers the embryological development of the auditory system, structural lesions of the auditory system, categories of genetic and metabolic deafness, and syndromes associated with deafness. Discusses contemporary neonatal screening methods and audiologic assessment of the pediatric patient. Reviews test interpretation, audiologic counseling, and amplification intervention options and verification procedures.

SLPA 6217. Noise and Hearing. 3 Hours.

Covers topics related to the effects of noise on the auditory system and strategies for educating people about noise hazards. Primarily examines recent research in the field and then considers strategies for disseminating information regarding noise hazards to the public. Each student is asked to write educational pieces intended to inform the public about the effects of noise on the performance of the auditory system, to regularly read research articles related to course topics, and to participate in discussions of those articles.

SLPA 6219. Aural Rehabilitation. 3-4 Hours.

Provides a detailed examination of various approaches to speech reading and auditory training as they apply to children and adults. Offers an integrated approach to management of hearing-impaired individuals.

SLPA 6221. Hearing Science. 3 Hours.

Provides a concentrated study of the physical sciences related to the practice of audiology, including waves, sound-unit conventions, sound propagation, filters, and sound technologies. Seeks to provide the student with an in-depth understanding of hearing science through lectures, hands-on experiences, as well as assignments.

SLPA 6224. Psychoacoustics and Electroacoustics. 3 Hours.

Offers an in-depth, high-level look at signal processing, electronics, and physical principles associated with the sound perception, propagation of sound, electroacoustical devices, and technologies common to the practice of audiology and hearing science.

SLPA 6301. Speech Science. 3 Hours.

Focuses on normative aspects of speech acoustics, speech production, and speech perception, but will also include exploration of disordered speech and remediation of speech disorders. Laboratory exercises and class projects are used to augment class lectures and discussions.

SLPA 6303. Stuttering. 3 Hours.

Provides students with the information base needed to work with individuals of all ages who present with any type of fluency disorder. Focuses on theoretical background and assessment/treatment techniques for dysfluent individuals. Emphasizes outcome and efficacy considerations.

SLPA 6304. Augmentative and Alternative Communication. 3 Hours.

Provides an overview of augmentative and alternative communication (AAC) approaches for individuals with severe communication impairments. Helps students gain the foundation knowledge and skills for further independent study, continuing education, further course work, and practicum experience. For student who seek additional study or experience in AAC, the course should provide an enabling foundation for providing direct services in AAC or to serve as a consultant to meet the needs of individuals with severe communication impairments. For those who will not seek additional study in AAC, the course should provide the basic knowledge for appropriate referral and collaboration.

SLPA 6305. Articulation and Phonology. 3 Hours.

Familiarizes students with theoretical, empirical, and practical views of the etiology, assessment, and treatment of disorders of the speech sound system. Focuses on disorders that are developmental in nature (as opposed to emerging after normal speech sound development has occurred). Includes a review of articulatory phonetics, discussion of relevant linguistic principles, and study of theory and data relevant to the course of normal speech sound system development.

SLPA 6306. Speech-Language Disorders in Children. 3 Hours.

Covers a variety of common speech and language disorders in children with both biological and environmental foundations. Studies models of speech and language processing, definitions of disorders in relation to those models, and a range of intervention methodologies. Students consider issues of bilingualism and bidialectism and how they impact speech and language learning and academic success. Finally, students consider the implications of these disorders for academic achievement, particularly reading and writing. Is taught using a case-based approach. A portion of the credit for the course is earned through Web-based learning.

SLPA 6307. Voice Disorders. 3 Hours.

Examines voice disorders, which are prevalent across the life span in both professional and lay voice users. Evaluation and treatment of organic and/or functional vocal pathologies are key focuses of speech-language pathologists across clinical settings (educational and medical). Provides students with the information base needed to work with these interesting and rewarding populations. Emphasis is on anatomy and physiology of normal and impaired voice production, instrumental and noninstrumental assessment, and treatment techniques for remediation. Emphasizes prevention, outcome, and efficacy considerations.

SLPA 6308. Dysphagia. 3 Hours.

Evaluating and treating swallowing disorders are key focuses of the speech-language pathologies in most clinical work settings (educational and medical), with individuals of all ages. Provides students with the information base needed to work with these challenging and rewarding populations. Focuses on theoretical background and assessment/treatment techniques for dysphagia individuals. Emphasizes outcome and efficacy considerations.

SLPA 6309. Speech-Language Disorders in Adults. 3 Hours.

Examines speech, language, and cognitive-linguistic disorders, which are typical consequences of acquired central and peripheral nervous system adult impairments. Provides students with the foundation needed to work with frequently referred adult-impaired populations across clinical settings. Emphasis is on the anatomy/etiology/neurology/physiology of commonly acquired adult communication disorders (including aphasia, apraxia, dementia, dysarthria, and traumatic brain injury), characteristics of these communication disorders, and intervention approaches (diagnostic and therapeutic). Addresses prevention, outcome, efficacy, and service-delivery considerations.

SLPA 6311. Counseling in SLP. 3 Hours.

Provides students with a theoretical framework from which specific counseling strategies may be implemented for individuals and their families with various communication disorders. Stresses conversational interactive strategies. .

SLPA 6314. Professional Practice. 2 Hours.

Provides contemporary information relative to the practice of audiology and speech-language pathology. Includes such topics as planning a business practice, establishing a successful business operation, securing third-party reimbursement, and providing services within state licensing and ASHA ethical guidelines. May be repeated without limit.

SLPA 6321. Motor Speech Disorders. 3 Hours.

Focuses on the neurology, SLP evaluation, and SLP treatment of individuals presenting with any type/types of anarthria/dysarthria and apraxia/dyspraxia of speech. Many of the neurologically impaired children and adults that speech-language pathologists work with present with motor speech disorders. Diagnostically, studies how to complete oral motor examinations (including an assessment of those cranial nerves involved in respiration, phonation, resonance, and articulation) and intelligibility testing. Therapeutically, studies a variety of therapy approaches for the range of motor speech disorders based on severity of impairment and prognosis for recovery/improvement including verbal, nonverbal, prosthetic, and pharmacologic.

SLPA 6330. Language Literacy 1. 0.5 Hours.

Designed to teach students in the field of communication disorders about early childhood literacy skill acquisition, use, and challenges. Offers students an opportunity to learn how to deliver language-based early literacy services to young children in a manner consistent with the American Speech-Language-Hearing Association (ASHA) position that speech-language pathologists can and should play a critical and direct role in literacy development/use for people with communication disorders across the life span.

SLPA 6331. Seminar in Communication Disorders. 1 Hour.

Explores in-depth issues in communication disorders relating to current aspects of clinical management. May include a variety of specific topics. May be repeated without limit.

SLPA 6332. Seminar in Communication Disorders. 1-3 Hours.

Allows for the advanced study of current diagnostic and intervention strategies, applications of theoretical and applied research, and exploration of current topics in speech-language pathology. Topics may range from the treatment of undeserved populations to the analysis of complex clinical cases requiring interdisciplinary management. May be repeated without limit.

SLPA 6335. Early Intervention: Assessment and Intervention. 3 Hours.

Covers assessment models and the multidomain tests used in early intervention. Students become familiar with informal and formal instruments used in different areas including cognition speech and language, motor, and social/emotional domains. Explains the process and responsibilities for the writing of individualized service plans (ISPs), as well as variety of intervention models, methods, and strategies to be implemented in natural environments. Is taught by professors drawn from special education, speech-language pathology, counseling psychology, nursing, and physical therapy. Students participate in Northeastern's Global Early Intervention Network.

SLPA 6337. Language Literacy Experiential Program. 0.5 Hours.

Offers students in the field of communication disorders an opportunity to obtain supervised off-campus clinical experience delivering language-based early literacy services to young children in a manner consistent with the American Speech-Language-Hearing Association (ASHA) position that speech-language pathologists can and should play a critical and direct role in literacy development/use.

SLPA 6338. Language Literacy 2. 2 Hours.

Designed to teach students in the field of communication disorders about literacy skill use and evaluation and treatment of literacy impairments beyond early childhood. Reinforces the knowledge and skills covered in SLPA 6330. Offers students an opportunity to learn how to deliver language based-services to middle-school-age children and adults in a manner consistent with the American Speech-Language-Hearing Association (ASHA) position that speech-language pathologists can and should play a critical and direct role in literacy development/use for people with communication disorders across the life span.

SLPA 6340. Language Disorders in Children 1. 3 Hours.

Explores communication disorders from infancy through the preschool period. Considers at-risk populations, as well as those with known etiologies. Addresses information on incidence, characteristics, principles and methods of assessment and intervention, multicultural issues, service delivery models, and current issues in the research literature. Examines theoretical issues and their implication for language intervention.

SLPA 6341. Language Disorders in Children 2. 3 Hours.

Offers students an opportunity to obtain a foundation of knowledge about the etiology and characteristics of language disorders in school-age children. Addresses the evolving language demands children encounter as they progress through school, the impact of language disorders on academic performance and social interaction in the classroom, the relationship between oral and written language development, as well as the role of the speech-language pathologist in the assessment and treatment of written language disorders. Also designed to teach students in the field of communication disorders about literacy skill use and evaluation and treatment of literacy impairments beyond early childhood. .

SLPA 6342. Speech-Language Disorders In Adults 1. 3 Hours.

Offers students an opportunity to obtain foundational skills needed to work with frequently referred adults with aphasia across clinical settings. Speech, language, and cognitive-communication disorders are typical consequences of acquired central and peripheral nervous system adult impairments. Emphasizes the anatomy, etiology, neurology, and physiology of different types of aphasia, characteristics of these, and intervention approaches (diagnostic and therapeutic). Addresses prevention, outcome, efficacy, and service-delivery considerations.

SLPA 6343. Speech-Language Disorders in Adults 2. 3 Hours.

Offers students an opportunity to obtain foundational skills needed to work with frequently referred adults with acquired neurologic cognitive-communicative impairments across clinical settings. Speech, language, and cognitive-communication disorders are typical consequences of acquired central and peripheral nervous system adult impairments. Emphasizes the anatomy, etiology, neurology, and physiology of different types of cognitive-communicative impairments, characteristics of these, and intervention approaches (diagnostic and therapeutic). Addresses prevention, outcome, efficacy, and service-delivery considerations.

SLPA 6415. Speech-Language Pathology Advanced Clinical Practicum 1. 3 Hours.

Offers supervised clinical experience in speech pathology for beginning graduate students. Includes practicum sites at the Northeastern University on-campus clinical site, satellite clinics, and/or educational settings. Requires student to be available a minimum of twenty hours per week during the academic year. Requires attendance at on-campus seminar meetings held weekly. May be repeated without limit.

SLPA 6416. Speech-Language Pathology Advanced Clinical Practicum 2. 2 Hours.

Offers supervised clinical experience in speech pathology at the Northeastern University Hearing, Language, and Speech Center, medical settings, educational settings, and rehabilitation centers. Uses practical experience to emphasize advanced diagnostic and management techniques, stressing the application of theory to practice. Requires student to be available a minimum of twenty hours per week during the academic year. May be repeated without limit.

SLPA 6417. Speech-Language Pathology Advanced Clinical Practicum 3. 2 Hours.

Offers supervised clinical experience in speech-language pathology for advanced graduate students, placing them in settings such as the Northeastern University Speech, Language, and Hearing Center, medical settings, educational settings, and rehabilitation centers. Uses practical experience to emphasize problem-solving techniques relevant to case management and continues to integrate theory and practice. Requires students to be available a minimum of twenty hours per week during the academic year. May be repeated without limit.

SLPA 6418. Speech-Language Pathology Advanced Clinical Practicum 4. 2 Hours.

Offers supervised clinical experience in speech-language management pathology for advanced graduate students, placing them in settings such as the Northeastern University Speech, Language, and Hearing Center, medical settings, educational settings, and rehabilitation centers. Uses practical experience to emphasize problem-solving techniques relevant to case management and continues to integrate theory and practice. Requires students to be available a minimum of twenty hours per week during the academic year. May be repeated without limit.

SLPA 6420. Practical Statistics for Speech-Language Pathology and Audiology. 3 Hours.

Introduces basic concepts in data collection, organization, and analysis using statistical methods with an overall focus on profession-specific application and interpretation.

SLPA 6711. Scope of Practice in Audiology. 2 Hours.

Using ASHA documents entitled "Scope of Practice in Audiology," describes and defines the ASHA Code of Ethics, segments of FDA policy regarding audiological activities, and relevant legislation such as Massachusetts General Law and Chapter 93:71. Examines the limits of regulated practice and identifies examples of practice deemed to have exceeded the limits imposed by defining authorities.

SLPA 6716. Amplification 2. 3 Hours.

Expands on SLPA 6715 and examines state-of-the-art digital technology and contemporary software fitting systems. Explores the use of computers to fit and validate hearing aids as well as computer approaches to document hearing aid benefit. Examines the limits of personally worn amplification and presents difficult-to-fit cases.

SLPA 6722. Evaluation and Treatment of Central Pathologies. 3 Hours.

Examines behavioral and electrophysiological assessment of central auditory dysfunction. Emphasizes audiological evaluation as well as neuropsychological and speech-language evaluations. Describes the importance of parent and teacher observation of child behavior. Discusses pharmacological treatment where appropriate. Discusses and demonstrates audiological intervention including formal and informal auditory training programs and the use of FM signal processors to facilitate auditory processing. Illustrates the role of the audiologist as a CORE team specialist and parental advocate. Offers hands-on experience during class time as well as through completion of assignments. Requires permission of instructor for students not enrolled in AuD program.

SLPA 6728. Assessment of Vestibular Disorders. 3 Hours.

Offers a detailed review of how to evaluate the dizzy patient in a clinical setting. Topics include neuroanatomy and physiology of the balance and vestibular system, the importance of case history and physical examination, standard laboratory testing such as videonystagmography (VNG), rotational chair, and computerized dynamic posturography (CDP). Includes contemporary assessment procedures such as vestibular evoked myogenic potential (VEMP), subjective visual vertical (SVV), and video head impulse test (vHIT). Offers hands-on experience during the course.

SLPA 6729. Management of Vestibular Disorders. 3 Hours.

Focuses on clinical management of a variety of balance and vestibular disorders, from initial diagnosis to treatment and rehabilitation. Topics may include, but are not limited to, Meniere's disease, benign paroxysmal positional vertigo, vestibular migraine, and vestibular schwannoma, etc. Expects students to learn how to integrate the knowledge of laboratory vestibular testing, covered in SLPA 6728, into clinical care of individual patients with specific vestibular complaints. Offers students an opportunity to become efficient in clinical decision making. Uses case studies during the course.

SLPA 6737. Advanced Evoked Potential Measures. 3 Hours.

Examines the latest applications of evoked potential measures, including auditory brainstem response (ABR), auditory steady-state response (ASSR), and stacked auditory brainstem response. Also covers the auditory P300 response, auditory middle latency response (AMLR), and the auditory late response (ALR). Discusses applications of these measures to clinical practice. Offers an opportunity to obtain hands-on experience during class time and through completion of assignments.

SLPA 6741. Pharmacology for Audiologists. 2 Hours.

Covers introductory information on pharmacological agents, their actions, and adverse reactions. Discusses the use of drugs to treat auditory disease, and analyzes the specific process of ototoxic reaction. Examines the use of drugs to treat tinnitus.

SLPA 6747. Implantable Hearing Devices. 3 Hours.

Examines implantable hearing devices, specifically cochlear implants (CI), middle-ear implants, and bone-anchored hearing aids (BAHA). Discusses cochlear implant candidacy, surgery, follow-up, and long-term training and education issues relevant to children. Covers the performance, cost, and efficiency of middle-ear implants and BAHA in detail. Provides hands-on experience with programming of devices during class time and through completion of assignments.

SLPA 6751. Advanced Audiology Clinic 1. 2 Hours.

Introduces students to clinical process and provides an opportunity for self-reflection and evaluation. Offers students the chance to learn how to observe client behavior, how to write clinical reports, and how to recommend specific audiological treatment. This course offers a supervised clinical experience in audiology designed for beginning graduate students. Practicum sites include the Northeastern University Speech-Language and Hearing Center, area clinics or hospitals, and/or educational settings. Requires students be available a minimum of 20 hours per week during the academic year for clinical practicum and scheduled seminars.

SLPA 6752. Advanced Audiology Clinic 2. 2 Hours.

Offers students the opportunity to expand on clinical skills as well as self-evaluation skills that were introduced in . Focuses on obtaining a basic case history, test procedures and skills, as well as providing results and recommendations to patients. This course offers a supervised clinical experience in audiology designed for beginning graduate students. Practicum sites include the Northeastern University Speech-Language and Hearing Center, area clinics or hospitals, and educational settings. Requires students be available a minimum of 20 hours per week during the academic year for clinical practicum and scheduled seminars.

SLPA 6754. Advanced Audiology Clinic 4. 2 Hours.

Provides practical experiences to emphasize problem-solving techniques relevant to case management and to continue to integrate theory and practice. Fosters greater independence in case management and follow-up. Practicum sites include the Northeastern University Speech-Language and Hearing Center, area clinics or hospitals, and educational settings. Requires students be available a minimum of 20 hours per week during the academic year for clinical practicum and scheduled seminars.

SLPA 6755. Advanced Audiology Clinic 5. 2 Hours.

Provides practical experiences to assist students in acquiring clinical skills and knowledge necessary to prepare them for the clinic internship. Focuses on student self-assessment skills as well as independent thinking and problem solving. Practicum sites include the Northeastern University Speech-Language and Hearing Center, area clinics or hospitals, and educational settings. Requires students be available a minimum of 20 hours per week during the academic year for clinical practicum and scheduled seminars. This is an advanced level of clinical training.

SLPA 6756. Advanced Audiology Clinic 6. 2 Hours.

Provides practical experiences to assist students in acquiring clinical skills and knowledge necessary to prepare them for the clinic internship. Focuses on assisting students in assigning priorities to clinical goals and objectives as well as independent thinking and problem solving. Practicum sites include the Northeastern University Speech-Language and Hearing Center, area clinics or hospitals, and educational settings. Formative assessment of emergent skills are performed as well as summative assessment of the complete clinician. Requires students be available a minimum of 20 hours per week during the academic year for clinical practicum and scheduled seminars. This is an advanced level of clinical training.

SLPA 6757. Advanced Audiology Clinic 7. 3 Hours.

Offers practical experiences that seek to assist students in acquiring clinical skills and the knowledge necessary to prepare them for the clinic internship. Focuses on assisting students in assigning priorities to clinical goals and objectives as well as independent thinking and problem solving. Practicum sites include the Northeastern University Speech-Language and Hearing Center, area clinics or hospitals, and educational settings. Formative assessment of emergent skills is performed as well as summative assessment of the complete clinician. Requires students be available a minimum of 20 hours per week during the academic year for clinical practicum and scheduled seminars. This is an advanced level of clinical training.

SLPA 6758. Advanced Audiology Clinic 8. 3 Hours.

Offers practical experiences that seek to assist students in acquiring clinical skills and the knowledge necessary to prepare them for the clinic internship. Focuses on assigning priorities to clinical goals and objectives as well as independent thinking and problem solving. Practicum sites include the Northeastern University Speech-Language and Hearing Center, area clinics or hospitals, and educational settings. Formative assessment of emergent skills is performed as well as summative assessment of the complete clinician. Requires students be available a minimum of 20 hours per week during the academic year for clinical practicum and scheduled seminars. This is an advanced level of clinical training.

SLPA 6773. Topics Seminar. 3 Hours.

Provides a forum for students to examine contemporary issues in audiology as they relate to patient services and audiologist expertise. Requires students to extract from contemporary audiological literature a multitude of topics that reflect the current state of audiology. The instructor functions as a moderator/facilitator.

SLPA 6791. AuD Clinic Internship 1. 3 Hours.

Provides students with the first of three segments of a full-time clinical experience in a variety of off-campus settings, including hospitals, clinics, private audiologic practices, rehabilitation centers, and educational settings. Direct supervision is provided by off-campus licensed audiologists who are in contact with University faculty.

SLPA 6792. AuD Clinic Internship 2. 3 Hours.

Provides students with the second of three segments of a full-time clinical experience in a variety of off-campus settings, including hospitals, clinics, private audiologic practices, rehabilitation centers, and educational settings. Direct supervision is provided by off-campus licensed audiologists who are in contact with University faculty.

SLPA 6793. AuD Clinic Internship 3. 3 Hours.

Provides students with the final segment of full-time clinical experience in a variety of off-campus settings, including hospitals, clinics, private audiologic practices, rehabilitation centers, and educational settings. Direct supervision is provided by off-campus licensed audiologists who are in contact with University faculty.

SLPA 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

SLPA 6990. Thesis. 3 Hours.

Offers a research activity that is the first of a two-course thesis sequence with the recommendation of the adviser. May be repeated without limit.

SIA 6000. Psychology of Intelligence Analysis. 4 Hours.

Offers an interdisciplinary viewpoint and approach to both security and intelligence analysis through the use of case studies as well as current research in psychology. Focuses on four sections: our mental machinery, involving cognition perception and memory; tools for thinking, which encompasses strategies for analytical judgment, the need for more information, keeping an open mind, structuring analytical problems, and analysis of competing hypotheses; cognitive biases, including biases in evaluation of evidence, perception of cause and effect, estimating probabilities, and evaluation of intelligence reporting; and improving intelligence analysis for homeland security and military applications.

SIA 6010. Intelligence Operations Management. 4 Hours.

Examines intensively case studies of intelligence operations engaged in by the United States and other countries. Uses several recent case studies, such as Operation Iraqi Freedom (OIF). Examines analysis and conceptual design of the operation, the strategic basis of the policy, as well as the operational- and tactical-level experiences. Offers students an opportunity to learn how intelligence fits in the strategic, operational, and tactical levels of OIF and the challenges in bringing the nation's intelligence assets together in a coherent and effective manner.

SIA 6020. Globalization and Intelligence Issues. 4 Hours.

Highlights the key themes that are currently developing within international intelligence liaison relationships. Explores the trend towards homogenization of intelligence and other law enforcement and security initiatives. Offers students an opportunity to discuss international standardization among a widening group of partners and how these processes may establish viable frameworks and operational parameters for the intelligence liaison arrangements, together with addressing counterintelligence and other security considerations. In short, a best-practice approach is defined and explored as becoming normalized operationally, facilitating the optimization of intelligence liaison arrangements.

SIA 6030. Intelligence Analysis and Policy Relationship. 4 Hours.

Describes how relationships are forged and fostered between policymakers and intelligence analysts. Policymakers need support from intelligence to help deal with uncertainty. Thus, policy officials come to respect and rely on analysts and managers who appreciate this aspect of the decision process. Analysts are deemed most useful when they clarify what is known by laying out the evidence and pointing to cause-and-effect patterns; carefully structure assumptions and argumentation about what is unknown and unknowable; and bring expertise to planning and action on important threats and opportunities. The heavily engaged policymaker has little use for intelligence products that emphasize prediction over explanation and opinion over evidence by assessments that trivialize the challenge of uncertainty by burying honest debate in compromise language and by ignoring high-impact contingencies.

SIA 6040. Interagency Collaboration. 4 Hours.

Offers an overview of the disparate intelligence agencies in the intelligence community and describes their missions, responsibilities, and how agencies do or do not collaborate in today's environment. Given the dynamic nature of threats and sources in the 21st century, this course reflects the rapid changes taking place. Requires students to analyze the relative missions and develop policy recommendations for future collaborative efforts in keeping with relevant U.S. and international laws.

Strategic Intelligence and Analysis - CPS (SIA)

Search SIA Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=SIA>)

SIA 6050. All-Source Intelligence. 4 Hours.

Offers students an opportunity to examine several means of collecting and analyzing multidiscipline information but remain focused on the need and ability to filter all of this data into objective and cohesive all-source products with an unbiased viewpoint. To provide the current and thorough intelligence analysis required today by senior policymakers, military leadership, and corporate America, all-source analysts utilize many types of intelligence: human, imaginary, signals, electronic, telemetry, communications, measurement and signals, and open-source. Professional analysts also use a variety of linking, modeling, and data-manipulation or artificial intelligence software packages.

SIA 6060. Human Intelligence Operations. 4 Hours.

Introduces all aspects of human intelligence (HUMINT), from its basic role as part of the intelligence community to operational considerations as a tool of U.S. national security policy. Studies what HUMINT is, how it is conducted, its challenges, specific analytical and reporting considerations that make it a unique discipline, and some of its great successes. Explores contemporary challenges to conducting HUMINT operations, given technology and the ways different U.S. government intelligence agencies organize and operate their HUMINT capabilities. Offers students an opportunity to develop advanced analytical and writing skills and to obtain a basis for dissertation research and writing. Requires students to research information from other disciplines and integrate it into their current research and applied decision making on HUMINT operations supporting counterterrorism.

SIA 6070. Analysis for Counterterrorism. 4 Hours.

Explores how to create a unified, integrated, and multidisciplinary counterterrorism analysis program that makes the best use of all available resources. The task of counterterrorism is one that is particularly analysis intensive. It requires its practitioners to employ a melded set of analytical tools and interoperable capabilities. This objective can be complicated by the fact that many counterterrorism operations might involve several entities, including both the intelligence community and unclassified counterterrorism efforts.

SIA 6080. Culture and Psychology. 4 Hours.

Examines the essential value of cultural knowledge in applying psychological theory. By understanding the varying thought processes and cultural values of some of the key cultures and geographic regions in which the intelligence community finds itself operating, analysts and policymakers can have a richer and more nuanced approach and viewpoint associated with the products produced on and about those areas and individuals from those areas of interest. Emphasizes nuanced differences in and among the Middle East countries and tribal areas as well as cultural differences among Far Eastern countries and cultures.

SIA 6090. Intelligence Collection. 4 Hours.

Explores the many ways in which intelligence information is collected. Topics include the value of open-source information as well as nonclassified means of collection, which enhance the knowledge base and resources available for analysts. Examines nontraditional approaches of accessing and utilizing public records and documents to satisfy client needs.

SIA 6100. Leadership for Intelligence Professionals. 4 Hours.

Studies the core leadership and management qualities and approaches necessary to engage intelligence users; to develop, manage, and apply the right mix of people, process, and technology; and to measure the value and impact to the intelligence effort. For intelligence to be valuable to policymakers and business executives, it must incorporate a multidisciplinary approach that delivers unique insights. This requires leadership skills to manage the development and implementation of the intelligence process.

SIA 6110. Law and Psychology. 4 Hours.

Offers students an opportunity to trace the effects of psychological factors through the course of a trial, including such issues as accuracy of eyewitness identification, plea bargaining, jury selection, persuasion tactics in the courtroom, presumption of innocence, jury size, jury decision rules, and sentencing and punishment. Evaluates the role that psychology currently plays in the development of laws and their application. Offers students an opportunity to explore future roles for psychologists in the establishment and function of laws in an ever-changing legal and digital environment.

SIA 6983. Topics in Strategic Intelligence and Analysis. 1-4 Hours.

Introduces selected and substantive issues in homeland security. Topics vary from one offering of the course to the next. May be repeated up to seven times for up to 8 total credits. .

SIA 7990. Thesis. 1-4 Hours.

Offers thesis supervision by members of the department.

Strategy (STRT)

Search STRT Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=STRT>)

STRT 4301. Strategic Analysis and Decision Making. 4 Hours.

Examines key components of strategic decision making in-depth. Strategic decision making involves solving complex business problems to achieve company objectives within a competitive context. Topics covered include understanding the competitive environment, managing uncertainty, identifying and evaluating resource allocation alternatives, and creating action plans to implement strategic decisions. Emphasizes critical thinking and making decisions with incomplete information in a competitive environment.

STRT 4501. Strategy in Action. 4 Hours.

Provides for the integration and application of administrative theory, knowledge, skills, and experiences for effective strategic performance in an organization. Offers students an opportunity to acquire a better understanding of the relevance and limitations of business and management concepts and techniques when making and implementing strategic decisions.

STRT 6200. Strategic Decision Making in a Changing Environment. 3 Hours.

Focuses on strategy development and implementation for a line of business and for the corporation as a whole by adopting a top management perspective. Beginning with developing a mission statement and goals for the firm, focuses on environmental scanning, incorporating economic, technological, sociopolitical, and legal trends in conducting industry analysis, thus assessing opportunities and threats and the firm's capabilities before formulating strategy that represents a fit between the environment and the firm. Discusses how to develop competitive advantage and assess competitive positioning, and studies how organizational structure and systems contribute to implementing strategy. Stresses the role of leadership and motivation before moving on to feedback mechanisms to assess success in strategy implementation, leading to revision of strategic plans as needed.

STRT 6208. Strategic Decisions for Growth. 3 Hours.

Focuses on developing and implementing long-term strategy for businesses. Examines how businesses grow in the context of the external environment. Environmental, macroeconomic, and competitive analysis; industry structure analysis; and an evaluation of current and future resources available to a firm together help determine strategy choices in a world characterized by alliances, outsourcing, and mergers and acquisitions. Leadership, organizational structure, business processes, the quality of human capital, corporate social responsibility, and reward systems all affect strategy implementation. Measurement and control systems help determine strategic plan achievement and create a feedback loop for revising strategic plans for future periods. Requires prior completion of 25 semester hours of MBA core curriculum; open to finance students.

STRT 6210. Workforce Metrics and Analytics. 3 Hours.

Introduces how to measure and manage a workforce strategically, including (1) identifying the strategic work that is truly necessary to execute firm strategy; (2) investing in differentiated management systems that support that work; and (3) designing and implementing targeted measurement systems, such as human resources function and workforce scorecards, designed to help to hold line managers accountable for strategic talent. Emphasizes helping students move from a focus on levels associated with a particular workforce attribute (e.g., what is our cost per hire?) to understanding the impact of the workforce on business-level outcomes (e.g., how might an increase in the quality of our project managers affect new product cycle time?).

STRT 6220. Strategic Management for Healthcare Organizations. 3 Hours.

Offers students an opportunity to understand general business strategy concepts as they relate to the healthcare industry. Explores how to analyze market opportunities and challenges as they apply to various healthcare organizations, such as hospitals, physician organizations, and nursing homes. Presents and discusses analytical frameworks for making strategic decisions, drawing on different disciplines, including economics, management, and psychology. Strategic issues include mergers and acquisitions, vertical integration, joint ventures and alliances, performance-control systems, and organizational design.

STRT 6318. Strategic Planning for the Future. 2 Hours.

Provides the fundamental concepts for understanding and managing strategy in a competitive context. Focuses on analysis, critical thinking, and making strategic decisions. Discusses the analytical tools to understand the industry and firm context. Explores the design and execution of strategies to compete successfully. Investigates the strategic changes involved as firms grow and expand into new businesses and geographic markets.

STRT 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

STRT 7976. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on chosen topics. May be repeated once.

Study Abroad (ABRD)

Search ABRD Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=ABRD>)

ABRD 5100. International Study—Sweden. 20 Hours.

Offers an opportunity to study in Sweden. May be repeated without limit.

ABRD 5101. International Study—Australia. 20 Hours.

Offers an opportunity to study in Australia. May be repeated without limit.

ABRD 5102. International Study—Belgium. 20 Hours.

Offers an opportunity to study in Belgium. May be repeated without limit.

ABRD 5103. International Study—Egypt. 20 Hours.

Offers an opportunity to study in Egypt. May be repeated without limit.

ABRD 5104. International Study—Israel. 20 Hours.

Offers an opportunity to study in Israel. May be repeated without limit.

ABRD 5105. International Study—England. 20 Hours.

Offers an opportunity to study in England. May be repeated without limit.

ABRD 5106. International Study—Ireland. 20 Hours.

Offers an opportunity to study in Ireland. May be repeated without limit.

ABRD 5107. International Study—Northern Ireland. 20 Hours.

Offers an opportunity to study in Northern Ireland. May be repeated without limit.

ABRD 5108. International Study—Ghana. 20 Hours.

Offers an opportunity to study in Ghana. May be repeated without limit.

ABRD 5109. International Study—Spain. 20 Hours.

Offers an opportunity to study in Spain. May be repeated without limit.

ABRD 5110. International Study—Canada. 20 Hours.

Offers an opportunity to study in Canada. May be repeated without limit.

ABRD 5111. International Study—Mexico. 20 Hours.

Offers an opportunity to study in Mexico. May be repeated without limit.

ABRD 5112. International Study—Czech Republic. 20 Hours.

Offers an opportunity to study in the Czech Republic. May be repeated without limit.

ABRD 5113. International Study—Italy. 20 Hours.

Offers an opportunity to study in Italy. May be repeated without limit.

ABRD 5114. International Study—South Africa. 20 Hours.

Offers an opportunity to study in South Africa. May be repeated without limit.

ABRD 5115. International Study—SEA Education. 20 Hours.

Offers an opportunity to study under the auspices of the Sea Education Association. May be repeated without limit.

ABRD 5116. International Study—Singapore. 20 Hours.

Offers an opportunity to study in Singapore. May be repeated without limit.

ABRD 5117. International Study—France. 20 Hours.

Offers an opportunity to study in France. May be repeated without limit.

ABRD 5118. International Study—New Zealand. 20 Hours.

Offers an opportunity to study in New Zealand. May be repeated without limit.

ABRD 5119. International Study—Vietnam. 20 Hours.

Offers an opportunity to study in Vietnam. May be repeated without limit.

ABRD 5140. International Study—Argentina. 20 Hours.

Offers an opportunity to study in Argentina. May be repeated without limit.

ABRD 5141. International Study—Chile. 20 Hours.

Offers an opportunity to study in Chile. May be repeated without limit.

ABRD 5142. International Study—China. 20 Hours.

Offers an opportunity to study in China. May be repeated without limit.

ABRD 5143. International Study—Costa Rica. 20 Hours.

Offers an opportunity to study in Costa Rica. May be repeated without limit.

ABRD 5144. International Study—Middle East. 20 Hours.

Offers an opportunity to study in the Middle East. May be repeated without limit.

ABRD 5145. International Study—Japan. 20 Hours.

Offers an opportunity to study in Japan. May be repeated without limit.

ABRD 5146. International Study—Scotland. 20 Hours.

Offers an opportunity to study in Scotland. May be repeated without limit.

ABRD 5147. International Study—Greece. 20 Hours.

Offers an opportunity to study in Greece. May be repeated without limit.

ABRD 5148. International Study—Dominican Republic. 20 Hours.

Offers an opportunity to study in the Dominican Republic. May be repeated without limit.

ABRD 5150. International Study—Denmark. 20 Hours.

Offers an opportunity to study in Denmark. May be repeated without limit.

ABRD 5151. International Study—Turkey. 20 Hours.

Offers an opportunity to study in Turkey. May be repeated without limit.

ABRD 5152. International Study—Thailand. 20 Hours.

Offers an opportunity to study in Thailand. May be repeated without limit.

ABRD 5153. International Study—Netherlands. 20 Hours.

Offers an opportunity to study in the Netherlands. May be repeated without limit.

ABRD 5154. International Study—Central Europe. 20 Hours.

Offers an opportunity to study in Central Europe. May be repeated without limit.

ABRD 5155. International Study—Switzerland. 20 Hours.

Offers an opportunity to study in Switzerland. May be repeated without limit.

ABRD 5156. International Study—Peru. 20 Hours.

Offers an opportunity to study in Peru. May be repeated without limit.

ABRD 5157. International Study—Hungary. 20 Hours.

Offers an opportunity to study in Hungary. May be repeated without limit.

ABRD 5158. International Study—Korea. 20 Hours.

Offers an opportunity to study in Korea. May be repeated without limit.

ABRD 5159. International Study—Russia. 20 Hours.

Offers an opportunity to study in Russia. May be repeated without limit.

ABRD 5160. International Study—Brazil. 20 Hours.

Offers an opportunity to study in Brazil. May be repeated without limit.

ABRD 5161. International Study—Iceland. 20 Hours.

Offers an opportunity to study in Iceland. May be repeated without limit.

ABRD 5162. International Study—Benin. 20 Hours.

Offers an opportunity to study in Benin. May be repeated without limit.

ABRD 5163. International Study—Cuba. 20 Hours.

Offers an opportunity to study in Cuba. May be repeated without limit.

ABRD 5164. International Study—India. 20 Hours.

Offers an opportunity to study in India. May be repeated without limit.

ABRD 5165. International Study—Caribbean. 20 Hours.

Offers an opportunity to study in the Caribbean. May be repeated without limit.

ABRD 5166. International Study—Armenia. 20 Hours.

Offers an opportunity to study in Armenia. May be repeated without limit.

ABRD 5167. International Study—Morocco. 20 Hours.

Offers an opportunity to study in Morocco. May be repeated without limit.

ABRD 5168. International Study—Germany. 20 Hours.

Offers an opportunity to study in Germany. May be repeated without limit.

ABRD 5169. International Study—Serbia. 20 Hours.

Offers an opportunity to study in Serbia. May be repeated without limit.

ABRD 5170. International Study—Austria. 20 Hours.

Offers an opportunity to study in Austria. May be repeated without limit.

ABRD 5171. International Study—Lebanon. 20 Hours.

Offers an opportunity to study in Lebanon. May be repeated without limit.

ABRD 5172. International Study—Senegal. 20 Hours.

Offers an opportunity to study in Senegal. May be repeated without limit.

ABRD 5173. International Study—South Korea. 20 Hours.

Offers an opportunity to study in South Korea. May be repeated without limit.

ABRD 5174. International Study—Kenya. 20 Hours.

Offers an opportunity to study in Kenya. May be repeated without limit.

ABRD 5175. International Study—Syria. 20 Hours.

Offers an opportunity to study in Syria. May be repeated without limit.

ABRD 5176. International Study—Balkans. 20 Hours.

Offers an opportunity to study in the Balkans. May be repeated without limit.

ABRD 5177. International Study—Uganda. 20 Hours.

Offers an opportunity to study in Uganda. May be repeated without limit.

ABRD 5178. International Study—Rwanda. 20 Hours.

Offers an opportunity to study in Rwanda. May be repeated without limit.

ABRD 5179. International Study—Wales. 20 Hours.

Offers an opportunity to study in Wales. May be repeated without limit.

ABRD 5180. International Study—Portugal. 20 Hours.

Offers an opportunity to study in Portugal. May be repeated without limit.

ABRD 5181. International Study—Indonesia. 20 Hours.

Offers an opportunity to study in Indonesia. May be repeated without limit.

ABRD 5182. International Study—Trinidad and Tobago. 20 Hours.

Offers an opportunity to study in Trinidad and Tobago. May be repeated without limit.

ABRD 5183. International Study—Jordan. 20 Hours.

Offers an opportunity to study in Jordan. May be repeated without limit.

ABRD 5184. International Study—Ecuador. 20 Hours.

Offers an opportunity to study in Ecuador. May be repeated without limit.

ABRD 5185. International Study—Tunisia. 20 Hours.

Offers an opportunity to study in Tunisia. May be repeated without limit.

ABRD 5186. International Study—Cameroon. 20 Hours.

Offers students an opportunity to study in Cameroon. May be repeated without limit.

ABRD 5187. International Study—Zambia. 20 Hours.

Offers students an opportunity to study in Zambia. May be repeated without limit.

ABRD 5188. International Study—Taiwan. 20 Hours.

Offers students an opportunity to study in Taiwan. May be repeated without limit.

ABRD 5189. International Study—Poland. 20 Hours.

Offers students an opportunity to study in Poland. May be repeated without limit.

ABRD 5190. International Study—Iran. 20 Hours.

Offers an opportunity to study in Iran. May be repeated without limit.

ABRD 5191. International Study—Bonaire. 20 Hours.

Offers students an opportunity to study in Bonaire. May be repeated without limit.

ABRD 5192. International Study—Grenada. 20 Hours.

Offers students an opportunity to study in Grenada. May be repeated without limit.

ABRD 5193. International Study—Tanzania. 20 Hours.

Offers students an opportunity to study in Tanzania. May be repeated without limit.

ABRD 5194. International Study—Oman. 20 Hours.

Offers students an opportunity to study in Oman. May be repeated without limit.

ABRD 5195. International Study—Lithuania. 20 Hours.

Offers students an opportunity to study in Lithuania. May be repeated without limit.

ABRD 5196. International Study—Oman. 20 Hours.

Offers students an opportunity to study in Oman. May be repeated without limit.

ABRD 5197. International Study—Bhutan. 20 Hours.

Offers students an opportunity to study in Bhutan. May be repeated without limit.

ABRD 5198. International Study—Jamaica. 20 Hours.

Offers students an opportunity to study in Jamaica. May be repeated without limit.

ABRD 5199. International Study—Finland. 20 Hours.

Offers students an opportunity to study in Finland. May be repeated without limit.

ABRD 5200. International Study—Norway. 20 Hours.

Offers students an opportunity to study in Norway. May be repeated without limit.

ABRD 5201. International Study—Kazakhstan. 20 Hours.

Offers students an opportunity to study in Kazakhstan. May be repeated without limit.

ABRD 5202. International Study—Botswana. 20 Hours.

Offers students an opportunity to study in Botswana. May be repeated without limit.

ABRD 5203. International Study—United States. 20 Hours.

Offers students an opportunity to study in the United States. May be repeated without limit.

ABRD 5204. International Study—Croatia. 20 Hours.

Offers students an opportunity to study in Croatia. May be repeated without limit.

ABRD 5205. International Study—Panama. 20 Hours.

Offers students an opportunity to study in Panama. May be repeated without limit.

ABRD 5206. International Study--Bolivia. 20 Hours.

Offers students an opportunity to study in Bolivia. May be repeated without limit.

ABRD 5207. International Study--Romania. 20 Hours.

Offers students an opportunity to study in Romania. May be repeated without limit.

ABRD 5208. International Study--Belize. 20 Hours.

Offers students an opportunity to study in Belize. May be repeated without limit.

ABRD 5209. International Study--Kuwait. 20 Hours.

Offers students an opportunity to study in Kuwait. May be repeated without limit.

Study Abroad - Business (ABRB)

Search ABRB Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=ABRB>)

ABRB 5100. International Study—Argentina. 20 Hours.

Offers an opportunity to study in Argentina. May be repeated without limit.

ABRB 5101. International Study—Canada. 20 Hours.

Offers an opportunity to study in Canada. May be repeated without limit.

ABRB 5102. International Study—France. 20 Hours.

Offers an opportunity to study in France. May be repeated without limit.

ABRB 5103. International Study—Germany. 20 Hours.

Offers an opportunity to study in Germany. May be repeated without limit.

ABRB 5104. International Study—Ireland. 20 Hours.

Offers an opportunity to study in Ireland. May be repeated without limit.

ABRB 5105. International Study—Netherlands. 20 Hours.

Offers an opportunity to study in the Netherlands. May be repeated without limit.

ABRB 5106. International Study—Singapore. 20 Hours.

Offers an opportunity to study in Singapore. May be repeated without limit.

ABRB 5107. International Study—Spain. 20 Hours.

Offers an opportunity to study in Spain. May be repeated without limit.

ABRB 5108. International Study—Chile. 20 Hours.

Offers an opportunity to study in Chile. May be repeated without limit.

ABRB 5109. International Study—Mexico. 20 Hours.

Offers an opportunity to study in Mexico. May be repeated without limit.

ABRB 5110. International Study—China. 20 Hours.

Offers an opportunity to study in China. May be repeated without limit.

ABRB 5111. International Study—Italy. 20 Hours.

Offers an opportunity to study in Italy. May be repeated without limit.

ABRB 5112. International Study—Hong Kong. 20 Hours.

Offers an opportunity to study in Hong Kong. May be repeated without limit.

ABRB 5113. International Study—Greece. 20 Hours.

Offers an opportunity to study in Greece. May be repeated without limit.

ABRB 5114. International Study—England. 20 Hours.

Offers an opportunity to study in England. May be repeated without limit.

ABRB 5115. International Study—Costa Rica. 20 Hours.

Offers an opportunity to study in Costa Rica. May be repeated without limit.

ABRB 5116. International Study—Japan. 20 Hours.

Offers an opportunity to study in Japan. May be repeated without limit.

ABRB 5117. International Study—Brazil. 20 Hours.

Offers an opportunity to study in Brazil. May be repeated without limit.

Study Abroad - CPS Specialty (ABRC)

Search ABRC Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=ABRC>)

ABRC 5001. International Study: Australia. 0 Hours.

Offers an opportunity to study in Australia.

ABRC 5002. International Study: Belgium. 0 Hours.

Offers an opportunity to study in Belgium.

ABRC 5003. International Study: Egypt. 0 Hours.

Offers an opportunity to study in Egypt.

ABRC 5004. International Study: Israel. 0 Hours.

Offers an opportunity to study in Israel.

ABRC 5005. International Study: England. 0 Hours.

Offers an opportunity to study in England.

ABRC 5006. International Study: Ireland. 0 Hours.

Offers an opportunity to study in Ireland.

ABRC 5007. International Study: Northern Ireland. 0 Hours.

Offers an opportunity to study in Northern Ireland.

ABRC 5008. International Study: Ghana. 0 Hours.

Offers an opportunity to study in Ghana.

ABRC 5009. International Study: Spain. 0 Hours.

Offers an opportunity to study in Spain.

ABRC 5010. International Study: Canada. 0 Hours.

Offers an opportunity to study in Canada.

ABRC 5011. International Study: Mexico. 0 Hours.

Offers an opportunity to study in Mexico.

ABRC 5012. International Study: Czech Republic. 0 Hours.

Offers an opportunity to study in the Czech Republic.

ABRC 5013. International Study: Italy. 0 Hours.

Offers an opportunity to study in Italy.

ABRC 5014. International Study: South Africa. 0 Hours.

Offers an opportunity to study in South Africa.

ABRC 5015. International Study: Sea Education Association. 0 Hours.

Offers an opportunity to study under the auspices of the Sea Education Association.

ABRC 5016. International Study: Singapore. 0 Hours.

Offers an opportunity to study in Singapore.

ABRC 5017. International Study: France. 0 Hours.

Offers an opportunity to study in France.

ABRC 5018. International Study: New Zealand. 0 Hours.

Offers an opportunity to study in New Zealand.

ABRC 5019. International Study: Vietnam. 0 Hours.

Offers an opportunity to study in Vietnam.

ABRC 5040. International Study: Argentina. 0 Hours.

Offers an opportunity to study in Argentina.

ABRC 5041. International Study: Chile. 0 Hours.

Offers an opportunity to study in Chile.

ABRC 5042. International Study: China. 0 Hours.

Offers an opportunity to study in China.

ABRC 5043. International Study: Costa Rica. 0 Hours.

Offers an opportunity to study in Costa Rica.

ABRC 5044. International Study: Middle East. 0 Hours.

Offers an opportunity to study in the Middle East.

ABRC 5045. International Study: Japan. 0 Hours.

Offers an opportunity to study in Japan.

ABRC 5046. International Study: Scotland. 0 Hours.

Offers an opportunity to study in Scotland.

ABRC 5047. International Study: Greece. 0 Hours.

Offers an opportunity to study in Greece.

ABRC 5048. International Study: Dominican Republic. 0 Hours.

Offers an opportunity to study in the Dominican Republic.

ABRC 5050. International Study: Denmark. 0 Hours.

Offers an opportunity to study in Denmark.

ABRC 5051. International Study: Turkey. 0 Hours.

Offers an opportunity to study in Turkey.

ABRC 5052. International Study: Sweden. 0 Hours.

Offers an opportunity to study in Sweden.

ABRC 5053. International Study: Germany. 0 Hours.

Offers an opportunity to study in Germany.

Study Abroad - Law (ABRL)

Search ABRL Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=ABRL>)

ABRL 5100. International Study—Argentina. 0 Hours.

Offers an opportunity to study in Argentina. May be repeated without limit.

ABRL 5101. International Study—Chile. 0 Hours.

Offers an opportunity to study in Chile. May be repeated without limit.

ABRL 5102. International Study—Italy. 0 Hours.

Offers an opportunity to study in Italy. May be repeated without limit.

ABRL 5103. International Study—Mexico. 0 Hours.

Offers an opportunity to study in Mexico. May be repeated without limit.

ABRL 5104. International Study—Costa Rica. 0 Hours.

Offers an opportunity to study in Costa Rica. May be repeated without limit.

ABRL 5105. International Study—China. 0 Hours.

Offers an opportunity to study in China. May be repeated without limit.

ABRL 5106. International Study—Turkey. 0 Hours.

Offers an opportunity to study in Turkey. May be repeated without limit.

ABRL 5107. International Study—England. 0 Hours.

Offers an opportunity to study in England. May be repeated without limit.

ABRL 5108. International Study—France. 0 Hours.

Offers an opportunity to study in France. May be repeated without limit.

ABRL 5109. International Study—School of Law. 0 Hours.

Offers an opportunity to study off-campus with the School of Law. May be repeated without limit.

ABRL 5110. International Study—Colombia. 0 Hours.

Offers an opportunity to study in Colombia. May be repeated without limit.

ABRL 5111. International Study—Brazil. 0 Hours.

Offers students an opportunity to study in Brazil. May be repeated without limit.

ABRL 5112. International Study—South Africa. 0 Hours.

Offers students an opportunity to study in South Africa. May be repeated without limit.

ABRL 5113. International Study—Spain. 0 Hours.

Offers students an opportunity to study in Spain. May be repeated without limit.

Study Abroad - Science (ABRS)

Search ABRS Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=ABRS>)

ABRS 5120. International Study—Three Seas Program. 20 Hours.

Offers an opportunity to study in the Three Seas Program. May be repeated without limit.

Study Abroad - Social Sciences and Humanities (ABRH)

Search ABRH Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=ABRH>)

ABRH 5001. International Study—University of Amsterdam. 20 Hours.

Offers students an opportunity to study at the University of Amsterdam. May be repeated without limit.

ABRH 6000. Study Abroad. 1-12 Hours.

Offers students an opportunity to study abroad at a partner university. May be repeated up to 11 times for up to 12 total credits.

Study USA (ABRU)

Search ABRU Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=ABRU>)

ABRU 5100. Study in the United States of America. 20 Hours.

Offers an opportunity to study at an off-campus location in the United States of America. May be repeated without limit.

Supply Chain Management (SCHM)

Search SCHM Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=SCHM>)

SCHM 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

SCHM 2301. Supply Chain and Operations Management. 4 Hours.

Focuses on the integrative management of business activities intrinsic to the smooth flow of goods or services, information, and financial transactions across firms from raw materials to the end customer. This collaborative approach creates competitive advantages for all members of a supply chain. Emphasizes the responsibilities of managers regarding decisions concerning the design, operation, and control of supply chains and operations. Considers customers, globalization, corporate strategy, resources, sustainability, ethics, and diversity. Topics covered include customer-centric management; supply chain and operations strategies; process structure and control; and supply, inventory, and quality management. Emphasizes the key role of information technology, logistics network design, supply chain relationships, and process evolution.

SCHM 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

SCHM 3301. Global Supply Chain Strategy. 4 Hours.

Focuses on the managerial activities of those involved in supply chain management operations and planning for companies doing international commerce. Analyzes contemporary issues that affect the design of international supply chain systems, including sourcing, logistics, transactions, risk, sustainability, and ethical considerations. Examines the current status and future prospects of the modes of international transportation as well as international trade and development issues, not only from the corporate perspective but also in terms of government policy.

SCHM 3305. Sourcing and Procurement. 4 Hours.

Addresses the strategic and operational role of sourcing and procurement and its impact on the supply chain as it relates to the entire organization. The selection, contracting, development and monitoring/ managing of the right supplier in the right location is more often a source of competitive advantage and a major contributor to a company's bottom line. The course focuses on a variety of aspects of this function—strategy development, organization, procedures, supplier selection, negotiations, buyer-supplier relationship management, quantity, quality, timeliness, and cost/price considerations for the purchase of goods and services.

SCHM 3308. Supply Chain Analytics. 4 Hours.

Examines state-of-the-art in analytics capabilities and how they drive supply chains, from marketing to sourcing. Examines how organizations use analytics to meet their strategic objectives, provide value to the business, and make decisions. Offers students an opportunity to develop strategic supply chain decision-making skills using the latest analytics capabilities as an enabler. Focuses heavily on industry best practices, including looking at some of the leading companies.

SCHM 3310. Logistics and Transportation Management. 4 Hours.

Examines the logistics and transportation operations, including the structure, challenges, and potential of the major modes of domestic transportation. Focuses on the interaction between logistics providers and shippers in the marketplace. Explores the major dynamics of the logistics marketplace and their impact on supply chain management. Seeks to provide students with a managerial perspective on controlling what is typically the most expensive component of supply chain management, transportation expenditures.

SCHM 3315. Managing Healthcare Operations and Supply Chain. 4 Hours.

Focuses on concepts and topics related to the design and management of healthcare sector operations and supply chain. Offers students an opportunity to learn about practices and strategies for effective management of operations and supply chain in healthcare organizations, including management of inventory, operations processes, capacity, procurement, logistics, IT systems, and attendant relationships, as well as various optimization tools and techniques.

SCHM 3320. Demand Planning and Forecasting. 4 Hours.

Offers a practical introduction to demand (sales) planning and forecasting for business students. Focuses on the organizational processes in managing demand as well as generating a forecast, regression analysis, exponential smoothing, time-series analysis, judgmental forecasting methods, and evaluation of forecast quality. Uses real-life data and various software packages to illustrate basic concepts.

SCHM 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

SCHM 4401. Advanced Problems in Supply Chain Management. 4 Hours.

Identifies and examines important issues that are of strategic importance to executives involved in supply chain management. Emphasizes the decision-making processes and tools employed by those executives in the context of corporate strategic management. While case studies are extensively employed, there is an important independent research component to the course, and research findings are discussed with the class and shared through presentations. Also involves companies and executives from supply chain service providers.

SCHM 4970. Junior/Senior Honors Project 1. 4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student's major field. Combined with Junior/Senior Project 2 or college-defined equivalent for 8 credit honors project. May be repeated without limit.

SCHM 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

SCHM 4993. Independent Study. 1-4 Hours.

Allows students who have received approval to undertake independent study in lieu of any course required in the various concentrations. Students present proposals to an Independent Studies Committee for evaluation and approval. Every proposal requires a detailed outline of the objectives and plan of study and must be accompanied by a supporting statement from the supervising faculty member under whose direction the study takes place. A copy of the final report prepared by the student is presented to the appropriate Independent Studies Committee. Further information about the Independent Studies Program can be obtained from concentration coordinators. May be repeated without limit.

SCHM 6200. Supply Chain and Operations Management. 4 Hours.

Focuses on integrative management of the flow of goods, services, and related information from product development, sourcing and procurement, production operations and control, logistics management, and attendant management of relationships between firms through delivery to end consumer. Offers students an opportunity to gain foundational knowledge on supply chain and operations management concepts and techniques.

SCHM 6201. Operations and Supply Chain Management. 3 Hours.

Focuses on the integrative management of processes and activities involved in transformation and delivery of goods and services. Offers students an opportunity to obtain foundational knowledge on operations and supply chain management concepts, techniques, and functions. Topics covered include sourcing and procurement, manufacturing and service operations, process design and control, quality management, capacity planning, demand planning and forecasting, inventory management, transportation and distribution management, interfirm relationship management, and attendant information flows.

SCHM 6211. Logistics and Transportation Management. 3 Hours.

Examines the logistics and transportation operations, including the structure, challenges, and potential of the major modes of domestic transportation. Focuses on the interaction between logistics providers and shippers in the marketplace. Explores the major dynamics of the logistics marketplace and their impact on supply chain management. Offers students a managerial perspective on controlling what is typically the most expensive component of supply chain management, transportation expenditures.

SCHM 6213. Global Supply Chain Strategy. 3 Hours.

Focuses on the managerial activities of those involved in supply chain management operations and planning for companies involved in international commerce. Analyzes contemporary issues that affect the design of international supply chain systems and strategies, including sourcing, logistics, transactions, risk, and ethical considerations. Examines the current status and future prospects of the modes of international logistics operations as well as international trade and development issues, not only from the corporate perspective but also in terms of government policy.

SCHM 6214. Sourcing and Procurement. 3 Hours.

Addresses the strategic and operational role of sourcing and procurement and its impact on the supply chain as it relates to the entire organization. The selection, contracting, development, and monitoring/ managing of the right supplier in the right location is more often a source of competitive advantage and a major contributor to a company's bottom line. Focuses on a variety of aspects of this function—strategy development, organization, procedures, supplier selection, negotiations, buyer-supplier relationship management, quantity, quality, timeliness, and cost/price considerations for the purchase of goods and services. Emphasizes the perspective of the sourcing and procurement manager. The key questions addressed in this course are: What does the manager need to know to be effective? How do they apply key concepts?.

SCHM 6215. Supply Chain Analytics. 3 Hours.

Designed to develop strategic decision-making skills using the latest analytics capabilities and enabler. Examines the state of the art in analytics capabilities and how these drive supply chains, from marketing to sourcing. Also examines how organizations use analytics to meet their strategic objectives, provide value to the business, and make decisions. Focuses on industry best practices, including studying some of the leading companies.

SCHM 6221. Sustainability and Supply Chain Management. 3 Hours.

Focuses on how to create sustainable supply chains that profitably yield high-quality, safe products without supply interruption while creating a net benefit for the employees, community, and the environment. Studies how companies measure environmental performance and use the data to motivate associates, suppliers, customers, policy makers, and the public. Also addresses the impacts of global sustainability frameworks and measures.

SCHM 6223. Managing Healthcare Supply Chain Operations. 3 Hours.

Examines concepts and topics related to the design and management of supply chain operations in the healthcare sector. Focuses on activities and functions such as inventory control, order fulfillment, logistics, procurement, managing processes, relationship management, and information technology systems. Introduces various tools and techniques that enhance effective supply chain operations in healthcare organizations.

SCHM 6224. Demand Planning and Forecasting. 3 Hours.

Offers a practical introduction to demand (sales) forecasting for business students. Focuses on the organizational processes in generating a forecast, regression analysis, exponential smoothing, time-series analysis, judgmental forecasting methods, and evaluation of forecast quality. Uses real-life data and various software packages to illustrate basic concepts.

SCHM 6318. Managing Operations and the Supply Chain. 2 Hours.

Focuses on the integrative management of processes and activities involved in transformation and delivery of goods and services. Emphasizes foundational knowledge on supply chain and operations management concepts, techniques, and functions. Topics covered include sourcing and procurement, manufacturing and service operations, logistics management, process design and control, inventory management, interfirm relationship management, and attendant information flows.

SCHM 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

SCHM 7976. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on chosen topics. May be repeated without limit.

Sustainable Building Systems (SBSY)

Search SBSY Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=SBSY>)

SBSY 5100. Sustainable Design and Technologies in Construction. 4 Hours.

Covers theory of sustainability and green building procedures; sustainable design and construction practices; use of appropriate materials and systems with low environmental impact for creating energy-efficient buildings; green construction practices, including reducing pollution, emissions, and construction waste; and U.S. Green Building Council's LEED rating system. May be helpful to students preparing for the LEED Green Associate examination.

SBSY 5200. Sustainable Engineering Systems for Buildings. 4 Hours.

Focuses on basic design and construction of mechanical/electrical/plumbing (MEP) systems in buildings. Covers MEP documentation, plumbing water supply, HVAC systems, electrical power supply and distribution, lighting systems, low-voltage electrical systems, and estimating and planning for these specialty areas. Also addresses sustainable design and construction practices for MEP, including minimization of energy consumption and carbon footprint.

SBSY 5300. Information Systems for Integrated Project Delivery. 4 Hours.

Focuses on new software systems for increasing efficiency of project delivery and facilitating design and construction integration through the use of BIM (Building Information Modeling) and related technologies. Exposes students to various software systems, including hands-on cases of BIM use, 4D (construction drawings linked to schedule) modeling, and 5D models (4D + cost). Covers the impact of new technology on project delivery, including owner's perspective, advantages, and disadvantages. Also covers use and background of common industry systems to apply BIM concepts to construction projects.

SBSY 5400. Sustainable Building Systems Seminar. 0 Hours.

Features prominent speakers from the sustainable building design and construction industry to showcase new building technologies, tools, and projects and to discuss national and international trends in the industry. Offers students an opportunity to meet innovators and key players advancing the field of sustainable building systems. May be repeated without limit.

SBSY 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

Sustainable Urban Environments (SUEN)

Search SUEN Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=SUEN>)

SUEN 6110. Graduate Studio 1: Sustainable Urban Sites. 6 Hours.

Offers a studio-based graduate-level introduction to design and management of sustainable urban sites. Core topics include fundamental site analysis, formal organization, spatial definition, and site operations. Emphasizes the contextual, programmatic, performative, aesthetic, and experiential aspects of waterfront and brownfield revitalization, with a focus on urban and landscape ecology best management practices (BMPs). Key tools and media are introduced and practiced in increasingly complex applications, including basic drawing, modeling, and design software.

SUEN 6120. Graduate Studio 2: Sustainable Urban Systems. 6 Hours.

Offers a graduate-level studio following SUEN 6110 and introducing fundamental landscape planning, design, and strategic management of environmental infrastructures at the urban and regional scale. Core topics include the spatial and operational role in the built landscape of living systems—such as constructed wetlands, urban forests, urban wilds, and managed habitats—and their dynamic relationship to recreation, transit, food, housing, and industrial networks. Emphasizes the integration of constructed ecologies into the cultural landscape around issues of environmental justice. Continues the introduction of key tools and media from SUEN 6110, including advanced digital drawing, modeling, and design communication.

SUEN 6210. Implementation and Visualization for Urban Environments 1. 4 Hours.

Offers an intensive introduction to site analysis and manipulation of earthworks, water, and vegetation, with a focus on disturbance regimes within waterfront and brownfield zones. Core topics emphasize the ecological services promoted by the urban environment, including urban soil structure; contouring the urban surface; regional plant communities; and storm water, surge, and tidal flux management. Supports development of implementation skills by training in vector, raster, and 3D modeling software. Constitutes the first half of a two-part sequence and provides the foundation for SUEN 6220.

SUEN 6220. Implementation and Visualization for Urban Environments 2. 4 Hours.

Constitutes the second half of a two-part sequence and builds upon material in SUEN 6210. Core topics include an introduction to regional landscape ecology in urbanized watersheds. Focuses on landscape-scale systems and soft infrastructure. Introduces GIS and geo-design software as a lens to learn about and visualize change in regional environments. Offers students an opportunity to advance landscape analysis and visualization skills through further training in vector, raster, and 3D modeling software.

SUEN 6310. Cities, Nature, and Design in Contemporary History and Theory. 4 Hours.

Offers a lecture course presenting a historical overview of evolving cultural, environmental, and technological influences on societal attitudes toward the relationship of cities, nature, and design. Core topics include the emergence of critical theories, aesthetic philosophies, and design typologies in the modern era of industrialization and the subsequent impact of information, participation, and globalization trends on twenty-first-century-designed urban environments.

SUEN 6340. Topics in Urban Environmental Design. 4 Hours.

Offers a lecture- and discussion-based course focusing on research themes relevant to the MDes-SUEN graduate program curriculum. Topics are developed based upon instructor's research relative to particular urban, ecological, sociological, landscape architectural, or technical subjects. Exposes students to cutting-edge methods of research and practice in designed urban environments. May be repeated up to two times.

SUEN 6964. Co-op Work Experience. 0 Hours.

Offers eligible students an opportunity for work experience. May be repeated up to two times.

SUEN 7130. Master's Research Studio: Design and the Resilient City. 6 Hours.

Offers an advanced graduate studio focusing on contemporary landscape and urbanism research strategies. Themes include ecological, economic, and social resiliency in urban environments. Offers students an opportunity to formulate original approaches to design research. Uses integrated analysis, visualization, and conceptualization skills to progress through group and individual exercises with a focus on design thinking for climate change, water rise, public health and security, and other issues of global relevance. Requires the formulation of a design thesis for resilient urban environments, presented and defended in written, oral, and digital formats, which provides the basis for development of individual design proposals in SUEN 7140. Requires permission of the Urban Landscape program for students without a BARCH, BLA, MARCH, MCP, MLA, MRP, MUD, or equivalent. May be repeated once.

SUEN 7140. Master's Research Studio: Master's Project. 6 Hours.

Constitutes the second half of the Master's Research Studio sequence. Using the design thesis established in SUEN 7130, offers students an opportunity to formulate proposals for intervention into a specific urbanized environment. Individual projects progress with instructor guidance from schematic phasing through design development, with a focus on change management and vitalization of the ecologic, economic, social, and aesthetic facets of contemporary cities and regions. Requires individual presentation and defense of master's projects in written, oral, and digital formats. May be repeated once.

SUEN 7230. Urban Ecologies and Technologies 1. 4 Hours.

Offers a workshop-based course as the first in a two-part sequence. Lectures, in-class exercises, and site-based investigation use case-study methods to document ecotechnologies operating in the built environment, with a focus on design and implementation metrics, material life cycle management, funding models, and aesthetic and cultural aspects. Potential topics include green roofs, green walls, bioswales, pervious pavements, constructed wetlands, "complete streets" elements, geosensor networks, alternative waste management, water detention and energy generation methods, and living infrastructure for coastal environments.

SUEN 7240. Urban Ecologies and Technologies 2. 4 Hours.

Offers a community outreach course as the second in a two-part sequence and builds upon SUEN 7230. The core theme is development of innovative, market-based ecotechnology prototypes for the urban landscape that contribute to the environmental and cultural life of the city. With instructor guidance, offers students an opportunity to identify a potential ecotechnology project to design through engagement with community members, public, or institutional clients. The course outcome includes site documentation; a schematic design proposal produced by students working in groups; and, if appropriate in terms of time, budget, and scale, implementation.

SUEN 7320. Pro-Seminar: Issues in Designed Urban Environments. 4 Hours.

Offers an advanced graduate seminar examining the forces shaping designed urban environments in contemporary global culture. A diverse range of material from published design criticism to open source social media engagement provides basis for discussion and written and oral presentations. Course themes determined by the instructor parallel the studio sequence SUEN 7130 and SUEN 7140, although discussion topics are broadly presented to engage graduate students from any background. May be repeated up to three times.

SUEN 7978. Independent Study. 1-6 Hours.

Offers independent work under the direction of members of the department and/or interdisciplinary faculty. Course content is defined and approved by instructor. May be repeated up to 11 times for up to 12 total credits.

Swahili (SWHL)

Search SWHL Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=SWHL>)

SWHL 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

SWHL 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

SWHL 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

SWHL 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

Technical Communications - CPS (TCC)

Search TCC Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=TCC>)

TCC 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

TCC 2200. Introduction to Technical Writing. 3 Hours.

Presents the elements of technical writing: performing audience analysis, conducting content-focused research, planning and structuring content, and designing documents/media for targeted audiences. Applies the output of content development, the results of information-gathering techniques, and the structure of content to a variety of media such as printed and electronic documents, Web content, and instructional materials. Offers students an opportunity to practice organizing, designing, researching, authenticating, formatting, writing, and editing content used in a variety of technical documents/media and for a variety of technical/nontechnical audiences; to examine a variety of technical documentation/media types; and to describe objects, mechanisms, or processes.

TCC 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

TCC 3200. Digital and Social Communication Technologies. 3 Hours.

Identifies and examines social media monitoring tools, language translation systems, document storage technologies, and content and learning management systems. Examines Internet (Web) delivery systems and describes social media platforms. Explores usability issues, digital file management fundamentals, and digital file naming systems. Offers students an opportunity to perform basic Web-oriented coding (HTML+); to describe the Web and the role of social media; to compare and contrast major Web technologies, content, and learning management systems; and to explore usability issues.

TCC 3210. Technical Editing. 3 Hours.

Examines the role of the technical editor in business, industry, the sciences, and within organizations. Identifies technical editorial techniques: proofreading, correcting grammar and syntax, correcting spelling, and researching technical terms and methods available for the analysis and critique of manuscripts/media. Describes working with authors, technical writers, and subject-matter experts (SMEs) such as scientists and engineers. Offers students an opportunity to practice technical editing skills, project editing, creating a consistent look and feel to documents/media, revising and rebuilding projects, working collaboratively, and presenting edits and corrections.

TCC 3220. Technical Promotional Writing. 3 Hours.

Explores the structure, style, and graphic presentation of technical content as rendered through promotional data sheets, brochures, and online advertisements for technical products and services. Describes the process of combining subject-matter knowledge and copywriting skills to design, develop, and produce professional-quality technical documents/media such as brochures, articles, product catalogs, demonstration kits, slide presentations, and Web pages. Offers students an opportunity to create technical writing content that persuades, such as election flyers and trade-show handouts; to examine and correct inaccurate and vague content descriptions, such as MSDS fact sheets and data analysis discussions; and to produce effective, persuasive written content, such as research laboratory annual reports and public policy news releases.

TCC 3230. Writing for the Biotechnology and Pharmaceutical Industries. 3 Hours.

Describes the content development process as it pertains to biosciences and pharmaceutical industries. Defines writing styles and document/media preparation appropriate for these industries. Explores the formal review cycle and then defines a formal review process. Explores bioethics, confidentiality policies, the need for quantification, and the detailed authenticating and referencing of source material. Offers students an opportunity to use corporate models and examples chosen from marketing, research, and sales for various technical documents/media such as abstracts, patient handouts, inserts and labels, and Web pages; to prepare medical data and research results for publication; to practice writing introductions, methods, and results; to create abstracts and summaries; and to participate in a peer-review process.

TCC 3240. Proposal and Grant Writing. 3 Hours.

Identifies techniques of effective argument and persuasive writing relative to proposal development. Compares and contrasts the various types of proposals generated by both nonprofits and industry and describes the importance of performing detailed audience analysis and researching funding opportunities. Lists and examines the elements of most proposals: cover letter, abstract/executive summary, needs statement, goals and objectives, project design, project evaluation, team members, budget, and time frame. Offers students an opportunity to prepare the elements of a proposal; to execute a step-by-step analysis of a request for proposal (RFP) or bid set; to create and then peer-review a mock proposal in a simulated situation through role-playing and participation on a proposal project team; and to execute collaborative writing assignments.

TCC 3450. Writing for the Web. 3 Hours.

Compares and contrasts how readers/viewers scan rather than read Web pages and why Web writing differs from traditional text/prose writing. Describes writing styles and how to structure information for the Web. Defines human factors and how they affect writing for the Web. Describes Web navigation and labeling, examines visualization concepts and theory, and presents the processes of evaluation and usability testing. This writing-intensive course offers students an opportunity both for hands-on laboratory-type experiences through planning, designing, building, and testing Web sites and for collaborative work with classmates.

TCC 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

TCC 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

TCC 6100. Introduction to Technical and Professional Writing. 4 Hours.

Introduces the basic principles of organizing, creating, and writing technical content. Reviews technical conventions such as headings, styles, and tone. Discusses the presentation of technical information to various audiences, including differences in prose style depending upon the audience. For example, reviews the differences in writing content for proposals, white papers, marketing, and end-user documentation. Emphasizes the concepts and skills for preparing content for technical manuals.

TCC 6102. Editing Technical Content. 4 Hours.

Introduces the practice of technical editing. Offers students an opportunity to learn the levels of editing, including developmental, technical, and copy editing. Other topics include the editor's role in the publication cycle, the editor's role within a technical publications department, working with writers in the department, and the creation and uses of style guides. The role of the editor in the online medium sometimes blurs distinctions between design, content, technical, and marketing, and this is assessed in the context of the evolving role of editing online content. Other issues discussed include word choice, consistency, and sentence structure. Uses weekly assignments to assist students to understand and master technical editing principles.

TCC 6110. Information Architecture. 4 Hours.

Introduces concepts important to the design of information architecture. Central to the course is an understanding of user-centered design principles. User-centered design requires that the information designer incorporate the end user into the design process. Offers students an opportunity to analyze and describe the design of an existing information appliance and then move on to the analysis of the design of an information architecture. Finally, students submit their own plans for an information architecture accompanied by a contextualizing document that describes the audience and circumstances for the use of the design.

TCC 6120. Usability and User Experience. 4 Hours.

Introduces and examines theories and practical application of research, evaluation, and design of information products, systems, user interfaces, and the wider user experience. Incorporates the user-centered design (UCD) process as the primary methodology. Reviews numerous usability methods in-depth, including usability testing; heuristic and expert evaluation; prototyping; user research (including surveys, user interviews, and the role of ethnography in this field); and the emerging methods in the field. Concludes with a look into the possible futures of usability.

TCC 6150. Writing Portfolio. 2 Hours.

Offers students an opportunity to complete a professional writing portfolio. Students are guided through critically evaluating their existing work and how best to present their work in a portfolio. Includes information regarding portfolio design, content, and delivery.

TCC 6200. Ethics in Technical Communication. 4 Hours.

Focuses on introducing students to definitions and philosophies of ethics as they pertain to technical communication. Examines both hypothetical and real-world scenarios encountered by technical communicators. Often, technical communicators face ethical dilemmas in creating technical documents, ranging from legal and confidentiality issues to honesty and conflicting cultural values. Offers students an opportunity to explore and analyze ethical decision-making scenarios and make recommendations for action on both personal and managerial levels.

TCC 6400. Structured Documentation. 4 Hours.

Introduces the process of analyzing, organizing, and presenting information using techniques for structuring and authoring data.

Presents information types, presentation methods, XML, DTDs, and the principles of structured writing. Offers students an opportunity to use what they learn to design and generate documents that can be easily and efficiently assembled, published, and delivered to the intended audience.

TCC 6410. Online Documentation. 4 Hours.

Introduces students to the types of online documentation written by technical writers, including help messages, online reference guides, and tutorials. Discussions and demonstrations cover the techniques as well as the principles of online documentation design, production, and evaluation, with emphasis on current technologies and software.

TCC 6420. Information Design for the Web. 4 Hours.

Introduces students to the skills necessary for Web-based information design. Topics include basic Web concepts, creating text-based Web pages, working with Web graphics, building usable navigation, building page templates, using cascading style sheets, authoring for the Web, designing a Web site, and multimedia considerations. Offers students an opportunity to code their own Web pages, critique existing Web sites, structure information for online presentation, and create a complete stand-alone Web site.

TCC 6430. Writing for the Computer Industry. 4 Hours.

Introduces students to writing and editing professional-quality computer user documentation. Focuses on techniques for creating usable documentation, including attention to text organization and visual elements. Offers students an opportunity to design and write a computer user manual and collateral technical documents, given a functional specification and software developed from that specification. To simulate a common work environment, class members may sometimes work in project teams.

TCC 6440. Advanced Writing for the Computer Industry. 4 Hours.

Seeks to prepare students to work as writers in the computer industry by building on fundamental skills in producing user documentation. Offers students an opportunity to use single-source techniques to create a variety of computer documentation pieces for technical audiences. Rather than doing a complete, hard-copy computer user manual, students focus on techniques for developing an information base and using that base to create different types of software documentation for different audiences. Topics include analyzing the needs of highly technical audiences, developing strategies for different types of documents (including specifications, reference manuals, and white papers), honing writing techniques (including single-sourcing, writing for impaired audiences, and internationalization/localization), working with engineering and marketing, and building a long-term career in the computer industry.

TCC 6450. Managing Technical Publications. 4 Hours.

Investigates how to manage and facilitate teams and groups within the work environment. Focuses on such topics as perception, personality, conflict, and negotiating. Covers assessing the need for change and its impact on an organization, as well as understanding and managing resistance to change. Uses lectures, case studies, and group work to assist students to better understand management roles and requirements.

TCC 6470. Web Accessibility for Technical Communicators. 4 Hours.

Examines the key principles of Web accessibility and how it relates to documentation and content from the user's perspective. Making Web content and information available to the widest possible audience is important from a legal standpoint but also from a business standpoint. Covers accessibility concepts and universal design as well as the methods people use to access Web content. Discusses rules, standards, and guidelines and how they relate to accessible content. Also touches on the relationship between usability and accessibility.

TCC 6480. Instructional Design for Technical Communicators. 4 Hours.

Focuses on the concepts and overview of instructional design for technical writers. Offers students an opportunity to analyze, design, and develop relevant and useful content for an intended audience, with a particular focus on materials with technical content. Course goals include building a foundation and conceptual framework surrounding the instructional design process. Emphasizes instructional strategies and skills to facilitate adult learning. Additional topics include determining the needs of the learner, techniques for stimulating and sustaining learner motivation, developing learning materials, using multimedia, and how to reinforce learning.

TCC 6490. Usability Testing for Technical Communicators. 4 Hours.

Introduces and examines how to plan, create, run, and facilitate usability testing based on best practices and known testing methodologies. These concepts and methodologies can be used to test products, services, websites, and documentation. Includes an overview of how to construct a usability test, recruit participants, facilitate test sessions, analyze results, and report findings. Emphasizes the emerging use of remote and mobile usability testing.

TCC 6495. Document Design. 2 Hours.

Covers both the principles of document design and the practical skill of using Microsoft Word (Windows and Mac). Explores basic text and paragraph formatting as well as more advanced topics such as page layout, creating styles, using themes, and editing/inserting graphics. Class assignments apply the techniques studied to actual documents. Discussions are an integral part of the course that broaden the classroom experience with issues designed to expand technical communication knowledge. Offers students an opportunity to learn how to solve documentation challenges—creating documents, revising existing documents, or converting older versions to newer versions.

TCC 6610. Prototyping. 2 Hours.

Covers the fundamental principles and methods of prototyping. A prototype is a vehicle that represents a design of something, such as a traditional user interface, a document, or a Web site. Discusses several of the most common methods used by content specialists. Investigates the uses and effectiveness of low-, medium-, and high-fidelity levels of prototyping methods. Reviews sketching, paper prototyping, and the most common prototyping software packages. A significant portion of the course involves collaboration and practical hands-on experience in the creation and iteration of various prototypes.

TCC 6620. Collecting User Data. 2 Hours.

Presents the different methods employed by content specialists to obtain feedback from users. Emphasizes understanding which data collection method is optimal for a particular context, environment, and information need. Focuses on different types of user groups and how they affect the way data collection is undertaken and completed. Also addresses data analysis, which is often the most challenging part of the process. Covers aspects of privacy and ethics, within the context of usability testing, and the Personally Identifiable Information (PII) Law in Massachusetts. Discusses the core methods of the basics of Web analytics, writing and administering surveys, and how to perform successful interviews.

TCC 6630. Introduction to XML. 2 Hours.

Presents an overview of the Extensible Markup Language (XML). In content-heavy technical communication workplaces, using structured XML content allows authors to produce consistent documentation. Offers students an opportunity to understand the basics of XML—including XML rules and syntax, structuring data with XML, and validating data with Document Type Definitions (DTDs) and schemas—and ample practice with XML. Also covers using cascading style sheets (CSS) and Extensible Stylesheet Language Transformations (XSLT).

TCC 6640. Wiki-Based Documentation. 2 Hours.

Offers students an opportunity to create their own wiki-based documentation project. Using wikis for writing technical documentation has been popular with open-source applications for many years. Today, wikis are increasingly being used by both nonprofit and commercial enterprises for their documentation needs. Students are expected to set up and edit their own personal wiki space as well as to collaborate with others to help develop their wiki pages. Also touches upon effective wiki design, usability, modular documentation, and collaborative writing and editing as part of understanding the best practices associated with creating wiki-based documentation.

TCC 6710. Content Strategy. 4 Hours.

Examines the emerging discipline of content strategy and its critical role and impact on design, creation, distribution, and governance of an organization's content. Explores a variety of issues relating to the life cycle of an organization's content, including strategy, audits, the role of legacy content, content migration, and content management systems (CMS). Reviews the role that staff, technical resources, and constraints play within content strategy and discusses the future role of content strategy within a variety of organizations.

TCC 6850. Technical Communications Capstone Project. 4 Hours.

Offers students an opportunity to use classroom learning to produce a final project, such as a technical manual, online help system, or Web-based assistance product. Offers practical advice and guidance on how to function effectively within the technical publications work environment. Seeks to prepare students for as many realistic situations as possible in the work environment, including how to deal with difficult people and situations. Reviews the most current research and trends in the profession. Students work both individually and within groups on various assignments and projects.

TCC 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

TCC 7983. Topics. 1-4 Hours.

Covers special topics in technical communications. May be repeated without limit.

TCC 7995. Project. 1-4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student's major field. May be repeated without limit.

Technology Commercialization - CPS (TCM)

Search TCM Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=TCM>)

TCM 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

Telecommunication Systems (TELE)

Search TELE Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=TELE>)

TELE 5330. Data Networking. 4 Hours.

Provides the basics of data networking protocols and architectures. Topics include protocol architecture of the internet; application protocols such as FTP, SMTP and HTTP, web caching, DNS, CDNs, and P2P applications; use of TCP and UDP socket programming to develop network applications in Python; transport protocols, including TCP, UDP, and TCP congestion control; IP protocol, addressing, IPv4 and v6, NATs, ICMP, and tunnels; routing algorithms and OSPF; data link protocols, encoding, framing, error control, and PPP; switched LANs, ARP, Ethernet, and VLANs; wireless LANs and 802.11 protocols; and network security—encryption, message integrity, authentication protocols, key management, SSL/TLS, IPsec, and 802.11i.

TELE 5331. Lab for TELE 5330. 0 Hours.

Addresses a range of networking components, including routers, switches, and Linux servers, and how they are configured to create a virtual environment. Covers the installation and configuration of networking concepts such as DNS, DHCP, and firewalls and the creation of virtual environments. Requires students, working in teams, to configure one or more components; the teams then must interconnect the components to form a small network. In the process of configuration and integration, students are exposed to troubleshooting at various protocol layers and have an opportunity to become familiarized with different operating systems and networking tools.

TELE 5340. Telecommunications Public Policy and Business Management. 4 Hours.

Introduces students to business management issues, such as basic accounting, finance, marketing, and operations in the telecommunications field, and also topics such as the time value of money and decision making. Also includes issues of human relations, organizational behavior, and business strategy. Provides an understanding of the regulatory environment of the telecommunications industry. Topics include universal service, service quality tariffs, the Modified Final Judgment and Telecom Act of 1996, market restrictions and segmentation, the current competitive environment in the United States and internationally, interconnection including unbundling, collocation, economic issues, and global trends in market reform.

TELE 5350. Telecom and Network Infrastructure. 4 Hours.

Provides in-depth treatment of the wireline and wireless infrastructure of the network supporting all telecommunication, internet, and enterprise applications. Covers the basics of communications—source coding, baseband and broadband modulation and transmission, channel coding, spread-spectrum, multiuser radio communications, radio link analysis, and propagation. Also covers the wireline core network—digital and optical transmission, framing, network synchronization, asynchronous and synchronous multiplexing, cross connects, SONET/SDH, DWDM, OTN, protection switching, and network availability. Addresses wireline (DSL, digital cable, FTTx, PONs) and wireless access (cellular, Wi-Fi), frequency reuse, and handoff. Also addresses support of data transport (switched Ethernet, VLAN, IP, MPLS) and application networks (PSTN, mobile core, internet, IPTV, and virtual networks).

TELE 5360. Internet Protocols and Architecture. 4 Hours.

Offers in-depth treatment of protocols used in the internet, wireless access, and enterprise networks. Topics include protocols for network layer QoS (including DiffServ, ECN, RSVP, MPLS); protocols for security, including both access control and network-level security (e.g., X.509, SSL/TLS, IPsec, IKE, EAP); protocols for interdomain routing (BGP); protocols to support multicast, broadcast, and streaming applications; protocols to support host mobility, large server deployments, content distribution, and enterprise networks (VLANs, etc); and protocols to support IPv6 (e.g., address assignment) and its interoperability with IPv4. Also covers network design architectures for cloud computing, data centers, content distribution, layer-2 networks, etc. Discusses general scaling issues for large networks.

TELE 5600. Linux/UNIX Systems Management for Network Engineers. 4 Hours.

Introduces UNIX/Linux in a networking/Internet environment. Covers operating system concepts, tools, and utilities; networking and security issues; and data and text processing using scripts and filters. Addresses basic administrative tasks such as managing users, file systems, security, and software. Covers networking topics such as network configuration, daemon processes, SSH, DNS, DHCP, diagnostic tools, and the use of scripts and automation to manage applications and systems, as well as security topics such as name and authentication services, access control lists, file modification protections, and firewalls.

TELE 5976. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

TELE 5978. Independent Study. 1-4 Hours.

Offers work performed under individual faculty supervision. May be repeated without limit.

TELE 6100. Mobile Wireless Communications and Networking. 4 Hours.

Studies communications and networking issues in providing broadband wireless access to mobile applications. Discusses networking technologies required by converged IP-based applications. Covers converged network architectures and the interworking of different generations of access technologies with the Evolved Packet Core (EPC). Registration limited and by application only; it is expected that all students have prior knowledge of digital communications, radio propagation, cellular networks, and second-generation wireless standards.

TELE 6350. IP Telephony. 4 Hours.

Provides a comprehensive overview of IP telephony architectures and protocols, with emphasis on SIP, the Session Initiation Protocol. Topics include a review of classical circuit-switched telephony, especially signaling; a review of IP networking, especially routing and addressing; peer and master-slave protocols for IP telephony (SIP, H.323, MGCP); speech coding; the transport of real-time traffic over IP (RTP and RTCP); bandwidth control; issues in network quality of service, such as traffic modeling, dimensioning, and QoS mechanisms; IMS; messaging protocols and systems; WebRTC, browser, and API-driven telephony applications; and Unified Communications. The emphasis on SIP includes call flows, network components, and services. Focuses on execution of labs and semester-long projects to provide hands-on learning in a small team environment.

TELE 6400. Software-Defined Networking. 4 Hours.

Introduces the foundational theories and technologies of software-defined networking (SDN), a new paradigm in computer networking that allows a logically centralized software program to control the behavior of an entire physical network. Discusses SDN technologies, such as the OpenFlow specification and OpenDaylight controller, and introduces students to SDN applications and network function virtualization (NFV). Offers hands-on exposure to popular open-source software and technologies through student projects. Requires good knowledge of Java or Python.

TELE 6603. Special Topics—Networking. 1-4 Hours.

Description to come. May be repeated up to eight times.

TELE 6945. Master's Project. 4 Hours.

Offers theoretical or experimental work under individual faculty supervision.

TELE 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

TELE 6964. Co-op Work Experience. 0 Hours.

Provides eligible students with an opportunity for work experience. May be repeated without limit.

TELE 6965. Co-op Work Experience Abroad. 0 Hours.

Provides eligible students with an opportunity for work experience abroad. May be repeated without limit.

Theatre (THTR)

Search THTR Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=THTR>)

THTR 1000. Theatre at Northeastern. 1 Hour.

Introduces new students to the communities and procedures of Northeastern University; the College of Arts, Media and Design; and the Department of Theatre. Offers insights into the study of the liberal arts in general and the creative facets of theatre study, including the rehearsal and production process. Emphasizes the departmental values of generosity, respect, and rigor and seeks to familiarize students with the arts and culture of Greater Boston.

THTR 1100. Production Experience 1. 1 Hour.

Offers lab practice in technical production. May be repeated once.

THTR 1101. Introduction to Theatre. 4 Hours.

Reveals the dynamic world of theatre by exploring the artistry, ideas, and techniques of actors, designers, directors, and playwrights. Goes behind the scenes in the study of theory and literature with both in-depth discussions and in-class performances. Includes a survey of significant movements in theatre history and analysis of diverse plays from contemporary drama. No theatre experience required.

THTR 1120. Acting 1. 4 Hours.

Focuses on the development of fundamental performance techniques and various significant acting methodologies needed by an actor to develop stage presence, strengthen the imagination, and increase freedom of expression. Studies, analyzes, and interprets contemporary texts through the performance of monologues and scenes.

THTR 1125. Improvisation. 4 Hours.

Introduces theatre improvisation principles through games, exercises, and readings. Offers a playful and rigorous environment for students to respond to unexpected situations with confidence and agility. In this experiential studio course, students participate in group and individual exercises that explore and practice creative impulses, adaptability, risk taking, intuition, and teamwork. Culminates in a self-reflection paper.

THTR 1130. Introduction to Acting. 4 Hours.

Introduces techniques that awaken the creative mind, body, and spirit of the actor. Through theatre games and voice/movement exercises, offers students an opportunity to explore and develop skills used by actors in preparation for a role. Students rehearse and perform scenes from contemporary plays. Designed for nontheatre majors; previous stage experience welcome but not required.

THTR 1131. Technical Theatre 1. 4 Hours.

Surveys the technical and stagecraft skills that are essential knowledge for all theatre professionals. Offers students an opportunity to develop a hands-on understanding of the areas of scenery and costume construction, production management, stage management, sound engineering, and lighting. Covers the practical skills needed to participate in the creation, evaluation, and revision of a theatrical production in this laboratory-based course through participation in crew work for department productions. No previous theatre experience is required.

THTR 1150. Dance Performance and History: Modern to Hip Hop. 4 Hours.

Explores dance as both performance and history, practice, and theory. Examines the ways in which diverse dance genres—such as modern, jazz, American ballet, African-American, and hip-hop—embody ideas about culture, politics, race, and gender. Offers students an opportunity to rehearse and perform dance techniques of various styles and by significant choreographers. Includes research and writing assignments.

THTR 1160. The Professional Voice. 4 Hours.

Offers students across disciplines an opportunity to obtain techniques to enhance the quality of the spoken voice and improve clarity of expression in both professional and interpersonal interactions. Offers methods to release tensions that inhibit the clear communication of thoughts and ideas. Focuses on physical and vocal exercises drawn from acting technique and the direct application of these skills to various texts. Includes regular vocal exercises outside of class, readings, and self-reflection in writing. Requires proficiency in spoken English.

THTR 1170. The Eloquent Presenter. 1 Hour.

Designed to help students to enhance the effectiveness with which they present themselves in front of an audience. Uses the application of theatre training exercises and practical tools to offer students an opportunity to improve the quality of their spoken voice, the clarity with which they articulate their ideas, and their ability to command the attention of audiences in diverse interpersonal and professional interactions.

THTR 1215. Activism and Performance. 4 Hours.

Explores the intersection of theatre, politics, and social transformation by studying and experiencing the work of activist theatre artists in both traditional and nontraditional forms, such as docudrama, ritual, dance, street theatre, and community-generated performance. Examines the texts, theories, and practices of international theatre artists committed to ethical reasoning, social change, peace building, human rights, and community empowerment. Culminates in the creation of an original activist performance.

THTR 1220. Race, Power, and Performance. 4 Hours.

Examines race, power, and privilege in global and national contexts by analyzing plays and theatrical performances as spaces of cultural representation. Analyzes performance as a communicative process for understanding and constituting identity. Students explore how they perform their own lives and racial identities and apply those theories to contemporary drama and performance texts that are read, watched, and created.

THTR 1230. The Evolution of Fashion and Costume. 4 Hours.

Traces the evolution of fashion and costume from ancient Greece to the twenty-first century. Illustrated lectures focus on the history and meaning of clothing design and the development of style. Clothing has been used for centuries to protect, attract, and define one's identity. Examines the shifting trends of fashion for men and women within its historical, cultural, and economic contexts.

THTR 1233. 19th- and 20th-Century Fashion in Europe. 4 Hours.

Traces the evolution of fashion and costume in Europe from the beginning of the nineteenth century to the twenty-first century. Illustrated lectures focus on the history and meaning of clothing design and the development of style. Examines trends in fashion for men and women within its historical, cultural, political, and economic contexts. By studying fashion history in cities such as London and Paris, students have access to primary sources of fashion history, including paintings, sculpture, and textiles and garments from the periods being studied. Emphasizes current trends in fashion, with in-depth studies of the work of designers such as Dior, Chanel, McQueen, Westwood, Dolce & Gabbana, Versace, McCartney, and more. Taught abroad. May be repeated without limit.

THTR 1235. Fashion and Costume Design in Film and Television. 4 Hours.

Examines the role of costume and fashion design in media, from the movies of the Golden Age of Hollywood to the latest high-tech motion pictures to the most recent cable miniseries. Studies the history and social contexts of clothing in media, as well as the critical role of fashion in relation to the narrative, i.e., how it enhances the mood and propels the dramatic action of the production. Uses illustrated lectures, critical thinking and writing, and a major experiential component to focus on how/why clothing is worn, how fashion design and costume design intersect, and how we can understand the economic and cultural realities of the twentieth and twenty-first centuries through the shifting trends of fashion.

THTR 1236. Introduction to Global Fashion Studies: History, Theory, and Contemporary Practice. 4 Hours.

Offers students an overview of the most significant and relevant theories on fashion, focusing on the cultural significance of clothing and style. Examines the intersection of fashion and other areas of study including the arts, history, economics, business, sociology, and anthropology. Explores global issues of gender, race, class, identity, image, style, material culture, and sustainability. Examines how populations from several postindustrial nations think about fashion, how globalization impacts their cultures and identities, and how designers and trendsetters are emerging from the new capitals of fashion.

THTR 1237. Introduction to Global Fashion Studies Abroad: History, Theory, and Contemporary Practice. 4 Hours.

Covers the most significant and relevant theories on fashion and focuses on the cultural significance of clothing and style. Examines the intersection of fashion and other areas of study including the arts, history, economics, business, sociology, and anthropology. Explores global issues of gender, race, class, identity, image, style, material culture, and sustainability. Examines how populations from several postindustrial nations think about fashion, how globalization impacts their cultures and identities, and how designers and trendsetters are emerging from the new capitals of fashion. Taught abroad.

THTR 1240. Fashion Industry and Trend Forecasting in Europe. 4 Hours.

Examines the world of global fashion forecasting with industry professionals in European cities such as London and Paris. Studies how and why global fashion trends are designed, developed, and produced and how economic and cultural realities are revealed through the shifting trends of fashion. Recent developments in business, politics, economics, and culture all have a tremendous impact on trends in fashion. Examines the fashion industry in terms of the five basic pillars of the complex fashion system: cultures of design, production, representation, consumption, and disposal. The course includes illustrated lectures, site visits to couture fashion houses/studios, an experiential component (the global fashion trend presentation), and the development of a class blog dedicated to trends seen by the students on the streets of Europe. Taught abroad. May be repeated without limit.

THTR 1260. Movement for the Actor. 4 Hours.

Explores movement techniques that enhance the actor's expressiveness, performance energy, and body awareness. Offers students an opportunity to experience diverse movement training theories such as Suzuki, Alexander, and Laban and synthesize them in the creation of an original ensemble-based performance. Focuses on physical exercises and processes that strengthen the body; enliven the imagination; enhance concentration; and improve flexibility, balance, relaxation, and posture. Seeks to empower actors to externalize the emotional and imaginative inner experience and maximize stage presence and power. No previous movement or acting experience required.

THTR 1270. Introduction to Theatrical Design. 4 Hours.

Introduces the principles of contemporary theatrical design and how to apply the creative process to scenery, costumes, and lighting. Offers students an opportunity to discover how design concepts are developed and relate to each other through research, script analysis, color theory, and visual composition. Seeks to develop the student's capacity for collaboration and techniques for conceptualizing a play into a multidisciplinary work of art. No theatre experience required.

THTR 1500. Musical Theatre Performance 1. 4 Hours.

Explores "acting the song" through singing techniques for musical theatre in a group class setting. Drawing from Broadway classics and contemporary musicals, offers students an opportunity to develop foundational vocal performance skills through work on solos and group songs that are based in dramatic storytelling, characterization, and emotional truth. Culminates in an original musical theatre cabaret/concert presented to the public.

THTR 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

THTR 2000. Production Experience 2. 1 Hour.

Offers lab practice in rehearsal and performance for production. May be repeated once.

THTR 2242. Fashion Retailing. 4 Hours.

Introduces fashion retailing. Analyzes the different types and sizes of fashion retail operations; physical site location, including omnichannel; store layout and design; advertising and display; relation of the store to its intended target market; and store organization.

THTR 2300. Classics of Global Theatre. 4 Hours.

Offers students an opportunity to discover the rich history of the theatre from Greek tragedies to Shakespeare's celebrated masterpieces, from Japanese Noh theatre to the witty Restoration comedies of the 1800s. Explores notable plays from Medieval and Elizabethan England, the golden age of Spain, 17th-century France, and the Italian Renaissance. Includes contextual study of the evolution of theatre and the artistic contributions to Western civilization by writers such as Sophocles, Marlowe, Calderón, and Molière.

THTR 2310. History of Musical Theatre. 4 Hours.

Traces the creative evolution of the stage musical from its 19th-century origins to current Broadway hits; from popular entertainment to an important theatrical art. Offers students an opportunity to examine this unique and original art form from multiple perspectives—historical, cultural, political, and aesthetic—and to develop insights into the concepts and methods of such pioneering composers, lyricists, and theatre artists as Gilbert and Sullivan, Cole Porter, Rodgers and Hammerstein, Leonard Bernstein, and Stephen Sondheim.

THTR 2315. Rebels of Modern Drama. 4 Hours.

Investigates groundbreaking classics by modern European playwrights (1890s–1950s) such as Henrik Ibsen, Anton Chekhov, August Strindberg, George Bernard Shaw, Bertolt Brecht, and Samuel Beckett. Reveals how these social and literary rebels broke with tradition and created new forms of theatre. Examines their significant works as literature, history, and performance, as well as their relevance today. Includes written and oral analyses of plays as performances and the creation of an original play or work of visual art.

THTR 2320. Classics of 20th-Century American Drama. 4 Hours.

Examines classic works by significant American playwrights of the 20th century, such as Eugene O'Neill, Tennessee Williams, Arthur Miller, Lillian Hellman, Lorraine Hansberry, Edward Albee, Sam Shepard, and August Wilson. Explores topics such as family relationships, race, gender, economics, religion, assimilation, and identity—both personal and national. Focuses on the artistic, literary, and cultural contributions and innovations made by modern American dramatists and their relevance today.

THTR 2325. From Script to Stage. 4 Hours.

Offers students an opportunity to develop the skills and techniques used by professional theatre artists to analyze a script and awaken the essence and meaning of a play in preparation for production. Examines structure and form, characters and action, symbols and metaphors, and the historical and social context in case studies of classic and contemporary plays.

THTR 2330. Playwriting. 4 Hours.

Offers a collaborative workshop environment for developing dialogue, scenes, and one-act plays. Analyzes the dramatic techniques of modern masters as well as acclaimed contemporary playwrights. Culminates in the development of original one-act plays and a presentation of workshop scripts by professional actors.

THTR 2335. Boston Theatre Experience. 4 Hours.

Offers a comprehensive experiential survey of professional theatre today. Students attend Boston-area productions that reflect a diverse range of styles and aesthetics, with special emphasis on the creation of new plays. Through preparatory readings and lectures, combined with postplay critical assessments (oral and in writing) and interactions with theatre artists (playwrights, actors, directors), offers students an opportunity to examine and discover how to interpret the art of contemporary theatre in the United States, from fringe companies to Broadway, as audience members and aspiring artists. Requires attendance at plays outside of class time.

THTR 2340. Theatre and Society. 4 Hours.

Covers several great practitioners of theatre. Focuses on how social behavior influenced the thought and craft of playwrights, actors, directors, designers, and theorists as well as how society was influenced by drama and theatre. Emphasizes how the play's ideas are translated into performance. Uses video, discussion, and live performance, when possible, as integral elements to the course.

THTR 2342. Acting 2. 4 Hours.

Continues THTR 1120. Focuses on developing the actor's sense of truth and emotional freedom. Emphasizes creating, developing, and sustaining character and developing ensemble. Includes monologues and scenes performed for classroom analysis.

THTR 2345. Acting for the Camera. 4 Hours.

Explores the craft and methods used by actors while working in front of the camera through monologues, scenes, and group projects. Provides students with techniques to identify and free their performance energy with a foundation on relaxation and authenticity. Includes the study and analysis of acting styles in diverse genres of film and television from situation comedies to dramas. Offers students an opportunity to explore a range of on-camera skills and acting techniques and apply them in filmed final projects. Previous acting experience suggested but not required.

THTR 2346. Viewpoints. 4 Hours.

Engages actors with an innovative technique that draws upon rigorous physical training exercises and practice in the nine areas of actors' concentration known as Viewpoints. Creative improvisational sessions provide an intuitive and dynamic approach to acting. Culminates in the application of Viewpoints to new scripted works.

THTR 2360. Stage Makeup. 4 Hours.

Studies the transformational principles and practical techniques used in makeup application for theatre, television, and film. Features methods to create character and fashion makeups, including techniques for aging, fantasy creatures, and special effects. Additionally, this studio course offers an overview of makeup design used for stage and screen. Requires lab fee for supplies.

THTR 2370. Lighting Design. 4 Hours.

Examines basic principles and practices of stage lighting, including the qualities and functions of light, lighting instruments and controls, use of color and directionality, and script analysis for lighting design elements. Offers students an opportunity to develop foundational skills and practice systematic reasoning in the programming and operation of lighting computer equipment. Through group projects and individual lab work, students create and execute lighting designs. Includes work on electric crews for university productions.

THTR 2380. Costume Design. 4 Hours.

Introduces the fundamentals of costume design and the artistic roles and responsibilities of a costume designer. Working on classical and contemporary texts, students examine the creative steps of the design process, including script analysis, character development, research, and collaboration. Through lectures, discussions, and projects, students create a design concept and communicate it through language and images. Includes experience with drawing and other costume rendering techniques such as painting, collage, and Photoshop. Does not require prior art or design experience.

THTR 2385. Fashion Construction and Pattern Making. 4 Hours.

Offers students an opportunity to develop the skills and techniques necessary for creating and using basic master patterns and dress forms to create skirts, dresses, trousers, and tops. Covers basic fashion construction, flat patterning, draping, and finishing techniques.

THTR 2400. Scenic Design. 4 Hours.

Introduces the theory and practice of theatrical design and the role of the designer in the production process. Through project work, examines the use of graphics tools—line, form, balance, color, rhythm, and so on—in the development of the design idea. Emphasizes understanding and utilizing spatial relationships; visually expressing conceptual themes; and understanding the various uses, problems, and practical considerations of proscenium, thrust, and arena staging.

THTR 2500. Breaking the Glass Ceiling: Women in Theatre. 4 Hours.

Surveys a wide range of dramatic forms, gender theories, and distinct theatrical techniques used by women artists to reveal larger social issues and encourage activism. Examines how the plays' sociocultural contexts represent female playwrights' diverse views of identity as well as their cultural, ethnic, racial, and geographical experiences. Identifies how women as artistic leaders are perceived and received by society and the industry. Analyzes why the issue of gender equity in theatre remains unresolved. THTR 2500 and WMNS 2501 are cross-listed.

THTR 2600. Voice and Speech for the Actor. 4 Hours.

Seeks to enhance the quality and power of the actor's voice with a focus on the clarity, vitality, and eloquence with which they communicate themselves on stage. Following the pedagogy known as Freeing the Natural Voice, developed by Kristin Linklater, sessions provide a progression of physical and vocal exercises that free the habitual tensions and inefficiencies that block the clear communication of emotional and creative impulses. Offers students an opportunity to apply voice and speech training to diverse texts comprised of drama, poetry, and original writing. The goal is a free, healthy, confident voice that fully expresses the actor's individuality and commands the attention of an audience.

THTR 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

THTR 2991. Research in Theatre. 1-4 Hours.

Offers an opportunity to conduct introductory-level research or creative endeavors under faculty supervision.

THTR 3100. Creative Storytelling for Social Engagement. 4 Hours.

Explores the immersive learning process of creating a contemporary living newspaper play by critically examining important social issues or questions; identifying, synthesizing, applying, and revising ideas; and engaging in team-building performative activities. Explores innovative ways to address civic engagement through a culminating workshop production of a treatment for the play.

THTR 3200. Queer Theatre and Performance. 4 Hours.

Explores significant dramatic texts that have shaped and expressed the changing nature of LGBTQ identity. Readings, viewings, lectures, and discussion focus on noteworthy queer plays as literature, history, cultural documents, and performance as seen through the lens of contemporary queer theories and knowledge. Analyzing these texts for their relevance to society and our lives, students evaluate and explore a range of topics including sexual identity, gender identity, religious and political views on queerness, the evolution of LGBTQ culture and communities, drag performance, homophobia, assimilation, appropriation, and coming out. Students who do not meet course restrictions may seek permission of instructor. THTR 3200 and WMNS 3200 are cross-listed.

THTR 3300. Devised Theatre Project: Collaborative Performance. 4 Hours.

Investigates innovative and experimental methods of making an original theatre performance in which the actors are also the creators. Functioning as a collaborative ensemble training, rehearsing, and performing together, students explore performance theories and rehearsal techniques using language, movement, music, images, and autobiography to create their own performative event inspired by a central theme drawn from literature, art, politics, or history. Culminates in a world-premiere public performance.

THTR 3350. Fashion Marketing and Merchandising in Europe. 4 Hours.

Examines the fundamentals of fashion marketing and merchandising in the established fashion capital of the world, Paris. Explores how basic marketing principles govern the fashion industry. Analyzes and evaluates the role and function of day-to-day industry professionals working and succeeding in Paris through site visits; lectures with industry professionals; and visits to fashion shows, collections, and museums. Taught abroad.

THTR 3400. Designing Combat for the Stage. 4 Hours.

Develops techniques of unarmed and armed combat and employs those techniques to design and choreograph exciting fight sequences that are safe for actor combatants to perform. Offers students an opportunity to learn strategies to control time and space in a way that maximizes the power of storytelling on stage. The course culminates in students designing, developing, notating, and filming their own fight scenes and presenting and performing their violence designs to an audience. Recommended for students who have completed THTR 1260. Students who do not meet course restrictions may seek permission of instructor.

THTR 3450. Acting 3—Playing Shakespeare. 4 Hours.

Explores ways to bring the texts of Shakespeare alive onstage. Using the First Folio, the course studies structure of the verse, rhetorical devices, figures of speech, in a variety of Shakespeare's texts, including sonnets, scenes, and soliloquies. Sound and movement sequences revitalize the eloquent speaking of heightened texts and the personal connection to the characters.

THTR 3550. Directing for the Stage. 4 Hours.

Focuses on purposes and techniques of theatrical direction related to script analysis, production style, pictorial composition, rhythmic evolution, and empathic responses.

THTR 3570. Musical Theatre Performance. 4 Hours.

Applies acting technique to the performance of songs and scenes from the musical theatre canon. Offers students an opportunity to integrate acting, singing, and dancing through character development. Analyzes and interprets Broadway musical classics and contemporary musical theatre forms by artists such as Rodgers and Hammerstein, Stephen Sondheim, Jason Robert Brown, Jeanine Tesori, and Lin-Manuel Miranda. Culminates in a student showcase of solo, small ensemble, and large ensemble excerpts from musicals.

THTR 3700. Rehearsal and Production: The Art of Collaboration. 4 Hours.

Offers students an opportunity to experience the process of making imaginative, innovative theatre by collaborating on a theatre department production. Based on auditions, experience, skills, and interest, students rehearse and perform an acting role or collaborate in areas of design, stage management, dramaturgy, or production under the direction of faculty, staff, and guest artists. Students chronicle the process in a stage journal and in a final paper, identifying creative discoveries, accomplishments, and experiences. Fulfills the experiential education requirement for theatre majors. May be repeated up to three times.

THTR 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

THTR 4100. Senior Career Seminar. 1 Hour.

Seeks to prepare theatre majors to define their personal career goals and creative ambitions and to help students devise individualized strategies to achieve them. Offers students an opportunity to survey potential career paths in areas such as acting, design, stage management, tech/production, marketing, fundraising, literary management, and education/community outreach. Examines diverse employment and organizational structures of nonprofit theatres from fringe to Broadway. Includes seminars, discussions, and conversations with faculty and theatre professionals on a range of topics such as casting/auditions, design portfolios, and professional networking. Requires senior standing; juniors admitted by special permission.

THTR 4702. Capstone Rehearsal and Performance. 4 Hours.

Requires students to research, prepare, and perform either a substantial acting role, a design assistantship, a dramaturgy, a stage-management position, or other position of responsibility for a departmental production. Also requires an intensive-writing component enabling the synthesis of the theoretical, analytical, and artistic aspects of theatre production.

THTR 4880. Special Topics: Theatre History. 1-4 Hours.

Offers opportunity for in-depth examination of a subject of particular significance to the field. May be repeated up to four times.

THTR 4970. Junior/Senior Honors Project 1. 4 Hours.

Focuses on in-depth project in which a student conducts research or produces a product related to the student's major field. Combined with Junior/Senior Project 2 or college-defined equivalent for 8-credit honors project. May be repeated without limit.

THTR 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

THTR 4992. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

THTR 4993. Independent Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

THTR 4994. Internship. 4 Hours.

Offers students an opportunity for internship work. May be repeated without limit.

Toxicology (TOXC)

Search TOXC Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=TOXC>)

TOXC 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

TOXC 6962. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

Urban Studies (URBS)

Search URBS Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=URBS>)

URBS 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

URBS 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

URBS 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

URBS 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

Women's, Gender, and Sexuality Studies (WMNS)

Search WMNS Courses using FocusSearch (<http://catalog.northeastern.edu/class-search/?subject=WMNS>)

WMNS 1101. Sex, Gender, and Popular Culture. 4 Hours.

Examines how femininities, masculinities, and different forms of sexual identity are produced and represented within popular culture. Using theories and concepts from both feminist/sexuality studies and popular culture studies, analyzes popular texts and media for their treatment of gender and sexuality and the intersection of those categories with racial and class identities. Explores the visual representation of women (and men) and analyzes how visual and textual media shape our attitudes and identities. Required reading and assignments include close readings of texts, film screenings, class discussions and activities, writing assignments, and creative projects. SOCL 1102 and WMNS 1101 are cross-listed.

WMNS 1103. Introduction to Women's, Gender, and Sexuality Studies. 4 Hours.

Offers an interdisciplinary course introducing key themes in gender and sexuality studies. Offers students an opportunity to learn core concepts that inform our understanding of how gender and sexuality are socially constructed and are experienced in everyday life. Drawing on women's studies, queer studies, masculinity studies, and allied areas, the course analyzes gender, sexuality, and other dimensions of identity; explores critical issues of gender, sex, and power; and studies gendered/sexed identities in both national and transnational contexts. Topics include the gendered conceptions of love, sexuality, and violence; biological arguments about gender and sexuality; the social construction of sexuality and gender; intersections of gender, race, class, and sexuality; masculinities and femininities; theories of sexual difference; gender and the state; and gender and popular culture.

WMNS 1104. Goddesses, Witches, Saints, and Sinners: Women in Western Religions. 4 Hours.

Introduces and examines the theory that Western religions were originally goddess centered through analyses of image, text, and ritual in the ancient world. Explores scholarship about the patriarchalization of these primal religions. Includes a consideration of scripture such as the Hebrew Bible, Greek Testament, and Qu'ran, as well as noncanonical texts. PHIL 1104 and WMNS 1104 are cross-listed.

WMNS 1225. Gender, Race, and Medicine. 4 Hours.

Examines the basic tenets of "scientific objectivity" and foundational scientific ideas about race, sex, and gender and what these have meant for marginalized groups in society, particularly when they seek medical care. Introduces feminist science theories ranging from linguistic metaphors of the immune system, to the medicalization of race, to critiques of the sexual binary. Emphasizes contemporary as well as historical moments to trace the evolution of "scientific truth" and its impact on the U.S. cultural landscape. Offers students an opportunity to develop the skills to critically question what they "know" about science and the scientific process and revisit their disciplinary training as a site for critical analysis. AFAM 1225, HIST 1225, and WMNS 1225 are cross-listed.

WMNS 1255. Sociology of the Family. 4 Hours.

Focuses on families historically and across cultures and classes. Considers changes in contemporary families in terms of gender, family composition; women's labor force participation, divorce, cohabitation, and other transformations. SOCL 1255 and WMNS 1255 are cross-listed.

WMNS 1260. Gender in a Changing Society. 4 Hours.

Considers why and how gender is socially constructed in U.S. society and looks at different theories of gender. Explores gender as an institution as well as different (cultural) expressions of masculinities and femininities. Includes topics of gender in everyday life as well as gender as an organizing principle in the institutions of families, education, workplaces, sexualities, religion, the media, politics, and forms of gender violence. SOCL 1260 and WMNS 1260 are cross-listed.

WMNS 1271. Sex in Judaism, Christianity, and Islam. 4 Hours.

Explores approaches to gender, social organization of sexuality and gender, sexual ethics, and marriage in Judaism, Christianity, and Islam. Explores various sources within each tradition that serve as normative foundations, contemporary cultural and sociological dynamics that challenge those foundations, and psychological/existential considerations for understanding the general nature of human sexuality. Addresses how these traditions understand gender and gender roles, seek to shape and control interactions between men and women, regulate sexual relations outside of and within marriage, view sexuality education, regard homosexuality, and examine historical and contemporary approaches to marriage, divorce, and parenting. PHIL 1271 and WMNS 1271 are cross-listed.

WMNS 1350. Feminist Resistance. 4 Hours.

Engages students in the study of a variety of forms of feminist resistance in recent history, emphasizing the United States in the context of cross-cultural examples. Examines key feminist texts and manifestos and studies feminist activism in coalition with other social movements. Students identify and analyze unique features of gender-based activism in itself and in its intersections with other social movements, including movements and activism focused on race, class, sexuality, and physical ability. WMNS 1350, SOCL 1350, and HIST 1350 are cross-listed.

WMNS 1990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

WMNS 2302. Gender and Sexuality: A Cross-Cultural Perspective. 4 Hours.

Examines popular and scientific notions about sex, gender relations, family, and kinship. Examines why our images of family, masculinity, and femininity are not universal by analyzing the patterns of sex roles, sexual practices, and kinship in other cultures. Discusses how and why relations between men and women change during times of socioeconomic and political change. ANTH 2302 and WMNS 2302 are cross-listed.

WMNS 2303. Gender and Reproductive Justice. 4 Hours.

Introduces the social, legal, and economic barriers to accessing reproductive healthcare domestically and internationally. Draws on various theoretical and analytic tools including critical race theory, critical legal theory, sociology of science, human rights, feminist theory, and a range of public health methods. Access to reproductive health services, including abortion, is one of the most contested political, social, cultural, and religious issues today. Covers domestic, regional, and international legal and regulatory frameworks on sexual reproductive health. HIST 2303, SOCL 2303, and WMNS 2303 are cross-listed.

WMNS 2304. Communication and Gender. 4 Hours.

Presents a theoretical and practical examination of the ways in which communication is gendered in a variety of contexts. Integrates into this analysis how different institutions and interpersonal situations affect our understanding of gender roles. COMM 2304 and WMNS 2304 are cross-listed.

WMNS 2373. Gender and Sexuality in World History. 4 Hours.

Introduces key concepts in the fields of gender and identity studies as they apply to world history since about 1800. Offers students an opportunity to understand the critical significance of gender, sex, sexuality, and identity to world events and how these contentious subjects influence the contemporary world. Surveys a series of major movements in geopolitics, labor, economics, culture, and society in order to analyze how individual and group identities, as well as mass assumptions about behavior and performance, have shaped these events. Gender, sex, and sexuality are integral to class discussions of work, welfare, art, culture, violence, war, and activism. HIST 2373 and WMNS 2373 are cross-listed.

WMNS 2451. Postcolonial Women Writers. 4 Hours.

Examines the literature and cultures of postcolonial nations in the Caribbean, Africa, Asia, and elsewhere through the lens of gender. Designed to familiarize students with the relationships between cultural paradigms associated with gender and transnational experiences of colonialism. Focuses on the variety of artistic strategies employed by writers to communicate the impacts of gender and sexuality on contemporary postcolonial themes such as neocolonialism, nationalism, and diaspora. Writers may include Chimamanda Adichie, Nawal El Saadawi, Marjane Satrapi, Bessie Head, Arundhati Roy, Banana Yoshimoto, Sonia Singh, and Dionne Brand. ENGL 2451, WMNS 2451, and CLTR 2451 are cross-listed.

WMNS 2455. American Women Writers Race. 4 Hours.

Surveys the diversity of American women's writing to ask what it means to describe writers as disparate as Phillis Wheatley, Edith Wharton, Toni Morrison, and Alison Bechdel as part of the same "tradition." With attention to all genres of American women's writing, introduces issues of genre and gender; literary identification; canons; the politics of recuperation; silence and masquerade; gender and sexuality; intersectionality; sexual and literary politics, compulsory heterosexuality, and more. AFAM 2455, ENGL 2455, and WMNS 2455 are cross-listed.

WMNS 2480. Women and World Politics. 4 Hours.

Introduces a variety of issues facing women across the globe. Focuses on the gender dynamics of key issues in international affairs. These could include economic policy, conflict and war, human rights/women's rights, political power, and collective action. Draws on examples from various world regions since the twentieth century to analyze similarities and differences across cases around the globe. INTL 2480 and WMNS 2480 are cross-listed.

WMNS 2501. Breaking the Glass Ceiling: Women in Theatre. 4 Hours.

Surveys a wide range of dramatic forms, gender theories, and distinct theatrical techniques used by women artists to reveal larger social issues and encourage activism. Examines how the plays' sociocultural contexts represent female playwrights' diverse views of identity as well as their cultural, ethnic, racial, and geographical experiences. Identifies how women as artistic leaders are perceived and received by society and the industry. Analyzes why the issue of gender equity in theatre remains unresolved. THTR 2500 and WMNS 2501 are cross-listed.

WMNS 2505. Digital Feminisms. 4 Hours.

Explores the unique ways that feminist activism and theory are impacted by the increasing digital nature of our world. From hashtags to Tumblr, feminists are using digital tools and platforms to aid in the pursuit of social justice. Offers students an opportunity to develop a timeline that traces feminists' engagement with the Internet, new media, and technological innovations from the late seventies to the present. Examines the strengths and challenges that the digital world creates for feminist engagement. MSCR 2505 and WMNS 2505 are cross-listed.

WMNS 2800. Sexual Orientation and Gender Expression. 4 Hours.

Introduces students to efforts among social and nonprofit organizations working to reduce heterosexism, homophobia, and transphobia in institutions, communities, and the society as a whole. Discusses practice across the life span for social professionals (social workers, counselors, advocates, and educators) in varied settings such as criminal justice, mental health, adoption, adult day health, and residential programs. Applying theories and current scholarship on LGBTQQ identity development, social movements, media, and advocacy, offers students an opportunity to evaluate contemporary issues of controversy for institutions, social practitioners, and policy. HUSV 2800 and WMNS 2800 are cross-listed.

WMNS 2990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

WMNS 2991. Research Practicum. 2-4 Hours.

Involves students in collaborative research under the supervision of a faculty member. Offers students an opportunity to learn basic research methods in the discipline. Requires permission of instructor. May be repeated once for up to 4 total credits.

WMNS 3100. Gender, Social Justice, and Transnational Activism. 4 Hours.

Introduces key issues, themes, and debates in feminist transnational theory, practice, and activism in contemporary contexts and how it has changed under socioeconomic, political, and cultural processes of globalization. Examines differences among women relating to race, class, sexuality, national identity, and political economy in reckoning with possibilities for sustainable social justice. Students interrogate the relationship between the local and global; the production of knowledge in different regional spaces; the pragmatics of political mobilization; the varying contours of “social justice”; and other key issues. Offers students an opportunity to discuss the impact of globalization, neoliberalism, and state and intimate violence on gendered politics and relations and to contend with the politics of difference, to debate its challenges, and to imagine possible futures for transnational gender justice. POLS 3100, SOCL 3100, and WMNS 3100 are cross-listed.

WMNS 3200. Queer Theatre and Performance. 4 Hours.

Explores significant dramatic texts that have shaped and expressed the changing nature of LGBTQ identity. Readings, viewings, lectures, and discussion focus on noteworthy queer plays as literature, history, cultural documents, and performance as seen through the lens of contemporary queer theories and knowledge. Analyzing these texts for their relevance to society and our lives, students evaluate and explore a range of topics including sexual identity, gender identity, religious and political views on queerness, the evolution of LGBTQ culture and communities, drag performance, homophobia, assimilation, appropriation, and coming out. Students who do not meet course restrictions may seek permission of instructor. THTR 3200 and WMNS 3200 are cross-listed.

WMNS 3304. Communication and Inclusion. 4 Hours.

Explores theoretical and practical issues in the relationships between communication, social identity, and social inclusion. Focuses on how communication shapes perceptions and positions of salient social identity groups and how individuals and groups resist and transform identity and promote inclusion through communication. Specifically focuses on communication and inclusion in the contexts of gender, race, sexual identity, social class, ability, and age. Course topics cover a range of theoretical and practical issues, including diversity in organizational settings and the social construction of identity. COMM 3304 and WMNS 3304 are cross-listed.

WMNS 3392. Gender and Film. 4 Hours.

Examines the representation of gender in film. Uses concepts and research from film and media studies to investigate the influences and consequences of gender representations in film. WMNS 3392 and MSCR 3392 are cross-listed.

WMNS 3500. Sexuality, Gender, and the Law. 4 Hours.

Examines the legal regulation of gender and sexuality. Investigates concrete legal cases to study the history of constitutional interpretation and the current status of rights for women and sexual minorities. Focuses on important theoretical issues emerging in the writings of diverse feminist and queer legal scholars. Addresses debates over the value of conventional equality approaches in legal doctrine; equality vs. difference perspectives; ways in which legal language constructs gender and sexuality; the incorporation of sexuality and gender in ideologies of law; and the intersections of gender, sexuality, and race in legal doctrine and legal theory. PHIL 3500, POLS 3500, and WMNS 3500 are cross-listed.

WMNS 3580. Sexual Violence: Counseling, Programs, and Policy. 4 Hours.

Offers an in-depth examination of sexual violence, its effects, and the resources available to assist survivors. Presents an overview of the criminal justice, medical, legal, and counseling systems and the impact these interweaving systems have on survivors. Offers students an opportunity to develop crisis counseling competency through group exercises and experiential activities. HUSV 3580 and WMNS 3580 are cross-listed.

WMNS 3610. Communication, Politics, and Social Change. 4 Hours.

Examines the place of race, gender, and sexual identity in American politics and public discourse. Emphasizes the role of communication in public attitudes toward identity, the role that identity plays in electoral politics, and how public policy and social change are made. Explores how public debate on issues related to identity influences how Americans think about the rights and place of minorities in society. Public discourse is defined broadly here—it encompasses different types of communication, from news stories and presidential speeches to sermons by clergy, television sitcoms, and film. COMM 3610 and WMNS 3610 are cross-listed.

WMNS 3676. Representing Gender and Sexuality in Literature. 4 Hours.

Investigates the construction of gender and its representation in relation to sexuality, power, and subjectivity in a variety of texts. May be repeated without limit. ENGL 3676 and WMNS 3676 are cross-listed.

WMNS 3678. Bedrooms and Battlefields: Hebrew Bible and the Origins of Sex, Gender, and Ethnicity. 4 Hours.

Considers stories from Hebrew Scripture in English translation, beginning with the Garden of Eden through the Book of Ruth, asking how these foundational narratives establish the categories that have come to define our humanity. Analyzes how the Bible's patterns of representation construct sexual and ethnic identities and naturalize ideas about such social institutions as “the family.” ENGL 3678, JWSS 3678, and WMNS 3678 are cross-listed.

WMNS 3900. Gender and Black World Literatures. 4 Hours.

Explores different aspects of the literary and cultural productions of black women throughout history. Examines writing by women in the United States—like Octavia Butler, Zora Neale Hurston, and Toni Morrison—in addition to writing by women across the global African diaspora—like Chimamanda Adichie and Jamaica Kincaid. Students may also engage with theories such as Black feminism, womanism, or intersectionality; consider issues of genre such as the novel, poetry, or science fiction; and explore key themes such as class, sexuality, and disability. AFRS 3900, WMNS 3900, and ENGL 3900 are cross-listed.

WMNS 3990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

WMNS 4010. Gender, Crime, and Justice. 4 Hours.

Examines the topics of femininities and masculinities and their influence on participants in the criminal justice system. Also explores topics such as gender and criminological theory; the notion of gender and offending; women and men as victims of violence; and women and men as professionals within the criminal justice system. CRIM 4010 and WMNS 4010 are cross-listed.

WMNS 4520. Race, Class, and Gender. 4 Hours.

Considers the intersection of race, class, and gender in social structure, institutions, and people's lives. Utilizes an interdisciplinary approach to focus on the socially constructed nature of these concepts and how they shape and create meaning in individual lives. Difference with an emphasis on inequality and varying life chances is central for understanding our society and is central to our work. Requires a significant amount of reading. Class format is like a seminar; students are expected to participate, take responsibility, and write a paper. SOCL 4520 and WMNS 4520 are cross-listed.

WMNS 4523. Sexualities. 4 Hours.

Offers a primarily sociological overview of the field of sexuality studies. Explores the ways in which sexual behaviors and identities are in fact shaped by social norms, values, and expectations; the meanings and statuses ascribed to sexual acts, behaviors, identities, and communities; and the interactive processes by which sexualities are achieved. Also brings an intersectional framework to discussions by emphasizing how our understandings of sexuality interact with categories of gender, race, nation, and class. Examines a variety of topics, such as transgenderism, power, extreme and illicit sex, socialization, pornography, and politics. SOCL 4523 and WMNS 4523 are cross-listed.

WMNS 4990. Elective. 1-4 Hours.

Offers elective credit for courses taken at other academic institutions. May be repeated without limit.

WMNS 4992. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on a chosen topic. Course content depends on instructor. May be repeated without limit.

WMNS 4994. Internship. 4 Hours.

Offers students an opportunity for internship work. May be repeated without limit.

WMNS 6100. Theorizing Gender and Sexuality. 4 Hours.

Seeks to challenge and expand our understanding of the relationship between biological sex; gendered identities; and sexual "preferences," practices, and life ways. This interdisciplinary course offers debates around sex, gender, sexuality, and the body that push beyond binary models reliant on a simple "nature/culture" distinction. Focuses on dynamic and variable aspects of sexuality, sex, and gender within and across cultures, representational forms, and historical periods, analyzing the circumstances in which they undergo significant challenge or transformation. Uses particular paradigmatic "case studies" to push hard at the boundaries of sex and gender and to dialogue around contesting conceptualizations of "the body," "sex," and "gender," particularly as they circulate in specific discourses of feminism, queer theory, and poststructuralism; ethnic studies; critical race theory; and cultural studies.

WMNS 7100. Queer Theory: Sexualities, Genders, Politics. 4 Hours.

Introduces the core texts and key debates that have shaped queer theory and examines the intersections between queer theory and feminism and critical race theory. Seeks to provide an understanding of expansive and radical contemporary queer politics by analyzing foundational queer and feminist texts, pushing beyond narrow constructions of identity politics, anti-discrimination policy, and rights-based reforms. Engages queer theory by means of a rich philosophical and political interrogation of the meaning and content of "queer." SOCL 7100 and WMNS 7100 are cross-listed.

WMNS 7615. Feminist Inquiry. 4 Hours.

Investigates theories and practices of feminist inquiry across a range of disciplines by studying a series of pairings of humanist and social science works by feminist scholars. Reflects on the ways that feminist inquiry/ies transform knowledge and inform varied forms of activism. Functions as an interdisciplinary course and engages students in questioning disciplinary assumptions and methodologies, seeking new ways to frame scholarly questions, and reconsidering the relationship between subjects and objects of study. Offers students an opportunity to meet with several of the feminist scholars read over the semester and to focus on specific theoretical and methodological choices as these are evidenced in practice.

WMNS 7635. Understanding the Pornographic and the Obscene. 4 Hours.

Introduces feminist scholars' criticisms and celebrations of pornography as well as more ecumenical efforts to study and understand what pornography is and has been and its adjacency to other media. Offers students an opportunity to develop an understanding of how pornography has been defined by various cultures and across time periods throughout history; how it is produced and consumed and by whom; the impacts of pornography consumption on individuals, families, communities, and societal norms; and how pornography interacts with the multiple forms of oppression and expression, based on race, class, national identity, gender, and sexual identities.

WMNS 7900. Special Topics in Women's, Gender, and Sexuality Studies. 4 Hours.

Examines selected topics in women's, gender, and sexuality studies. May be repeated up to five times.

WMNS 7976. Directed Study. 1-4 Hours.

Offers independent work under the direction of members of the department on chosen topics. May be repeated without limit.

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Chemistry - CPS (CHM)	62	Economics (ECON)	145
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