Bioinformatics, Graduate Certificate

The Graduate Certificate in Bioinformatics seeks to provide students with core knowledge in bioinformatics programming, integrating knowledge from the biological, computational, and mathematical disciplines. Students gain the data and genomic analysis skills needed to employ bioinformatics techniques to biological problems. The graduate certificate consists of four courses, three bioinformatics courses and one elective, totaling 15–16 semester hours.

Program Requirements

Complete all courses and requirements listed below unless otherwise indicated.

Core Requirements

Code	Title	Hours
BINF 6200	Bioinformatics Programming	4
BINF 6308	Bioinformatics Computational Methods 1	4
BINF 6309	Bioinformatics Computational Methods 2	4

Elective

Code

Complete one of the following. Electives outside this list may be chosen in consultation with faculty adviser.3-4BIOE 5235Biomedical ImagingBIOE 5420Cellular EngineeringBIOE 6100Medical PhysiologyBIOL 5543Stem Cells and RegenerationBIOL 5549Inventions in Microbial BiotechnologyBIOL 5569Advanced MicrobiologyBIOL 5573Medical MicrobiologyBIOL 5581Biological ImagingBIOL 5583ImmunologyBIOL 5585Evolution	Code	Title	Hours
BIOE 5420Cellular EngineeringBIOE 6100Medical PhysiologyBIOL 5543Stem Cells and RegenerationBIOL 5549Inventions in Microbial BiotechnologyBIOL 5569Advanced MicrobiologyBIOL 5573Medical MicrobiologyBIOL 5581Biological ImagingBIOL 5583Immunology	Complete one of the following. Electives out	side this list may be chosen in consultation with faculty adviser.	3-4
BIOE 6100Medical PhysiologyBIOL 5543Stem Cells and RegenerationBIOL 5549Inventions in Microbial BiotechnologyBIOL 5569Advanced MicrobiologyBIOL 5573Medical MicrobiologyBIOL 5581Biological ImagingBIOL 5583Immunology	BIOE 5235	Biomedical Imaging	
BIOL 5543Stem Cells and RegenerationBIOL 5549Inventions in Microbial BiotechnologyBIOL 5569Advanced MicrobiologyBIOL 5573Medical MicrobiologyBIOL 5581Biological ImagingBIOL 5583Immunology	BIOE 5420	Cellular Engineering	
BIOL 5549Inventions in Microbial BiotechnologyBIOL 5569Advanced MicrobiologyBIOL 5573Medical MicrobiologyBIOL 5581Biological ImagingBIOL 5583Immunology	BIOE 6100	Medical Physiology	
BIOL 5569Advanced MicrobiologyBIOL 5573Medical MicrobiologyBIOL 5581Biological ImagingBIOL 5583Immunology	BIOL 5543	Stem Cells and Regeneration	
BIOL 5573 Medical Microbiology BIOL 5581 Biological Imaging BIOL 5583 Immunology	BIOL 5549	Inventions in Microbial Biotechnology	
BIOL 5581 Biological Imaging BIOL 5583 Immunology	BIOL 5569	Advanced Microbiology	
BIOL 5583 Immunology	BIOL 5573	Medical Microbiology	
	BIOL 5581	Biological Imaging	
BIOL 5585 Evolution	BIOL 5583	Immunology	
	BIOL 5585	Evolution	
BIOL 5587 Comparative Neurobiology	BIOL 5587	Comparative Neurobiology	
BIOL 5591 Advanced Genomics	BIOL 5591	Advanced Genomics	
BIOL 5593 Cell and Molecular Biology of Aging	BIOL 5593	Cell and Molecular Biology of Aging	
BIOL 5597 Immunotherapies of Cancer and Infectious Disease	BIOL 5597	Immunotherapies of Cancer and Infectious Disease	
BIOL 6299 Molecular Cell Biology for Biotechnology	BIOL 6299	Molecular Cell Biology for Biotechnology	
BIOL 6300 Biochemistry	BIOL 6300	Biochemistry	
BIOL 6301 Molecular Cell Biology	BIOL 6301	Molecular Cell Biology	
BIOL 6303 Neurobiology and Behavior	BIOL 6303	Neurobiology and Behavior	
BIOL 6407 Biochemistry for Molecular Biologists	BIOL 6407	Biochemistry for Molecular Biologists	
BIOT 5120 Foundations in Biotechnology	BIOT 5120	Foundations in Biotechnology	
BIOT 5145 Basic Biotechnology Lab Skills	BIOT 5145	Basic Biotechnology Lab Skills	
BIOT 5219 The Biotechnology Enterprise	BIOT 5219	The Biotechnology Enterprise	
BIOT 5225 Managing and Leading a Biotechnology Company	BIOT 5225	Managing and Leading a Biotechnology Company	
BIOT 5226 Biotechnology Entrepreneurship	BIOT 5226	Biotechnology Entrepreneurship	
BIOT 5227 Launching Your Science: Biotechnology Entrepreneurship	BIOT 5227	Launching Your Science: Biotechnology Entrepreneurship	
BIOT 5560 Bioprocess Fundamentals	BIOT 5560	Bioprocess Fundamentals	
BIOT 5631 Cell Culture Processes for Biopharmaceutical Production	BIOT 5631	Cell Culture Processes for Biopharmaceutical Production	
BIOT 5635 Downstream Processes for Biopharmaceutical Production	BIOT 5635	Downstream Processes for Biopharmaceutical Production	
BIOT 5640 Drug Product Processes for Biopharmaceuticals	BIOT 5640	Drug Product Processes for Biopharmaceuticals	
BIOT 5700 Molecular Interactions of Proteins in Biopharmaceutical Formulations	BIOT 5700	Molecular Interactions of Proteins in Biopharmaceutical Formulations	
BIOT 5810 Cutting-Edge Applications in Molecular Biotechnology	BIOT 5810	Cutting-Edge Applications in Molecular Biotechnology	
BIOT 5850 Higher-Order Structure Analytics	BIOT 5850	Higher-Order Structure Analytics	
BIOT 7245 Biotechnology Applications Laboratory	BIOT 7245	Biotechnology Applications Laboratory	
CHEM 5550 Introduction to Glycobiology and Glycoprotein Analysis	CHEM 5550	Introduction to Glycobiology and Glycoprotein Analysis	
CHEM 5616 Protein Mass Spectrometry	CHEM 5616	Protein Mass Spectrometry	

2 Bioinformatics, Graduate Certificate

CHEM 5617Protein Mass Spectrometry LaboratoryCHEM 5620Protein ChemistryCHEM 5620Protein ChemistryCHEM 7317Analytical BiotechnologyCS 5100Programming Design ParadigmCS 5100Foundations of Artificial IntelligenceCS 5200Database Management SystemsCS 5600Foundations of Software EngineeringCS 5600Computer SystemsCS 5600Computer SystemsCS 5600Computer SystemsCS 5600Fundamentals of Computer NetworkingCS 5700Fundamentals of Computer NetworkingCS 5800AlgorithmsCS 6200Information RetrievalCS 6200Collecting, Storing, and Retrieving DataDA 5020Collecting, Storing, and Retrieving DataINSH 5301Introduction to Data Mining/Machine LearningINSH 5302Information To Mathematical Methods and ModelingMATH 7203Numerical Analysis 1MATH 7203Numerical Analysis 2MATH 7241Probability 1MATH 7241Probability 2MATH 7344Regression, ANOVA, and DesignPHYS 5116Network Science 1		
CHEM 7317Analytical BiotechnologyCS 5010Programming Design ParadigmCS 5100Foundations of Artificial IntelligenceCS 5200Database Management SystemsCS 5400Principles of Programming LanguageCS 5500Foundations of Software EngineeringCS 5600Computer SystemsCS 5610Web DevelopmentCS 5700Fundamentals of Computer NetworkingCS 5800AlgorithmsCS 6200Information RetrievalCS 6200Information RetrievalCS 6200Collecting, Storing, and Retrieving DataDA 5020Collecting, Storing, and Retrieving DataDA 5030Introduction to Data Mining/Machine LearningINSH 5301Introduction to Computational StatisticsINSH 5302Information RetrievalMATH 7233Numerical Analysis 1MATH 7233Graph TheoryMATH 7241Probability 1MATH 7242Mathematical StatisticsPHSC 6214Experimental Design and BiostatisticsPHYS 5116Network Science 1	CHEM 5617	Protein Mass Spectrometry Laboratory
CS 5010Programming Design ParadigmCS 5100Foundations of Artificial IntelligenceCS 5200Database Management SystemsCS 5400Principles of Programming LanguageCS 5500Foundations of Software EngineeringCS 5600Computer SystemsCS 5610Web DevelopmentCS 5700Fundamentals of Computer NetworkingCS 5600AlgorithmsCS 5610Meb DevelopmentCS 5700Fundamentals of Computer NetworkingCS 5700AlgorithmsCS 6200Information RetrievalCS 6200Data Mining TechniquesDA 5020Collecting, Storing, and Retrieving DataDA 5030Introduction to Data Mining/Machine LearningINSH 5301Introduction to Computational StatisticsINSH 5302Information Design and Visual AnalyticsMATH 7203Numerical Analysis 1MATH 7203Numerical Analysis 2MATH 7233Graph TheoryMATH 7241Probability 1MATH 7344Regression, ANOVA, and DesignPHYS 5116Network Science 1	CHEM 5620	Protein Chemistry
CS 5100Foundations of Artificial IntelligenceCS 5200Database Management SystemsCS 5400Principles of Programming LanguageCS 5500Foundations of Software EngineeringCS 5500Computer SystemsCS 5510Web DevelopmentCS 5700Fundamentals of Computer NetworkingCS 5700Fundamentals of Computer NetworkingCS 5700Fundamentals of Computer NetworkingCS 6140Machine LearningCS 6200Information RetrievalCS 6220Data Mining TechniquesDA 5020Collecting, Storing, and Retrieving DataDA 5030Introduction to Data Mining/Machine LearningINSH 5301Introduction to Computational StatisticsINSH 5302Information RetrievalMATH 7203Numerical Analysis 1MATH 7205Numerical Analysis 2MATH 7233Graph TheoryMATH 7241Probability 1MATH 7342Mathematical StatisticsPHSC 6214Experimental Design and BiostatisticsPHYS 5116Network Science 1	CHEM 7317	Analytical Biotechnology
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CS 5600Computer SystemsCS 5610Web DevelopmentCS 5700Fundamentals of Computer NetworkingCS 5700AlgorithmsCS 6140Machine LearningCS 6200Information RetrievalCS 6220Data Mining TechniquesDA 5020Collecting, Storing, and Retrieving DataDA 5030Introduction to Data Mining/Machine LearningINSH 5301Introduction to Computational StatisticsINSH 5302Information Design and Visual AnalyticsMATH 7203Numerical Analysis 1MATH 7203Numerical Analysis 2MATH 7233Graph TheoryMATH 7241Probability 1MATH 7342Mathematical StatisticsMATH 7344Regression, ANOVA, and DesignPHSC 6214Experimental Design and BiostatisticsPHYS 5116Network Science 1	CS 5400	Principles of Programming Language
CS 5610Web DevelopmentCS 5700Fundamentals of Computer NetworkingCS 5700AlgorithmsCS 6140Machine LearningCS 6200Information RetrievalCS 6220Data Mining TechniquesDA 5020Collecting, Storing, and Retrieving DataDA 5030Introduction to Data Mining/Machine LearningINSH 5301Introduction to Computational StatisticsINSH 5302Information Design and Visual AnalyticsMATH 7203Numerical Analysis 1MATH 7205Numerical Analysis 2MATH 7341Probability 1MATH 7344Regression, ANOVA, and DesignMATH 7344Regression, ANOVA, and DesignPHYS 5116Network Science 1	CS 5500	Foundations of Software Engineering
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CS 6200Information RetrievalCS 6220Data Mining TechniquesDA 5020Collecting, Storing, and Retrieving DataDA 5030Introduction to Data Mining/Machine LearningINSH 5301Introduction to Computational StatisticsINSH 5302Information Design and Visual AnalyticsMATH 5131Introduction to Mathematical Methods and ModelingMATH 7203Numerical Analysis 1MATH 7205Numerical Analysis 2MATH 7233Graph TheoryMATH 7241Probability 1MATH 7341Probability 2MATH 7344Regression, ANOVA, and DesignPHSC 6214Experimental Design and BiostatisticsPHYS 5116Network Science 1	CS 5800	Algorithms
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MATH 7342Mathematical StatisticsMATH 7344Regression, ANOVA, and DesignPHSC 6214Experimental Design and BiostatisticsPHYS 5116Network Science 1	MATH 7241	Probability 1
MATH 7344Regression, ANOVA, and DesignPHSC 6214Experimental Design and BiostatisticsPHYS 5116Network Science 1	MATH 7341	Probability 2
PHSC 6214Experimental Design and BiostatisticsPHYS 5116Network Science 1	MATH 7342	Mathematical Statistics
PHYS 5116 Network Science 1	MATH 7344	Regression, ANOVA, and Design
	PHSC 6214	Experimental Design and Biostatistics
	PHYS 5116	Network Science 1
PHYS 7332 Network Science Data 2	PHYS 7332	Network Science Data 2

Note: International students are required to select a 4-credit elective to maintain a full-time status, 8SH.

Program Credit/GPA Requirements

15–16 total semester hours required Minimum 3.000 GPA required