Environmental and Sustainability Sciences and Chemistry, BS

The Departments of Marine and Environmental Sciences and Chemistry provide education in basic environmental and sustainability sciences (ESS) and chemistry-related disciplines. The overall objective of this combined major is to provide the fundamental scientific background and practical training for students as they prepare for environmental and chemically related careers or advanced study in fields including the traditional specialties such as toxicology, pollution, bioremediation, environmental protection, education, law, and other endeavors that may draw upon an understanding of the chemical basis of the environment and the changes that will likely result from global environmental change.

Key general objectives are the development of qualitative and quantitative problem-solving skills and effective communication skills. This combined major includes the development of conceptual understanding and problem-solving abilities in the fundamental dynamics between the environment and its chemistry, be it analytical chemistry, biochemistry, inorganic chemistry, organic chemistry, and physical chemistry. Students will have the opportunity to perform quantitative measurements; learn proper laboratory practices, including safety; develop proficiency with modern instruments and computers for data acquisition and analysis; and learn the relevance of chemistry within the context of the abiotic and biotic environments.

Students also have the opportunity to participate in the cooperative education program and thereby gain invaluable professional experience to augment their classroom and laboratory work. Not only does that experience add immensely to the overall education received, it also has the potential to provide contacts and references for later employment or graduate school admissions. Students in this major may also undertake research projects for at least one semester under the supervision of a faculty member. Sufficient electives are available in the program either to take more advanced courses or research within the department or to add courses in an area of special interest.

There are a number of interdisciplinary opportunities involving ESS. Due to curricular overlap, combinations of any ESS major, including combined majors, cannot occur with majors or minors in ecology and evolutionary biology or environmental studies or with the minor in geoscience. ESS and chemistry combined majors are also restricted from a minor in environmental chemistry.

Program Requirements

Complete all courses listed below unless otherwise indicated. Also complete any corequisite labs, recitations, clinicals, or tools courses where specified and complete any additional courses needed beyond specific college and major requirements to satisfy graduation credit requirements.

Universitywide Requirements

All undergraduate students are required to complete the Universitywide Requirements (http://catalog.northeastern.edu/undergraduate/university-academics/university-wide-requirements/).

NUpath Requirements

All undergraduate students are required to complete the NUpath Requirements (http://catalog.northeastern.edu/undergraduate/university-academics/nupath/).

Environmental Science and Sustainability Requirements

Code	Title	Hours
Core Courses		
EEMB 2302 and EEMB 2303	Ecology and Lab for EEMB 2302	5
ENVR 1200 and ENVR 1201	Dynamic Earth and Lab for ENVR 1200	4-5
or ENVR 2200	Earth's Changing Cycles	
ENVR 1400 and ENVR 1401	Foundations in Environmental and Sustainability Sciences and Lab for ENVR 1400	5
ENVR 2515	Sustainable Development	4
Complete one skills course:		4-5
ENVR 1500 and ENVR 1501	Introduction to Environmental, Social, and Biological Data and Lab for ENVR 1500	
ENVR 3300 and ENVR 3301	Geographic Information Systems and Lab for ENVR 3300	
Complete four courses from the list below. Three of four must be above the 3000 level:		16
EEMB 2400	Introduction to Evolution	
EEMB 3460	Conservation Biology	
EEMB 4001	Landscape and Restoration Ecology	
ENVR 2310 and ENVR 2311	Earth Materials and Lab for ENVR 2310	
ENVR 2340	Earth Landforms and Processes	

ENVR 3125	Global Oceanic Change
ENVR 3150	Food Security and Sustainability
ENVR 3200	Water Resources
ENVR 3600	Oceanography
ENVR 4500 and ENVR 4501	Applied Hydrogeology and Lab for ENVR 4500
ENVR 4505	Wetlands
ENVR 5150	Climate and Atmospheric Change
ENVR 5190	Soil Science
ENVR 5210	Environmental Planning
ENVR 5220	Ecosystem-Based Management
ENVR 5350	Sustainable Energy and Climate Solutions
ENVR 5450	Applied Social-Ecological Systems Modeling
ENVR 5670	Global Biogeochemistry
ENVR 5750	Urban Ecology
ENVR 5800	Climate Adaptation and Nature-Based Solutions
POLS 2395	Environmental Politics and Policy
PPUA 5260	Ecological Economics
SOCL 2485	Environment, Technology, and Society

Chemistry Requirements

Code	Title	Hours
General Chemistry		
Complete the following lecture and lab:		
CHEM 1161	General Chemistry for Science Majors	4
or CHEM 1151	General Chemistry for Engineers	
CHEM 1162	Lab for CHEM 1161	1
Intermediate-Level Chemistry		
CHEM 2161 and CHEM 2162	Concepts in Chemistry and Lab for CHEM 2161	5
CHEM 2311 and CHEM 2312	Organic Chemistry 1 and Lab for CHEM 2311	5
CHEM 2313 and CHEM 2314	Organic Chemistry 2 and Lab for CHEM 2313	5
CHEM 2321 and CHEM 2322	Analytical Chemistry and Lab for CHEM 2321	5
Advanced-Level Chemistry		
Complete two of the following:		10
CHEM 3331 and CHEM 3332	Bioanalytical Chemistry and Lab for CHEM 3331	
CHEM 3401 and CHEM 3402	Chemical Thermodynamics and Kinetics and Lab for CHEM 3401	
CHEM 3403 and CHEM 3404	Quantum Chemistry and Spectroscopy and Lab for CHEM 3403	
Math Requirement		
Complete two of the following:		8-9
MATH 1241	Calculus 1	
or MATH 1251	Calculus and Differential Equations for Biology 1	
or MATH 1341	Calculus 1 for Science and Engineering	
MATH 1242	Calculus 2	
or MATH 1252	Calculus and Differential Equations for Biology 2	
or MATH 1342	Calculus 2 for Science and Engineering	
ENVR 2500 and ENVR 2501	Biostatistics and Lab for ENVR 2500	
or ECON 2350	Statistics	

or POLS 2400	Quantitative Techniques
or SOCL 2321	Research Methods in Sociology

Integrative Requirement

Code	Title	Hours
Integrative Requirement		
Complete two of the following:		8
CHEM 3410	Environmental Geochemistry	
CHEM 4750	Senior Research	
ENVR 4050	Solving Emerging Environmental Challenges through Capstone	
ENVR 4504	Environmental Pollution	
ENVR 5190	Soil Science	

Major Credit Requirement

89 total semester hours required in the major

Program Credit Requirement

137 total semester hours required in the major

Plan of Study

Four Years, Two Co-ops in Summer 2/Fall

Year 1

Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
ENVR 1200 and ENVR 1201	5	ENVR 2515	4	General elective	4	General elective	4
CHEM 1161 and CHEM 1162	5	CHEM 2161 and CHEM 2162 and CHEM 2163	5	General elective	4	General elective	4
General elective #1	4	General elective #2	4				
ENVR 1400 and ENVR 1401	5	EEMB 2302 and EEMB 2303	5				
	19		18		8		8

Year 2

Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
CHEM 2311 and CHEM 2312	5	CHEM 2313 and CHEM 2314	5	General elective #5	4	Co-op	
General elective #3	4	ENVR elective; 2 of 4	4	Math requirement, 2 of 2	4		
Math requirement; 1 of 2	4	ENVR skills requirement	4				
ENVR elective; 1 of 4	4	General elective #4	4				
	17		17		8		0

Year 3

Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
Co-op		ENVR elective; 3 of 4	4	General elective #7	4	Co-op	
		Advanced CHEM elective 1 of 2	5	General elective #8	4		
		Advanced Chem elective 2 of 2	5				
		General elective #6	4				
	0		18		8		0

Year 4

Fall	Hours	Spring	Hours
Co-op		ENVR elective; 4 of 4	4
		Integrative course 1 of 2	4
		Integrative course 2 of 2	4

	General elective #9	4
	0	16

Total Hours: 137