

Environmental and Sustainability Sciences and Chemistry, BS (Boston)

The Departments of Marine and Environmental Sciences and Chemistry provide education in basic environmental and sustainability sciences 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 (<https://catalog.northeastern.edu/undergraduate/university-academics/university-wide-requirements/>).

NUpath Requirements

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

Environmental Science and Sustainability Requirements

Code	Title	Hours
Introduction to College		
CHEM 1000 or INSC 1000	Chemistry/Chemical Biology at Northeastern Science at Northeastern	1
Experiential Learning Introduction		
EESC 2000	Professional Development for Co-op	1
Core Courses		
EEMB 2302 and EEMB 2303	Ecology and Lab for EEMB 2302	5
ENVR 1200 and ENVR 1201 or ENVR 2200	Dynamic Earth and Lab for ENVR 1200 Earth's Changing Cycles	4-5
ENVR 1400 and ENVR 1401	Foundations in Environmental and Sustainability Sciences and Lab for ENVR 1400	5
ENVR 2515	Sustainable Development	4
ENVR Skills		
Complete two of the following:		9-10
ENVR 1500 and ENVR 1501	Introduction to Environmental, Social, and Biological Data and Lab for ENVR 1500	

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ENVR 2500 and ENVR 2501 and ENVR 2502	Biostatistics and Lab for ENVR 2500 and Recitation for ENVR 2500
ENVR 3300 and ENVR 3301 or ENVR 5260	Geographic Information Systems and Lab for ENVR 3300 Geographical Information Systems

ENVR electives

Complete three of the following (two of three must be above the 3000 level): 12-15

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 and ENVR 2341	Earth Landforms and Processes and Lab for ENVR 2340
ENVR 2500 and ENVR 2501 and ENVR 2502	Biostatistics and Lab for ENVR 2500 and Recitation for ENVR 2500
ENVR 3125	Global Oceanic Change
ENVR 3150	Food Security and Sustainability
ENVR 3200	Water Resources
ENVR 3300 and ENVR 3301 or ENVR 5260	Geographic Information Systems and Lab for ENVR 3300 Geographical Information Systems
ENVR 3600	Oceanography
ENVR 4500 and ENVR 4501	Applied Hydrogeology and Lab for ENVR 4500
ENVR 4505	Wetlands
ENVR 4970	Junior/Senior Honors Project 1
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 5563	Advanced Spatial Analysis
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		
CHEM 1161 and CHEM 1162 and CHEM 1163	General Chemistry for Science Majors and Lab for CHEM 1161 and Recitation for CHEM 1161	5
CHEM 2161 and CHEM 2162 and CHEM 2163	Concepts in Chemistry and Lab for CHEM 2161 and Recitation for CHEM 2161	5
Organic Chemistry		
Complete one of the following		5-6
CHEM 2311 and CHEM 2312	Organic Chemistry 1 and Lab for CHEM 2311	

CHEM 2315 and CHEM 2316	Organic Chemistry 1 for Chemistry Majors and Lab for CHEM 2315	
Complete one of the following		5-6

CHEM 2313 and CHEM 2314	Organic Chemistry 2 and Lab for CHEM 2313	
CHEM 2317 and CHEM 2318	Organic Chemistry 2 for Chemistry Majors and Lab for CHEM 2317	

Analytical Chemistry

CHEM 2321 and CHEM 2322 and CHEM 2323	Analytical Chemistry and Lab for CHEM 2321 and Recitation for CHEM 2321	5
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Advanced-Level Chemistry

CHEM 3401 and CHEM 3402	Chemical Thermodynamics and Kinetics and Lab for CHEM 3401	5
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Complete one of the following:		5
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CHEM 3331 and CHEM 3332	Bioanalytical Chemistry and Lab for CHEM 3331	
CHEM 3403 and CHEM 3404	Quantum Chemistry and Spectroscopy and Lab for CHEM 3403	

Math Requirements

MATH 1241 or MATH 1341	Calculus 1 Calculus 1 for Science and Engineering	4
MATH 1242 or MATH 1342	Calculus 2 Calculus 2 for Science and Engineering	4

Physics Requirement

PHYS 1151 and PHYS 1152 and PHYS 1153	Physics for Engineering 1 and Lab for PHYS 1151 and Interactive Learning Seminar for PHYS 1151	5
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Integrative Requirements

Code	Title	Hours
Integrative Requirements		
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 4970	Junior/Senior Honors Project 1	
ENVR 4997	Senior Thesis	
ENVR 5190	Soil Science	

NUPath Requirements

The following NUPath requirements are fulfilled by required courses in this major:

- Analyzing and Using Data (AD)
- Conducting Formal and Quantitative Reasoning (FQ)
- Demonstrating Thought and Action in a Capstone (CE)
- Engaging with the Natural and Designed World (ND)
- Two Writing-Intensive Courses in the Disciplines (WI)
- Understanding Societies and Institutions (SI)

Other NUPath requirements may be fulfilled by electives in the major.

Writing Requirements

Code	Title	Hours
ENGW 1111 or ENGW 1102	First-Year Writing First-Year Writing for Multilingual Writers	4

ENGW 3307	Advanced Writing in the Sciences	4
or ENGW 3303	Advanced Writing in the Environmental Professions	
or ENGW 3315	Interdisciplinary Advanced Writing in the Disciplines	

Co-op Requirements

Code	Title	Hours
Students who want to participate in co-op will need to complete EESC 2000 Professional Development for Co-op.		
EESC 2000	Professional Development for Co-op	1

Science GPA Requirement (Environmental and Sustainability Sciences)

A minimum 2.000 GPA in the following course codes is required: ENVR, EEMB

Major Credit Requirement

97 total semester hours required in the major

Program Credit Requirement

128 total semester hours required in the program

Plan of Study

Sample Plan of Study

FOUR YEARS, TWO CO-OPS IN SUMMER SECOND HALF/FALL

Year 1							
Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
CHEM 1161 and CHEM 1162 and CHEM 1163		5 CHEM 2161 and CHEM 2162 and CHEM 2163		5 General elective 1		4 Vacation	
ENVR 1000, CHEM 1000, or INSC 1000	1	EEMB 2302 and EEMB 2303		5 General Elective 2		4	
ENVR 1200 and ENVR 1201	5	ENGW 1111		4			
ENVR 1400 and ENVR 1401	5	ENVR 2515		4			
		16		18		8	0
Year 2							
Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
CHEM 2311 and CHEM 2312		5 CHEM 2313 and CHEM 2314		5 CHEM 2321 and CHEM 2322 and CHEM 2323		5 Co-op	0
MATH 1241	4	EESC 2000		1 MATH 1242		4	
ENVR elective; 1 of 3	4	PHYS 1151 and PHYS 1152 and PHYS 1153		5			
ENVR skill; 1 of 2	5	ENVR skill; 2 of 2		4			
		ENVR elective; 2 of 3		4			
		18		19		9	0
Year 3							
Fall	Hours	Spring	Hours	Summer 1	Hours	Summer 2	Hours
Co-op		0 CHEM 3401 and CHEM 3402		5 General elective 3		4 Co-op	0
		ENGW 3307		4 General elective 4		4	
		Advanced CHEM elective		5			
		ENVR elective; 3 of 3		4			
		0		18		8	0
Year 4							
Fall	Hours	Spring	Hours				
Co-op		0 General elective 5		4			

General elective 6	4
Integrative course; 1 of 2	4
Integrative course; 2 of 2	4
0	16

Total Hours: 130