

MAJOR IN ENVIRONMENTAL SCIENCE & STUDIES - ENVIRONMENTAL SCIENCE CONCENTRATION

The Environmental Science Concentration prepares students to become environmental problem-solvers in a world confronting climate change, population expansion, pollution and depletion of natural resources. Students in this concentration select from several tracks depending on student interest in Biology, Chemistry, Geology or the more general, Environmental Science.

Requirements Environmental Science Concentration

The Environmental Science Concentration requires 43–45 units. Students then choose a track that provides advanced study in one of three different fields: biology, chemistry or geology, or for students who choose not to specialize, a more general Environmental Science Track is also available. Each track has its own required courses and electives. The Environmental Science Concentration requires a total of 71–86 units (depending upon the track selected).

Common Required Courses

Code	Title	Units
Natural Sciences		
BIOL 206 & 206L	BIOLOGY II: INTRODUCTION TO ECOLOGY AND EVOLUTION [LECTURE] and BIOLOGY II: INTRODUCTION TO ECOLOGY AND EVOLUTION [LAB]	4
CHEM 131 & 131L	GENERAL CHEMISTRY I LECTURE and GENERAL CHEMISTRY I LABORATORY	4
CHEM 132 & 132L	GENERAL CHEMISTRY II LECTURE and GENERAL CHEMISTRY II LABORATORY	4
GEOL 121	PHYSICAL GEOLOGY	4
Mathematics and Statistics		
Select one of the following:		3-4
MATH 117	TRIGONOMETRY AND ADVANCED COLLEGE ALGEBRA	
MATH 119	PRE-CALCULUS	
MATH 211	CALCULUS FOR APPLICATIONS	
Select one of the following:		3-4
MATH 231	BASIC STATISTICS	
MATH 237	ELEMENTARY BIostatistics	
GEOG 375	QUANTITATIVE METHODS IN GEOGRAPHY	
ECON 205	STATISTICS FOR BUSINESS AND ECONOMICS I	
Social Sciences/Humanities		
ENGL 318 or GEOG 383	TECHNICAL AND SCIENTIFIC WRITING or NATURAL RESOURCES AND SOCIETY: A GEOGRAPHIC PERSPECTIVE	3
PHIL 255	ENVIRONMENTAL ETHICS	3

or HLTH 451	INTRODUCTION TO ENVIRONMENTAL HEALTH	
Select two of the following sequences, which include both an upper level and lower level course:		12
Sequence 1		
GEOG 101 & GEOG 410	PHYSICAL GEOGRAPHY and ENVIRONMENTAL GEOGRAPHY	
Sequence 2		
ECON 201	MICROECONOMIC PRINCIPLES	
ECON 375 or ECON 376	ENVIRONMENTAL ECONOMICS or NATURAL RESOURCE ECONOMICS	
Sequence 3		
POSC 103 or POSC 207	AMERICAN NATIONAL GOVERNMENT or STATE GOVERNMENT	
Select one of the following:		
ENVS 411	WATER POLICIES OF THE UNITED STATES	
ENVS 420	ENVIRONMENTAL POLICY AND SUSTAINABLE MANAGEMENT	
ENVS 425	SCIENCE AND POLICY OF THE CHESAPEAKE BAY RESTORATION	
Applications		
Select one of the following:		3
ENVS 482	ENVIRONMENTAL RESEARCH	
ENVS 485	ENVIRONMENTAL INTERNSHIP	
ENVS 491	SENIOR SEMINAR	
Total Units		43-45

Environmental Biology Track

Students must complete 28-36 units of course work for the track combined with 43-45 units of Common Required Courses (36 units of course work must be at the upper level).

Code	Title	Units
Required Courses		
BIOL 200 & 200L	BIOLOGY I: INTRODUCTION TO CELLULAR BIOLOGY AND GENETICS [LECTURE] and BIOLOGY I: INTRODUCTION TO CELLULAR BIOLOGY AND GENETICS [LAB]	4
BIOL 205 or BIOL 207	GENERAL BOTANY or GENERAL ZOOLOGY	4
Select one of the following:		4
BIOL 310	CONSERVATION BIOLOGY	
BIOL 402	GENERAL ECOLOGY	
BIOL 435	PLANT ECOLOGY	
Select one of the following:		
CHEM 333 & 333L	ESSENTIALS OF ORGANIC CHEM [LECTURE] and ESSENTIALS OF ORGANIC CHEMISTRY LABORATORY	5-8
or CHEM 334 & CHEM 336 & CHEM 337	ORGANIC CHEMISTRY I [LECTURE] and INTRODUCTORY ORGANIC CHEMISTRY LABORATORY and ORGANIC CHEMISTRY II [LECTURE]	
Electives		
Select three of the following:		9-12

BIOL 304	NATURAL HISTORY INTERPRETATION AND PUBLIC ENVIRONMENTAL EDUCATION
BIOL 306	HUMAN ECOLOGY AND SUSTAINABILITY
BIOL 309	GENETICS
BIOL 310	CONSERVATION BIOLOGY (if not taken as required)
BIOL 318	MICROBIOLOGY
BIOL 325	ANIMAL PHYSIOLOGY
BIOL 334	HUMANS, SCIENCE AND THE CHESAPEAKE BAY
BIOL 347	MARINE BIOLOGY
BIOL 353	INVERTEBRATE ZOOLOGY
BIOL 382	ENVIRONMENTAL EDUCATION AND SERVICE LEARNING IN THE TROPICS
BIOL 389	CURRENT DEVELOPMENTS IN BIOLOGY ²
BIOL 402	GENERAL ECOLOGY (if not taken as required)
BIOL 405	MOLECULAR ECOLOGY, EVOLUTION AND CONSERVATION
BIOL 406	LIMNOLOGY
BIOL 413	EVOLUTION
BIOL 419	ENVIRONMENTAL MICROBIOLOGY
BIOL 432	VASCULAR PLANT TAXONOMY
BIOL 435	PLANT ECOLOGY (if not taken as required)
BIOL 436	PLANT PHYSIOLOGY
BIOL 444	WILDLIFE MANAGEMENT
BIOL 446	TROPICAL ECOLOGY AND CONSERVATION
BIOL 447	TROPICAL FIELD ECOLOGY
BIOL 452	WETLAND ECOLOGY
BIOL 455	FISH BIOLOGY
BIOL 456	ORNITHOLOGY
BIOL 458	MAMMALOGY
BIOL 461	ENTOMOLOGY
BIOL 467	HERPETOLOGY
BIOL 473	ECOLOGICAL FIELD METHODS LABORATORY
BIOL 474	MOLECULAR TECHNIQUES IN ECOLOGY, EVOLUTION, AND CONSERVATION
CHEM 480	CHEMICAL TOXICOLOGY

Select one additional course from among any of the Environmental Science and Studies tracks electives. 2-4

Total Units 28-36

Environmental Chemistry Track

Students must complete 34-41 units of course work for the track combined with 43-45 units of Common Required Courses (39 units of course work must be at the upper level).

Code	Title	Units
Required Courses		
CHEM 220 & 220L	ANALYTICAL CHEMISTRY [LECTURE] and ANALYTICAL CHEMISTRY [LAB]	5

CHEM 333 & 333L	ESSENTIALS OF ORGANIC CHEM [LECTURE] and ESSENTIALS OF ORGANIC CHEMISTRY LABORATORY	5-8
or CHEM 334 & CHEM 336 & CHEM 337	ORGANIC CHEMISTRY I [LECTURE] and INTRODUCTORY ORGANIC CHEMISTRY LABORATORY and ORGANIC CHEMISTRY II [LECTURE]	

CHEM 472	APPLICATIONS OF ENVIRONMENTAL CHEMISTRY	3
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PHYS 211	GENERAL PHYSICS I; NON CALCULUS-BASED ³	4
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Select one of the following (additional prerequisites may be required): 4

BIOL 310	CONSERVATION BIOLOGY
BIOL 402	GENERAL ECOLOGY
BIOL 406	LIMNOLOGY

Select one of the following:		
GEOL 305	ENVIRONMENTAL GEOLOGY	4
or GEOL 415	HYDROGEOLOGY	

Electives
Select at six units from the following: 6-9

CHEM 310	INSTRUMENTAL ANALYSIS
CHEM 323	INORGANIC CHEMISTRY
CHEM 339	INTERMEDIATE ORGANIC CHEMISTRY LABORATORY
CHEM 345	PRINCIPLES OF PHYSICAL CHEMISTRY
CHEM 351	BIOCHEMISTRY
CHEM 356	BIOCHEMISTRY LAB
CHEM 372	PHYSICAL CHEMISTRY LABORATORY
CHEM 461	ADVANCED LECTURE TOPICS ²
CHEM 462	ADVANCED LABORATORY TECHNIQUES ²
CHEM 480	CHEMICAL TOXICOLOGY
GEOL 410	METHODS FOR ENVIRONMENTAL GEOCHEMISTRY

Select one additional course from among any of the Environmental Science and Studies tracks electives. 3-4

Total Units 34-41

Environmental Geology Track

Students must complete 29-33 units of course work for the track combined with 43-45 units of Common Required Courses (36 units of course work must be at the upper level).

Code	Title	Units
Required Courses		
GEOL 305	ENVIRONMENTAL GEOLOGY	4
GEOL 331	MINERALOGY	4
GEOL 410	METHODS FOR ENVIRONMENTAL GEOCHEMISTRY ⁴	4-5
or CHEM 220 & 220L	ANALYTICAL CHEMISTRY [LECTURE] and ANALYTICAL CHEMISTRY [LAB]	
GEOL 415	HYDROGEOLOGY	4
PHYS 211	GENERAL PHYSICS I; NON CALCULUS-BASED ³	4

Select one of the following: 4

GEOL 321	STRUCTURAL GEOLOGY
GEOL 443	SEDIMENTOLOGY AND STRATIGRAPHY

Electives

Select one of the following: 3-4

GEOL 301	SUSTAINABILITY AND THE USE OF NATURAL RESOURCES
GEOL 307	PALEONTOLOGY
GEOL 321	STRUCTURAL GEOLOGY (if not taken as required)
GEOL 333	PETROLOGY OF IGNEOUS AND METAMORPHIC ROCKS
GEOL 357	OCEANOGRAPHY
GEOL 421	TECTONICS
GEOL 443	SEDIMENTOLOGY AND STRATIGRAPHY (if not taken as required)
GEOL 492	GEOLOGICAL FIELD METHODS

Select one additional course from among any of the Environmental Science and Studies tracks electives. 2-4

Total Units 29-33**Environmental Science Track**

Students must complete 28-33 units of course work for the track combined with 43-45 units of Common Required Courses (36 units of course work must be at the upper level).

Code **Title** **Units****Required Courses**

BIOL 200 & 200L	BIOLOGY I: INTRODUCTION TO CELLULAR BIOLOGY AND GENETICS [LECTURE] and BIOLOGY I: INTRODUCTION TO CELLULAR BIOLOGY AND GENETICS [LAB]	4
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Select one of the following: 4-5

CHEM 220 & 220L	ANALYTICAL CHEMISTRY [LECTURE] and ANALYTICAL CHEMISTRY [LAB]	4-5
CHEM 333 & 333L	ESSENTIALS OF ORGANIC CHEM [LECTURE] and ESSENTIALS OF ORGANIC CHEMISTRY LABORATORY	
GEOL 410	METHODS FOR ENVIRONMENTAL GEOCHEMISTRY	
PHYS 211	GENERAL PHYSICS I; NON CALCULUS-BASED ³	4

Electives

Select two of the following: (additional prerequisites may be required) 7-8

BIOL 310	CONSERVATION BIOLOGY
BIOL 402	GENERAL ECOLOGY
BIOL 406	LIMNOLOGY
CHEM 310	INSTRUMENTAL ANALYSIS
GEOL 305	ENVIRONMENTAL GEOLOGY
GEOL 415	HYDROGEOLOGY
PHYS 212	GENERAL PHYSICS II; NON CALCULUS-BASED

Two additional environmental electives in the same discipline from Biology, Chemistry, Geology, or Geography 6-8

One additional course selected from among any of the Environmental Science and Studies tracks electives. 3-4

Total Units 28-33¹ The requirement of MATH 117 MATH 119 or MATH 211 may also be satisfied by successful completion of MATH 273 or MATH 274.² Acceptable topics related to environmental science and studies. Please contact the Environmental Science and Studies program director for approval.³ The requirement of PHYS 211 also may be satisfied by successful completion of PHYS 241.⁴ GEOL 410 preferred.**Four-Year Plan of Study****Sample Four-Year Plan**

The selected course sequence below is an example of the simplest path to degree completion. Based on course availability, student needs, and student choice, individual schedules will vary. Students should consult with their adviser to make the most appropriate elective choices and to ensure that they have completed the required number of units (120) to graduate.

Freshman

Term 1	Units	Term 2	Units
CHEM 131 & 131L (Core 8) ¹	4	BIOL 206 & 206L (Core 7) ¹	4
Select one of the following: (Core 3)	3	CHEM 132 & 132L	4
MATH 117		Select one of the following:	3
MATH 119		ECON 201 (Core 6)	
MATH 211		GEOG 101	
Select one of the following: ²	4	POSC 103	
BIOL 200 & 200L		POSC 207 (Core 11)	
GEOL 121		Core 2 (or Core 1)	3
Core 1 (or Core 2)	3		
	14		14

Sophomore

Term 1	Units	Term 2	Units
ECON 205, GEOG 375, MATH 231, or MATH 237	3	ECON/GEOG/POSC upper level	3
ECON/GEOG/POSC lower level	3	Track Requirement	4
GEOL 121 (or Track Requirement)	4	Track Requirement	4
Core 4	3	Core 10	3
Core 5	3		
	16		14

Junior

Term 1	Units	Term 2	Units
ECON/GEOG/POSC upper level	3	ENGL 318 or GEOG 383 (Core 9)	3
PHIL 255 or HLTH 451	3	Track Requirement	4
Track Requirement	4	Track Requirement	5
Core 11	3	Core 13	3

Core 12	3	
	16	15
Senior		
Term 1	Units	Term 2
ENVS 482, 485, or 491	3 Track Requirement or elective	4
Track Requirement	3 Track Requirement or elective	3
Track Requirement	4 Elective	3
Core 14	3 Elective	3
Elective	3 Elective	2
	16	15
Total Units 120		

¹ Students who place into a math course below MATH 115 should NOT be placed into BIOL 200 & BIOL 200L and should instead take GEOL 121 and/or GEOG 101.

² BIOL 200 / BIOL 200L is required for Environmental Biology and Environmental science track and is a prerequisite for BIOL 206. However, students in other environmental science tracks that elect not to take BIOL 200/200L could consider GEOL 121 in this semester.

Learning Outcomes

1. Apply their knowledge of the sciences and the scientific method to collect, analyze and interpret data that they have collected or to critique the methods used by others to collect, analyze and interpret data.
2. Identify the cultural, economic, geographic and/or political facets of environmental problems/situations and relate their understanding of these components to particular situations.
3. Relate the theoretical background materials presented in natural science, social science or humanities courses to specific current environmental problems/dilemmas.
4. Students will display competency in essential skills required of a college graduate by reading, interpreting, analyzing and evaluating written discourse.
5. Students will display competency in essential skills required of a college graduate by researching a topic, develop an argument and organize supporting details (ILTC).