

ENVIRONMENTAL SCIENCES MAJOR: GEOSYSTEMS OPTION (B.S.)

<https://ceps.unh.edu/earth-sciences/program/bs/environmental-sciences-major-geosystems-option>

Description

The College of Engineering and Physical Sciences (CEPS) and the College of Life Science and Agriculture (COLSA) jointly offer a bachelor of science degree in environmental sciences. Environmental sciences, an interdisciplinary field, focuses on the interaction of biological, chemical, and physical processes that shape our natural environment. Students graduating with a degree in environmental sciences will have an understanding of these interacting processes, the ability to communicate effectively with both scientific and lay audiences, competency in field methods appropriate for entry-level environmental science positions, competency in the use and application of Geographic Information Systems (GIS), a basic understanding of environmental policy, and the ability to contribute to multidisciplinary teams. The University of New Hampshire is a recognized leader in environmental sciences research, and the environmental sciences program capitalizes on faculty expertise in this area. The full-time faculty members comprising this program have major teaching and research emphases in the areas of biogeochemical cycling, environmental chemistry, ecosystem science, geospatial science, global change, hydrology, plant ecology, soil science, and water resource management.

Employment opportunities include environmental consulting firms, educational facilities (e.g., science centers), environmental monitoring laboratories (e.g., water treatment plants; the Environmental Protection Agency), government agencies (e.g., the U.S. Geological Survey, Bureau of Land Management, Natural Resource Conservation Service), university and government research laboratories, and nongovernment environmental organizations. The environmental sciences program also constitutes an excellent preparation for graduate programs in several areas relating to the environment. Students should consult with their adviser early if their goals include further study.

The Program has four options, and specific course requirements for the major vary by option. The geosystems and hydrology options are both managed by the Department of Earth Sciences in CEPS, and the ecosystems and soils and watersheds options are both managed by the Department of Natural Resources and the Environment in the COLSA. The geosystems option provides students with a solid grounding in quantitative reasoning, with an emphasis on geochemical and geospatial systems.

Requirements

In addition to the Discovery Program and University writing requirements, all students will take Introduction to Environmental Science NR 403 Introduction to Environmental Science and Professional Perspectives in Natural Resources (NR 400 Professional Perspectives in Natural Resources), plus one other elective introductory environmental science

course. Foundation courses include introductions to biology, physics, chemistry, geology, calculus, and statistics.

INTRODUCTORY

Code	Title	Credits
NR 400	Professional Perspectives in Natural Resources	1
NR 403	Introduction to Environmental Science	4
Plus one other elective introductory environmental science course		4
Total Credits		9

FOUNDATION

Code	Title	Credits
Biology		
BIOL 411	Introductory Biology: Molecular and Cellular	4
or BIOL 412	Introductory Biology: Evolution, Biodiversity and Ecology	
Chemistry		
Select one of the following:		4-8
CHEM 403 & CHEM 404	General Chemistry I and General Chemistry II	
or CHEM 405	Chemical Principles for Engineers	
Physics		
PHYS 407 & PHYS 408	General Physics I and General Physics II	8
Calculus		
MATH 425 & MATH 426	Calculus I and Calculus II	8
Statistics		
MATH 644 or BIOL 528	Statistics for Engineers and Scientists Applied Biostatistics I	4
Geology		
Select one of the following:		4
ESCI 401	Dynamic Earth	
ESCI 402	Earth History	
ESCI 409	Geology and the Environment	
Total Credits		32-36

CORE COURSES

Code	Title	Credits
ESCI 534	Techniques in Environmental Sciences	3
ESCI 654	Fate and Transport in the Environment	4
ESCI 777	GIS for Earth & Environmental Sciences	4
or NR 658	Introduction to Geographic Information Systems	
NR 602	Natural Resources and Environmental Policy	4
Capstone Experience ¹		
Total Credits		15

¹ NR 791 Preparation for Capstone and an independent study or capstone course taken in the senior year and approved by their adviser and the program coordinator.

Geosystems

Code	Title	Credits
Mineralogy		
ESCI 512	Principles of Mineralogy	4
Geomorphology		
ESCI 561	Landscape Evolution	4
Biogeosciences		
ESCI 642	Biogeosciences in the Earth System	3
Geochemistry		
Approved Geochemistry Elective		4
ESCI 741	Geochemistry	
ESCI 745	Isotope Geochemistry	
ESCI 747	Aqueous Geochemistry	
ESCI 796 or NR 744	Topics (Biogeochemistry) Biogeochemistry	

A course in quantitative or spatial analysis

Select two or three approved electives

8-12

Total Credits

27-31

Some students enroll in the EcoQuest program (a study abroad opportunity in New Zealand), which satisfies the policy requirement, and capstone requirement if taken senior year.

Students must complete additional courses for the geosystems option to total 88 credits in the major.

For a list of approved elective courses and for further information about the geosystems option, students may contact earth.sciences@unh.edu. (earth.sciences@unh.edu)

Capstone Experience

A capstone experience is required of all undergraduate Earth sciences majors during their senior year. All capstone experiences at UNH must meet one or more of the following criteria:

1. The capstone synthesizes and applies disciplinary knowledge and skills.
2. The capstone fosters reflection on undergraduate learning and experience.
3. The capstone demonstrates emerging professional competencies.
4. The capstone applies, analyzes, and/or interprets research or data or artistic expression.
5. The capstone explores areas of interest based on the integration of prior learning.

Suggested ways of meeting the capstone requirement in the Department of Earth Sciences include approved INCO 790 experiences, ESCI 795/796 field courses, senior thesis (ESCI 799/799H), URA/SURF/IROP projects, internships, environmental/geologic field camps, REU programs, or Earth Sciences education and outreach activities designed according to the above criteria. Capstone experiences must be equivalent to a minimum of 2 academic credits. Students should work closely with their faculty advisors to define the most appropriate capstone experience for their Earth Sciences degree program, although the capstone mentor can be someone other than their primary faculty advisor. All capstone experiences must be approved and certified by the faculty advisor and the capstone mentor. Presentation of projects or experiences developed for the capstone is encouraged at the annual UNH Undergraduate Research Conference or other appropriate venue.

Student Learning Outcomes

- Recognize common Earth and environmental materials and dynamic processes in the Earth System and environment.
- Understand the Earth is a system and be able to describe the broad attributes of and interactions within the Earth System and the environment through both short- and long- term perspectives, evaluate how and why it is changing today, and assess coupled human and natural system interactions. Understand the ecological and chemical systems of the environment.
- Understanding Earth processes and cycles using a strong foundation of physical, biological and chemical sciences.
- Demonstrate knowledge of core concepts in the hydrologic sciences: stream flow, groundwater water budget Darcy's Law hydrologic fluxes such as, evaporation, precipitation, infiltration, and transpiration, and physical factors that affect them, and a basic understanding of the uses and limitations of a hydrologic model. (Hydrology option)
- Perform field measurements and simple calculations to collect, evaluate and interpret quantitative environmental or geological data. Understand the role that spatially explicit data plays in understanding environmental and hydrological sciences.
- Collect, interpret, and synthesize basic field observations and measurements to develop and test multiple working hypotheses to explain them.
- Summarize, analyze, and evaluate their own scientific data and the primary Earth and environmental sciences literature.
- Communicate results of scientific inquiries orally, visually, and in writing.