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

Degree Requirements

Minimum Credit Requirement: 128 credits
Minimum GPA: 2.0 required for conferral*

Minimum Residency Requirement: 32 credits must be taken at UNH

Core Curriculum Required: Discovery & Writing Program Requirements
Foreign Language Requirement: No
All Major, Option and Elective Requirements as indicated.
*Major GPA requirements as indicated.

Major Requirements

In addition to the Discovery Program and University writing requirements, all students will take two required introductory courses, plus one other elective introductory environmental science course. Foundation courses include introductions to biology, physics, chemistry, geology, calculus, and statistics.

INTRODUCTORY

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>NR 400</td>
<td>Professional Perspectives in Natural Resources</td>
<td>1</td>
</tr>
<tr>
<td>NR 403</td>
<td>Introduction to Environmental Science</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>One additional elective introductory environmental science course</td>
<td>4</td>
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<tr>
<td></td>
<td>Total Credits</td>
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FOUNDATION

<table>
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<tr>
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<tbody>
<tr>
<td>BIOL 411</td>
<td>Introductory Biology Molecular and Cellular</td>
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<tr>
<td></td>
<td>or BIOL 412 Introductory Biology Evolution, Biodiversity and Ecology</td>
<td>4</td>
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<tr>
<td>CHEM 403</td>
<td>General Chemistry I and General Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>or CHEM 405 Chemical Principles for Engineers</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 407</td>
<td>General Physics I</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>or PHYS 408 General Physics II</td>
<td>8</td>
</tr>
<tr>
<td>MATH 425</td>
<td>Calculus I</td>
<td>8</td>
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<tr>
<td></td>
<td>or MATH 426 Calculus II</td>
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<tr>
<td>MATH 544</td>
<td>Statistics for Engineers and Scientists</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>or BIOL 528 Applied Biostatistics I</td>
<td>4</td>
</tr>
<tr>
<td>ESCI 401</td>
<td>Dynamic Earth</td>
<td>4</td>
</tr>
<tr>
<td>ESCI 402</td>
<td>Earth History</td>
<td>4</td>
</tr>
<tr>
<td>ESCI 409</td>
<td>Geology and the Environment</td>
<td>4</td>
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<td>Total Credits</td>
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CORE COURSES

<table>
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<tr>
<th>Code</th>
<th>Title</th>
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<tbody>
<tr>
<td>ESCI 534</td>
<td>Techniques in Environmental Sciences</td>
<td>3</td>
</tr>
<tr>
<td>ESCI 654</td>
<td>Fate and Transport in the Environment</td>
<td>4</td>
</tr>
<tr>
<td>ESCI 777</td>
<td>GIS for Earth &amp; Environmental Sciences</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>or NR 658 Introduction to Geographic Information Systems</td>
<td>4</td>
</tr>
<tr>
<td>NR 602</td>
<td>Natural Resources and Environmental Policy</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Capstone Experience</td>
<td>1</td>
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<td>Total Credits</td>
<td>15</td>
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</table>

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

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESCI 512</td>
<td>Principles of Mineralogy</td>
<td>4</td>
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1
Environmental Sciences Major: Geosystems Option (B.S.)

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 Topics (Biogeochemistry) or NR 744 Biogeochemistry

A course in quantitative or spatial analysis 4
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.

Degree Plan

First Year

Fall

Credits
NR 400 Professional Perspectives in Natural Resources 1
or ESCI 400 or Freshman Field Seminar
NR 403 Introduction to Environmental Science 4
MATH 425 Calculus I 4
CHEM 403 General Chemistry I 4
ENGL 401 First-Year Writing 4

Credits 17

Spring

ESCI 409 Geology and the Environment 4
MATH 426 Calculus II 4
CHEM 404 General Chemistry II 4
Inquiry Discovery Course 1 4

Credits 16

Second Year

Fall

BION 411 or BION 412 Introductory Biology: Molecular and Cellular 4
or Introductory Biology: Evolution, Biodiversity and Ecology
ESCI 534 Techniques in Environmental Sciences 3
PHYS 407 General Physics I 4
Discovery Course 1 4

Credits 15

Spring

ESCI 501 or ESCI 514 Introduction to Oceanography 4
or Introduction to Climate
ESCI 512 Principles of Mineralogy 4
PHYS 408 General Physics II 4
Discovery Course 1 4

Credits 16

Third Year

Fall

ESCI 561 Landscape Evolution 4
ESCI 741 Geochemistry 4
or ESCI 747 Aqueous Geochemistry
ESCI 777 GIS for Earth & Environmental Sciences 4
Discovery Course 1 4

Credits 16

Spring

ESCI 654 Fate and Transport in the Environment 4
MATH 644 or BIOL 528 Statistics for Engineers and Scientists 4
or Applied Biostatistics I
ESCI 642 Biogeosciences in the Earth System 3
NR #791 Preparation for Capstone 1
NR 602 Natural Resources and Environmental Policy 4

Credits 16

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 Advanced Research Experience, ESCI 795 Topics, ESCI 796 Topics, ESCI 799 Senior Thesis, 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.
Fourth Year

Fall
Elective 4
Approved Technical Elective 2 4
Quantitative/Spatial Analysis Elective 2 4
Discovery Course 1 4
Credits 16

Spring
Discovery Course 1 4
Senior Capstone (ESCI 799, INCO 790) or elective if capstone is satisfied 4
Approved Technical Elective 2 4
Elective 4
Credits 16

Total Credits 128

1 One course must be taken in each of the remaining Disciplinary Groups of the University Discovery Program (Environment Technology & Society; Historical Perspectives; World Culture; Fine & Performing Arts; Social Science; Humanities).
2 Three technical electives must be approved in consultation with departmental advisor.
All students must take four writing intensive courses, including ENGL 401 First-Year Writing, a course in the major, and a course at the 600/700 level.

Student Learning Outcomes

Students will be able to:

- Recognize common Earth and environmental materials.
- Understand the Earth as 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 Earth processes and cycles.
- Perform field measurements and simple calculations to collect, evaluate and interpret quantitative environmental or geological data. Understand the role that spatially explicit data and time series play 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. Additionally, become comfortable with the use of technology and computational methods in processing a range of scientific data.
- Analyze, summarize, evaluate, and explain/present their own scientific data and the primary Earth and environmental sciences literature.
- Communicate results of scientific inquiries orally, visually, and in writing.