

EARTH AND ENVIRONMENTAL SCIENCES MAJOR

MAJOR DESCRIPTION

The Major in Earth and Environmental Sciences (E&ES) provides students with a broad base of knowledge of the natural world. Topics of study range from planetary evolution to climate change to ecosystem conservation. Courses in geology, environmental science, environmental chemistry, ecology, and how the Earth's spheres—geosphere, hydrosphere, atmosphere, biosphere—interact with each other prepare students to choose their own areas of specialization. E&ES majors work with faculty on research projects that range from research into past climates using terrestrial and ocean proxies to the geological makeup of the planet Venus, and from nearby coastal areas to faraway lagoons. The major culminates in a capstone course where students perform independent research in the field.

Students drawn to this major may have a passion for environmental awareness and responsibility, understanding natural systems, or an orientation toward problem-solving. They may enjoy spending time in nature doing fieldwork as well as working in the lab and communicating complex concepts to diverse audiences.

Earth and Environmental Sciences majors are equipped with the knowledge and skills to decipher the structure, composition, and dynamics of the Earth system, conduct research, analyze data, evaluate scientific claims, and communicate their findings. They are well prepared to pursue advanced post-graduate opportunities or various careers in fields like education, environmental consulting, conservation science, planetary science, sustainability, urban planning, renewable energy, and climate analysis.

ADMISSION TO THE MAJOR

GATEWAY COURSES FOR THE MAJOR

To declare E&ES as a major, students are required to have completed an E&ES gateway course (E&ES101, E&ES115, E&ES155, E&ES197), and to have completed (or be currently taking) two gateway courses (or higher) in biology, chemistry, mathematics, or physics.

Code	Title	Hours
E&ES101	Dynamic Earth!	1.25
E&ES115	Introduction to Planetary Geology	1
E&ES155	Earth System Science	1.25
E&ES197	Introduction to Environmental Studies	1

SOPHOMORE SEMINAR

Code	Title	Hours
E&ES195	Sophomore Field Course	0.5

MAJOR REQUIREMENTS

The Department of E&ES does not require completion of Wesleyan's General Education Requirements to complete the major. Honors students are required to complete Wesleyan's General Education Requirements through stage II.

The following is a list of required courses for the major (**14 credits total**):

Code	Title	Hours
E&ES Gateway Course		
E&ES101	Dynamic Earth!	1.25
or E&ES115	Introduction to Planetary Geology	
or E&ES155	Earth System Science	
or E&ES197	Introduction to Environmental Studies	
Natural Science Courses & Mathematics *		
BIOL181 & BIOL182	Principles of Biology I: Cell Biology and Molecular Basis of Heredity and Principles of Biology II	4
or CHEM141 & CHEM142	General Chemistry I and General Chemistry II	
or CHEM143 & CHEM144	Honors General Chemistry I and Honors General Chemistry II	
or PHYS111 & PHYS112	Introductory Physics I and Introductory Physics II	
or PHYS113 & PHYS116	General Physics I and General Physics II	
or MATH121 & MATH122	Calculus I and Calculus II	
Upper-Level Electives **		7
E&ES195	Sophomore Field Course ***	.5
E&ES497	Senior Seminar #	1

* E&ES majors are required to take one year (two semesters) of gateway courses from two of these disciplines for a total of four courses.

**Students must complete seven upper-level courses.

***This course is typically taken during the spring semester of the sophomore year.

This course is typically taken during the senior year.

NATURAL SCIENCE COURSES

Upper-level courses in these disciplines can be substituted, as can statistics courses for mathematics. Students are urged to complete these introductory courses within their first two years. Students considering professional work in the sciences are encouraged to take gateways in more than two disciplines, including any associated lab courses, as well as upper-level coursework in other natural science and mathematics disciplines.

UPPER-LEVEL ELECTIVES

Students must complete seven upper-level courses. Five of these courses must cover the following thematic areas: two from "Earth and Planets" (numbered 201-233 and 301-333), two from "Hydrosphere, Biosphere, and Atmosphere" (numbered 234-266 and 334-366), and one from "Methods" (numbered 267-299 and 367-399). Lab courses associated with the primary courses are required. The remaining two courses may come from any thematic area. Also, the following can be used: up to two upper-level natural science or math courses taken in other departments, and up to two pre-

approved courses from study-abroad programs. At least four of the upper-level courses must be Wesleyan E&ES courses. Tutorials and the senior thesis do not count towards the requirement.

THEMATIC AREAS

EARTH AND PLANET COURSES

Code	Title	Hours
E&ES201	Geology of Connecticut	1
E&ES205	The Shaping of a Landscape: Exploring the Geology of Western North America	1.5
E&ES220 & E&ES221	Geomorphology and Geomorphology Laboratory	1.5
E&ES223 & E&ES224	Structural Geology and Field Geology	1.5
E&ES230 & E&ES231	Sedimentology and Sedimentology Laboratory	1.5
E&ES313 & E&ES314	Petrogenesis of Igneous and Metamorphic Rocks and Laboratory Study of Igneous and Metamorphic Rocks	1.5
E&ES319 & E&ES320	Meteorites and Cosmochemistry and Meteorites Laboratory	1.5
E&ES321	Planetary Evolution	1
E&ES325	Geologic Field Mapping	1
E&ES327	The Microbial Fossil Record	1

ECOSYSTEM AND ENVIRONMENT COURSES

Code	Title	Hours
E&ES234 & E&ES235	Geobiology and Geobiology Laboratory	1.5
E&ES238	The Forest Ecosystem	1
E&ES240	Invasive Species: Biology, Policy, and Management	1
E&ES242	Irrigation	1
E&ES244 & E&ES245	Soils and Soils Laboratory	1.5
E&ES246	Hydrology	1
E&ES250 & E&ES251	Environmental Geochemistry and Environmental Geochemistry Laboratory	1.5
E&ES257	Environmental Archaeology	1
E&ES258	Community Paleocology	1
E&ES260 & E&ES261	Oceans and Climate and Techniques in Ocean and Climate Investigations	1.5
E&ES312	Global Change Biogeography	1
E&ES327	The Microbial Fossil Record	1
E&ES329	Fire Ecology and Management	1
E&ES342	Ecological Resilience: The Good, the Bad, and the Mindful	1.25
E&ES350	Animals in Archaeology	1

METHOD COURSES

Code	Title	Hours
E&ES270	Quantitative Methods for the Biological and Environmental Sciences	1

E&ES280 & E&ES281	Introduction to GIS and GIS Service-Learning Laboratory	1.5
E&ES368	Isotope Geochemistry	1
E&ES375	Modeling the Earth and Environment	1
E&ES380	Advanced GIS and Spatial Analyses	1
E&ES385 & E&ES386	Remote Sensing and Remote-Sensing Laboratory	1.5
E&ES399	Calderwood Seminar in Public Writing: Environmental Science Journalism	1
E&ES568	Isotope Geochemistry	1

CAREER OPTIONS AND THE E&ES MAJOR

Earth and environmental sciences majors go on to pursue a wide range of careers, limited only by their own imaginations. **E&ES** courses can be selected to help prepare for a student's long-term interests. The course listings below are not requirements, but suggested guidelines. Students interested in academic or research careers should consider involvement in research or producing a senior thesis.

Geology. These courses can help prepare students for academic careers or jobs in industry or government in natural resource or geohazard management (e.g., USGS, water resources, mining and energy industries).

Code	Title	Hours
E&ES101	Dynamic Earth!	1.25
E&ES115	Introduction to Planetary Geology	1
E&ES155	Earth System Science	1.25
E&ES201	Geology of Connecticut	1
E&ES213 & E&ES214	Mineralogy and Laboratory Study of Minerals	1.5
E&ES220 & E&ES221	Geomorphology and Geomorphology Laboratory	1.5
E&ES223 & E&ES224	Structural Geology and Field Geology	1.5
E&ES230 & E&ES231	Sedimentology and Sedimentology Laboratory	1.5
E&ES246	Hydrology	1
E&ES260 & E&ES261	Oceans and Climate and Techniques in Ocean and Climate Investigations	1.5
E&ES280 & E&ES281	Introduction to GIS and GIS Service-Learning Laboratory	1.5
E&ES313 & E&ES314	Petrogenesis of Igneous and Metamorphic Rocks and Laboratory Study of Igneous and Metamorphic Rocks	1.5
E&ES321	Planetary Evolution	1
E&ES385 & E&ES386	Remote Sensing and Remote-Sensing Laboratory	1.5
E&ES497	Senior Seminar	1

Environmental Science/Environmental Chemistry. These courses can help prepare students for jobs in consulting, government, or nonprofit organizations (e.g., EPA, NOAA, USGS, state agencies), or for academic careers in climate science and water resources.

Code	Title	Hours
E&ES155	Earth System Science	1.25
E&ES197	Introduction to Environmental Studies	1
E&ES213 & E&ES214	Mineralogy and Laboratory Study of Minerals	1.5
E&ES220 & E&ES221	Geomorphology and Geomorphology Laboratory	1.5
E&ES223 & E&ES224	Structural Geology and Field Geology	1.5
E&ES234 & E&ES235	Geobiology and Geobiology Laboratory	1.5
E&ES244 & E&ES245	Soils and Soils Laboratory	1.5
E&ES248	Environmental Investigation and Remediation	1
E&ES250 & E&ES251	Environmental Geochemistry and Environmental Geochemistry Laboratory	1.5
E&ES260 & E&ES261	Oceans and Climate and Techniques in Ocean and Climate Investigations	1.5
E&ES270	Quantitative Methods for the Biological and Environmental Sciences	1
E&ES280 & E&ES281	Introduction to GIS and GIS Service-Learning Laboratory	1.5
E&ES380		1
E&ES368	Isotope Geochemistry	1
E&ES497	Senior Seminar	1
BIOL216	Ecology	1

Planetary Geology. These courses can help prepare students for jobs in government and industry (e.g., NASA, remote sensing, and GIS contractors) or for academic careers in space science and remote sensing.

Code	Title	Hours
E&ES101	Dynamic Earth!	1.25
E&ES115	Introduction to Planetary Geology	1
E&ES155	Earth System Science	1.25
E&ES213 & E&ES214	Mineralogy and Laboratory Study of Minerals	1.5
E&ES220 & E&ES221	Geomorphology and Geomorphology Laboratory	1.5
E&ES223 & E&ES224	Structural Geology and Field Geology	1.5
E&ES280 & E&ES281	Introduction to GIS and GIS Service-Learning Laboratory	1.5
E&ES313 & E&ES314	Petrogenesis of Igneous and Metamorphic Rocks and Laboratory Study of Igneous and Metamorphic Rocks	1.5
E&ES321	Planetary Evolution	1
E&ES385 & E&ES386	Remote Sensing and Remote-Sensing Laboratory	1.5

GENERAL EDUCATION

Candidates for honors in E&ES are required to complete the University's General Education Expectations through stage II.

STUDENT LEARNING GOALS

Students graduating with a BA degree in Earth and environmental sciences should be able to:

- **Decipher the structure, composition, and dynamics of the Earth system.** The student should understand the structure and composition of Earth's spheres (geosphere, hydrosphere, atmosphere, biosphere), and how these spheres interact with one another and change over time.
- **Apply the scientific method.** The student should be able to develop and test scientific hypotheses.
- **Understand data.** The student should understand how earth and environmental sciences data are produced, interpreted, and applied.
- **Apply quantitative tools.** The student should be able to select and apply appropriate quantitative techniques to Earth and environmental sciences questions (e.g., calculus, statistics, spatial analysis).
- **Use the primary literature.** The student should be able to search for and understand publications from the primary scientific literature.
- **Critically evaluate scientific claims.** The student should be able to critique arguments made in the Earth and environmental sciences literature.
- **Communicate.** The student should be able to present Earth and environmental sciences data and their interpretation in a variety of written, visual, and oral formats.
- **Conduct research.** The student should be able to carry out an original research project, including: the identification of a research problem; the formulation of a hypothesis; the design of the methodology; the collection, processing, and interpretation of data; and the presentation of findings in written, visual, and oral formats.

RELATED PROGRAMS OR CERTIFICATES

- **The College of the Environment**, which includes the environmental studies-linked major and Environmental Studies Certificate, provides a linkage between the sciences, public policy, economics, and the arts and provides a wide variety of career options.
- **The Planetary Science Group and the Planetary Science Course Cluster** seek to understand the origin and evolution of the solar system in which we live and the other solar systems that we have identified in our galaxy.
- **The Service-Learning Center and Service-Learning Course Cluster** seek to broaden students' understanding of course content through activities that are, at the same time, of service to the community.

BA/MA PROGRAM

Wesleyan offers a BA/MA program for exceptional Wesleyan students. The E&ES Department requirements for the BA/MA degree are the same as those of the MA degree outlined above, however please note the expectations for BA/MA students in the timeline.

For details about the BA/MA program see: https://www.wesleyan.edu/grad/graduate-programs/bama_program.html

For additional information, please visit wesleyan.edu/ees/graduate (<https://wesleyan.edu/ees/graduate/>)

HONORS

Candidates for honors in E&ES are required to complete the University's General Education Expectations through stage II.

CAPSTONE EXPERIENCE

Code	Title	Hours
E&ES409	Senior Thesis Tutorial	1
E&ES410	Senior Thesis Tutorial	1
E&ES497	Senior Seminar	1
E&ES498	Senior Field Research Project	.5