EARTH SCIENCE

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MAJOR IN EARTH SCIENCE

Earth Science provides the opportunity to learn about the history of our planet, the processes that have shaped it, and its position in the Universe, through the subfields of Geology, Meteorology, Oceanography, Astronomy, and Environmental Geoscience. Interest and employment in the Earth Sciences is driven by society's continued need for energy and natural materials, environmental protection, natural-hazard mitigation, and responsible stewardship of land and natural resources.

For students whose career interests are well-defined, the Earth Sciences Department offers major programs leading to the Bachelor of Science degree with concentrations in general earth science, environmental earth science, and geology. Programs leading to the Bachelor of Arts degree and the Bachelor of Science in Secondary Education are also available for students who have more general interests in earth science.

It is desirable that courses in chemistry, physics, and mathematics be completed in the freshman and sophomore years because they are prerequisites to several introductory earth science courses.

Bachelor of Science Degree in Earth Science:

General Earth Science Concentration

The B.S Earth Science with concentration in general earth science is for students who wish to pursue a rigorous scientific curricula and have broad interests in the earth sciences including geology, meteorology, oceanography, and astronomy.

Geology Concentration

The B.S. Earth Science with concentration in geology is designed for students who are interested in the study of the solid earth and intend to seek careers as professional geologists. The concentration prepares students for careers in geotechnical industries.
(energy, mining, agriculture, engineering, government agencies) and graduate-level study in geology and other related fields.

**Environmental Earth Science Concentration**

The B.S. Earth Science with concentration in Environmental Earth Science is designed for students who want to study Earth Science with an environmental focus. In addition to a foundational courses in geology, meteorology, oceanography, and physical science, the program includes additional coursework in the life sciences and public health. The concentration prepares students for careers in the environmental and geotechnical fields and graduate-level study in the earth and environmental sciences.

**Bachelor of Arts Degree in Earth Science**

The Bachelor of Arts in Earth Science provides a broad-based background in the fundamentals of Earth Sciences. It offers maximum flexibility in course selection to enhance interdisciplinary study and makes a double major easily accessible to students in related fields. It is designed for students who are interested in science and who wish to pursue a career in a field in which a scientific or technical background is necessary, but who do not want to follow one of the more specialized programs leading to the Bachelor of Science degree.

**Bachelor of Science Degree in Secondary Education**

The B.S. Earth Science with 7-12 teaching certification is intended for students who are interested in becoming middle and high school earth science and general science teachers. The curriculum involves core science content in general science, geology, meteorology, oceanography, astronomy, and environmental earth science as well as content related specifically to the teaching professions. Students who successfully receive the B.S. degree and pass Praxis® II will be recommended for Initial Teaching Certification.

The specific professional requirements for Initial Teaching Certification in Connecticut are listed in the secondary education section of the School of Education.
The department offers the following:

Earth Science, B.A.
Earth Science, B.S. - Concentration: General
Earth Science, B.S. - Concentration: Environmental
Earth Science, B.S. - Concentration: Geology
Earth Science 7-12, B.S.
Minor in Earth Science
EARTH SCIENCE 7-12, B.S.

This program has a separate admission process. Please consult the admission requirements for this program on the School of Education page for more information.

Overall GPA of 2.7 Required
120 Overall Credits Required

LIBERAL EDUCATION PROGRAM AND WRITING REQUIREMENTS

Liberal Education Program

50 Credits Required

Students must complete a comprehensive three-tiered Liberal Education Program (LEP). View all requirements of the tiers on the Liberal Education Program.

While the choice of courses that fulfill the requirements is generally left up to students, some departments require that students select specific courses to complement their major. This major has specific Tier requirements/restrictions for the following:

Tier 1 - Quantitative Reasoning (select one):
MAT 122 – Precalculus
MAT 150 – Calculus I

Tier 2 – American Experience (select one):
HIS 110 – United States History I
HIS 111 – United States History II

Tier 2 – Mind and Body:
SHE 203 – School Health

Tier 2 – Natural World I: Physical Realm:
CHE 120 – General Chemistry I

Tier 2 – Natural World II: Life and Environment:
ESC 201 — Historical Geology ('C-' or better)

Tier 2 - Social Structure, Conflict, and Consensus
EDU 200 - Teachers, Schools, and Society

Tier 2 – Time and Place:
ESC 210 — Principles of Astronomy ('C-' or better)

Tier 3 – Capstone:
ESC 332 – Invertebrate Paleontology ('C-' or better)
Writing Requirements (“W-Courses”)

Three W-courses are required. These may not be taken until after a student has passed ENG 112 — Writing Arguments. W-courses may count toward LEP, major, or cognate requirements, as well as free electives. Course sections that meet this requirement are designated by section numbers ending in “W”.

Transfer students who enter with 60 to 89 credits are required to pass two W-courses, while transfer students who enter with 90 credits or more must pass one W-course.

MAJOR REQUIREMENTS

62 Credits Required

Earth Science Requirements
35 Credits Required
‘C-‘ or better required

Requirements:
ESC 200 — Physical Geology
ESC 205 — Principles of Meteorology
ESC 220 — Physical and Chemical Oceanography
ESC 311 — Mineralogy
ESC 350 - Structural Geology and Tectonics
ESC 430 — Field Methods

Select one from:
• ESC 312 – Petrology
• ESC 325 – Stratigraphy and Sedimentation

Select one from:
• ESC 404 — Air Pollution Meteorology
• ESC 420 – Earth Resources
• ESC 421 – Marine Geology
• ESC 457 — Hydrology
• ESC 458 — Soil Science

Select two from:
• ESC 303 – Environmental Earth Science
• ESC 312 – Petrology
• ESC 315 — Geomorphology
• ESC 325 – Stratigraphy and Sedimentation
• ESC 404 — Air Pollution Meteorology
• ESC 420 – Earth Resources
• ESC 421 – Marine Geology
• ESC 457 — Hydrology
• ESC 458 — Soil Science

**Education Requirements**
27 Credits Required

Requirements:
EDU 316 - Child Development and Psychology for Educators
EDU 413 – Secondary Education
EDU 471 - Supporting English Learners for School Success (formerly IDS 471)
RDG 470 - Literacy in the Content Areas (formerly IDS 470)
SCE 490 – Science (Secondary School)
SCE 494 – Student Teaching (Science)
SCE 496 – Student Teaching Seminar (Science)
SED 482 – Teaching Exceptional Students in the Secondary Education Classroom

**Cognate Requirements**

8 Credits Required
Requirements:
PHY 200 – General Physics I

Select one from:
• BIO 102 – Biology I
• BIO 120 – Microbiology
• CHE 121 – General Chemistry II
• PHY 201 – General Physics II

Non-Course Requirement:
Pass Praxis® II with a score of 157 or higher

**Free Electives**

Students must take remaining credits to reach Overall Credits Required (listed above).
EARTH SCIENCE, B.S. - CONCENTRATION: ENVIRONMENTAL

120 Overall Credits Required

LIBERAL EDUCATION PROGRAM AND WRITING REQUIREMENTS

**Liberal Education Program**

50 Credits Required

Students must complete a comprehensive three-tiered Liberal Education Program (LEP). View all requirements of the tiers on the Liberal Education Program.

While the choice of courses that fulfill the requirements is generally left up to students, some departments require that students select specific courses to complement their major. This major has specific Tier requirements/restrictions for the following:

Tier 1 - Quantitative Reasoning (select one):
- MAT 122 – Precalculus
- MAT 150 – Calculus I

Tier 2 – Natural World I: Physical Realm:
- CHE 120 – General Chemistry I

Tier 2 – Natural World II: Life and Environment:
- ESC 201 — Historical Geology (‘C-’ or better)

Tier 2 – Time and Place:
- ESC 210 — Principles of Astronomy (‘C-’ or better)

Tier 3 – Capstone:
- ESC 332 – Invertebrate Paleontology (‘C-’ or better)

**Writing Requirements (“W-Courses”)**

Three W-courses are required. These may not be taken until after a student has passed ENG 112 — Writing Arguments. W-courses may count toward LEP, major, or cognate requirements, as well as free electives. Course sections that meet this requirement are designated by section numbers ending in “W”.

Transfer students who enter with 60 to 89 credits are required to pass two W-courses, while transfer students who enter with 90 credits or more must pass one W-course.

MAJOR REQUIREMENTS
46 Credits Required
‘C-’ or better required

Requirements:
ESC 200 — Physical Geology
ESC 205 — Principles of Meteorology
ESC 220 — Physical and Chemical Oceanography
ESC 303 – Environmental Earth Science
ESC 311 — Mineralogy
ESC 312 – Petrology
ESC 325 – Stratigraphy and Sedimentation
ESC 350 - Structural Geology and Tectonics
ESC 430 — Field Methods

Select three courses from:
• ESC 315 — Geomorphology
• ESC 404 — Air Pollution Meteorology
• ESC 420 – Earth Resources
• ESC 421 – Marine Geology
• ESC 457 — Hydrology
• ESC 458 — Soil Science

Select one option from the following two:
• ESC 492 – Undergraduate Thesis Proposal
  • and ESC 493 – Undergraduate Thesis
• Two additional ESC courses above the 200-level

COGNATE REQUIREMENTS

14 Credits Required

Requirements:
PHY 200 – General Physics I

Select one from:
• BIO 102 – Biology I
• BIO 120 – Microbiology
• BIO 233 - General Microbiology
• CHE 121 – General Chemistry II
• PHY 201 – General Physics II

Select two from:
• BIO 202 - Ecology
• BIO 210 - Environmental Biology and Conservation
• PCH 202 - Introduction to Public Health
• PCH 259 - Environmental Health
Non-Course Requirement:
Pass Praxis® II with a score of 157 or higher

FREE ELECTIVES

Remaining credits to reach total Overall Credits Required (listed above).
EARTH SCIENCE, B.A.

120 Overall Credits Required

LIBERAL EDUCATION PROGRAM AND WRITING REQUIREMENTS

Liberal Education Program

50 Credits Required

Students must complete a comprehensive three-tiered Liberal Education Program (LEP). View all requirements of the tiers on the Liberal Education Program.

While the choice of courses that fulfill the requirements is generally left up to students, some departments require that students select specific courses to complement their major. This major has specific Tier requirements/restrictions for the following:

Tier 1 - Quantitative Reasoning (select one):
MAT 122 – Precalculus
MAT 150 – Calculus I

Tier 2 – Natural World I: Physical Realm:
CHE 120 – General Chemistry I

Tier 2 – Natural World II: Life and Environment:
ESC 201 — Historical Geology (‘C-’ or better)

Tier 2 – Time and Place:
ESC 210 — Principles of Astronomy (‘C-’ or better)

Tier 3 – Capstone:
ESC 332 – Invertebrate Paleontology (‘C-’ or better)

Writing Requirements (“W-Courses”)

Three W-courses are required. These may not be taken until after a student has passed ENG 112 — Writing Arguments. W-courses may count toward LEP, major, or cognate requirements, as well as free electives. Course sections that meet this requirement are designated by section numbers ending in “W”.

Transfer students who enter with 60 to 89 credits are required to pass two W-courses, while transfer students who enter with 90 credits or more must pass one W-course.

MAJOR REQUIREMENTS

32 Credits Required
‘C’ or better required

Requirements:
ESC 200 — Physical Geology
ESC 205 — Principles of Meteorology
ESC 220 — Physical and Chemical Oceanography
ESC 311 — Mineralogy
ESC 350 - Structural Geology and Tectonics
ESC 430 — Field Methods

Select one from:
- ESC 312 — Petrology
- ESC 325 — Stratigraphy & Sedimentation

Select two from (at least one at 400-level):
- ESC 303 – Environmental Earth Science
- ESC 312 – Petrology
- ESC 315 — Geomorphology
- ESC 325 – Stratigraphy and Sedimentation
- ESC 404 — Air Pollution Meteorology
- ESC 420 – Earth Resources
- ESC 421 – Marine Geology
- ESC 457 — Hydrology
- ESC 458 — Soil Science

COGNATE REQUIREMENTS

8 Credits Required

Requirements:
PHY 200 - General Physics I

Select one from:
- BIO 102 – Biology I
- BIO 120 – Microbiology
- CHE 121 – General Chemistry II
- PHY 201 – General Physics II

Non-Course Requirements:
Pass Praxis® II with a score of 157 or higher

FREE ELECTIVES

Remaining credits to reach Overall Credits Required (listed above).
EARTH SCIENCE, B.S. - CONCENTRATION: GEOLOGY

120 Overall Credits Required

LIBERAL EDUCATION PROGRAM AND WRITING REQUIREMENTS

Liberal Education Program

50 Credits Required

Students must complete a comprehensive three-tiered Liberal Education Program (LEP). View all requirements of the tiers on the Liberal Education Program.

While the choice of courses that fulfill the requirements is generally left up to students, some departments require that students select specific courses to complement their major. This major has specific Tier requirements/restrictions for the following:

Tier 1 - Quantitative Reasoning (select one):
MAT 122 – Precalculus
MAT 150 – Calculus I

Tier 2 – Natural World I: Physical Realm:
CHE 120 – General Chemistry I

Tier 2 – Natural World II: Life and Environment:
ESC 201 — Historical Geology (‘C-’ or better)

Tier 2 – Time and Place:
ESC 210 — Principles of Astronomy (‘C-’ or better)

Tier 3 – Capstone:
ESC 332 – Invertebrate Paleontology (‘C-’ or better)

Writing Requirements (“W-Courses”)

Three W-courses are required. These may not be taken until after a student has passed ENG 112 — Writing Arguments. W-courses may count toward LEP, major, or cognate requirements, as well as free electives. Course sections that meet this requirement are designated by section numbers ending in “W”.

Transfer students who enter with 60 to 89 credits are required to pass two W-courses, while transfer students who enter with 90 credits or more must pass one W-course.

MAJOR REQUIREMENTS
45 Credits Required
‘C-’ or better required

Requirements:
ESC 200 — Physical Geology
ESC 311 — Mineralogy
ESC 312 – Petrology
ESC 325 – Stratigraphy and Sedimentation
ESC 350 – Structural Geology and Tectonics
ESC 430 — Field Methods

Select six courses courses (at least three at the 400-level) from:

• ESC 205 — Principles of Meteorology
• ESC 220 — Physical and Chemical Oceanography
• ESC 303 – Environmental Earth Science
• ESC 315 – Geomorphology
• ESC 404 — Air Pollution Meteorology
• ESC 420 – Earth Resources
• ESC 421 – Marine Geology
• ESC 457 — Hydrology
• ESC 458 — Soil Science

Select one option from the two listed below:

• ESC 492 – Undergraduate Thesis Proposal and ESC 493 – Undergraduate Thesis
• Two additional ESC courses above the 200-level

COGNATE REQUIREMENTS

8 Credits Required

Requirements:
PHY 200 - General Physics I

Select one from:

• BIO 102 – Biology I
• BIO 120 – Microbiology
• CHE 121 – General Chemistry II
• PHY 201 – General Physics II

Non-Course Requirements:
Pass Praxis® II with a score of 157 or higher

FREE ELECTIVES

Remaining credits to reach Overall Credits Required (listed above).
EARTH SCIENCE, B.S. - CONCENTRATION: GENERAL

120 Overall Credits Required

LIBERAL EDUCATION PROGRAM AND WRITING REQUIREMENTS

**Liberal Education Program**

50 Credits Required

Students must complete a comprehensive three-tiered Liberal Education Program (LEP). View all requirements of the tiers on the Liberal Education Program.

While the choice of courses that fulfill the requirements is generally left up to students, some departments require that students select specific courses to complement their major. This major has specific Tier requirements/restrictions for the following:

Tier 1 - Quantitative Reasoning (select one):
MAT 122 – PreCalculus
MAT 150 - Calculus I

Tier 2 – Natural World I: Physical Realm:
CHE 120 – General Chemistry I

Tier 2 – Natural World II: Life and Environment:
ESC 201 — Historical Geology (‘C-’ or better)

Tier 2 – Time and Place:
ESC 210 — Principles of Astronomy (‘C-’ or better)

Tier 3 – Capstone:
ESC 332 – Invertebrate Paleontology (‘C-’ or better)

**Writing Requirements (‘W-Courses’)**

Three W-courses are required. These may not be taken until after a student has passed ENG 112 — Writing Arguments. W-courses may count toward LEP, major, or cognate requirements, as well as free electives. Course sections that meet this requirement are designated by section numbers ending in “W”.

Transfer students who enter with 60 to 89 credits are required to pass two W-courses, while transfer students who enter with 90 credits or more must pass one W-course.

MAJOR REQUIREMENTS
47 Credits Required
‘C-’ or better required

Requirements:
ESC 200 — Physical Geology
ESC 205 — Principles of Meteorology
ESC 220 — Physical and Chemical Oceanography
ESC 311 — Mineralogy
ESC 312 – Petrology
    or ESC 325 – Stratigraphy and Sedimentation
ESC 350 - Structural Geology and Tectonics
ESC 430 — Field Methods

21 Credits of ESC at the 300 to 400-level

COGNATE REQUIREMENTS

8 Credits Required

Requirements:
PHY 200 – General Physics I

Select one from:
• BIO 102 – Biology I
• BIO 120 – Microbiology
• CHE 121 – General Chemistry II
• PHY 201 – General Physics II

FREE ELECTIVES

Remaining credits to reach total Overall Credits Required (listed above).
COURSES

ESC 103 - General Geology
A survey of the fundamental principles of physical and historical geology. Topics include the formation of rocks and minerals, the structure of the earth's interior, the processes that shape the surface landscape, and the evolution of earth over time. Lecture, 2 hours; Laboratory, 2 hours.
Prerequisite(s): MAT 100 or MAT 100P or higher.
Last Offered: Spring 2020
3 credits

ESC 104 - Geohazards: The Impact on the Environment
Survey of earth sciences through an examination of natural hazards including causes and effects of earthquakes, tsunamis, volcanoes, floods, landslides, hurricanes, tornados, droughts, wildfires, climate change, and impacts of extraterrestrial objects. Discussion focuses on personal and societal adjustments to these hazards. Lecture, 2 hours; Laboratory, 2 hours.
Prerequisite(s): MAT 100 or MAT 100P or or higher.
Last Offered: Spring 2020
3 credits

ESC 105 - General Meteorology
An introduction to meteorology for non-science majors. Includes instrument use, data interpretation, making weather forecasts, and climates and their change. Lecture, 2 hours; laboratory 2 hours. Not open to biology, chemistry, earth science, and physics majors.
Prerequisite(s): MAT 100 or MAT 100P or higher.
Last Offered: Spring 2020
3 credits

ESC 106 - General Oceanography
Physical, chemical, geological, and biological aspects of the ocean basins and waters. The historical development and interdisciplinary nature of oceanography are stressed. Recommended for non-science majors. Not open to biology, chemistry, earth science, and physics majors.
Lecture, 2 hours; laboratory, 2 hours.
Prerequisite(s): MAT 100 or MAT 100P or higher.
Last Offered: Spring 2020
3 credits

ESC 107 - General Astronomy
An introduction to the universe for non-science majors. Lecture, 2 hours; laboratory 2 hours. Not open to students who have credit for or are currently registered for ESC 210. Not open to biology, chemistry, earth science, and physics majors.
Prerequisite(s): MAT 100 or MAT 100P or higher.
Last Offered: Fall 2018
3 credits

ESC 111 - Life Through Time
The origin and evolution of life on earth, including an introduction to the geological and biological foundations of evolutionary theory in addition to an overview of the important evolutionary events in earth history. Laboratory will include examination and comparison of the primary invertebrate and vertebrate fossil groups. Recommended for non-science majors. Lecture, 2 hours; Laboratory, 2 hours.
Prerequisite(s): MAT 100 or MAT 100P or higher.
Last Offered: Spring 2020
3 credits
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Description</th>
<th>Lecture Hours</th>
<th>Laboratory Hours</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESC 115</td>
<td>Stories from Stone: a Geological History of Connecticut</td>
<td>A study of the development of the unique landscape of Connecticut, which is the result of complex tectonic and geologic processes spanning approximately 500 million years of geologic time. Lecture, 2 hours; Laboratory, 2 hours. 3 credits.</td>
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<tr>
<td>ESC 200</td>
<td>Physical Geology</td>
<td>Introduction to the fundamental concepts of physical geology including the composition, structure, and dynamics of the earth from the atomic scale of minerals to the planetary scale of plate tectonics. Recommended for students with concentrated interest in the sciences and for those who are interested in pursuing a degree in Earth Science or science teaching certification. Lecture, 3 hours; laboratory, 3 hours. Prerequisite(s): MAT 103 or higher (may be taken concurrently).</td>
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<tr>
<td>ESC 201</td>
<td>Historical Geology</td>
<td>Evolution of the earth and life through time, with emphasis on the geologic history of North America. Lecture, 3 hours; laboratory, 3 hours. Prerequisite(s): MAT 103 or higher (may be taken concurrently) or placement above MAT 108.</td>
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<tr>
<td>ESC 205</td>
<td>Principles of Meteorology</td>
<td>Description of atmospheric phenomena and discussion of their underlying physical principles. Lecture, 3 hours; laboratory, 3 hours. Prerequisite(s): MAT 103 or higher.</td>
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<tr>
<td>ESC 210</td>
<td>Principles of Astronomy</td>
<td>A survey of astronomy addressing topics ranging from earth’s time of day to the solar system, stars, galaxies, and origin and evolution of the universe. Exploration of the philosophical and societal interaction with the scientific understanding of the universe. Telescopic observing sessions are included. Lecture, 3 hours; laboratory, 2 hours. Prerequisite(s): MAT 108 or higher; and PHY 200 or PHY 210 or higher. Last Offered: Fall 2019 4 credits</td>
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<tr>
<td>ESC 220</td>
<td>Physical and Chemical Oceanography</td>
<td>Introduction to the physical and chemical characteristics of ocean water and the ocean basins. The course focuses on the composition and properties of sea water, waves, tides, coastal processes, and ocean circulation. The relationships between chemical and physical oceanographic processes and the geology and biology of the oceans will be explored. Recommended for science majors or those with an aptitude for science. Lecture, 2 hours; laboratory, 2 hours. Prerequisite(s): MAT 103 or higher (may be taken concurrently).</td>
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<tr>
<td>ESC 303</td>
<td>Environmental Earth Science</td>
<td>The collection, interpretation and utilization of natural resource information as it applies to environmental decision making. Lecture, 3 hours. Prerequisite(s): ’C-' or better in ESC 200 or ESC 201.</td>
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<tr>
<td>ESC 311</td>
<td>Mineralogy</td>
<td>Systematic study of minerals. Lecture, 3 hours; laboratory, 3 hours. Prerequisite(s): CHE 120 and 'C-' or better in ESC 200 or ESC 201. Last Offered: Fall 2019 4 credits</td>
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</tbody>
</table>
ESC 312 - Petrology
Occurrence, classification, and genesis of igneous and metamorphic rocks. Silicate melt equilibria, rock associations, petrography and field relations. Lecture, 3 hours; laboratory, 3 hours.
Prerequisite(s): 'C-' or better in ESC 311.
Last Offered: Spring 2019
4 credits

ESC 315 - Geomorphology
Study of the earth’s surface features with emphasis on fluvial, eolian, and glacial landforms on maps and aerial photographs. Lecture, 2 hours; laboratory, 2 hours.
Prerequisite(s): 'C-' or better in ESC 200 or ESC 201.
Last Offered: Spring 2019
3 credits

ESC 325 - Stratigraphy and Sedimentation
Occurrence, genesis, and physical and chemical properties of sediments. Methods of using ancient sediments to determine geological history. Lecture, 3 hours; laboratory, 3 hours.
Prerequisite(s): 'C-' or better in both ESC 201 and ESC 311.
Last Offered: Spring 2020
4 credits

ESC 332 - Invertebrate Paleontology and the Fossil Record
Overview of the major groups of invertebrate fossils and their depositional environments. Class discussions include important concepts in paleontology and paleobiology including the origins of life, speciation, evolutionary theory and the patterns, taphonomy, biostratigraphy, and also ethical issues in paleontology, which students examine in depth as part of a culminating project. A laboratory component includes examination of fossil invertebrates and plants using hand specimens and microscopes. Lecture, 3 hours; Laboratory, 3 hours.
Prerequisite(s): 'C-' or better in BIO 102 or ESC 201, junior or senior status, 6 of 8 Tier 2 complete (Honors 15 cr. HON or 45 cr. total), and prior or concurrent completion of all Tier 1 (Honors Coll.: T1MC and T1QR only).
Last Offered: Spring 2018
4 credits

ESC 350 - Structural Geology and Tectonics
Orientation, measurement description, and analysis of planar and linear structures in rocks, including folds, faults, and fabrics. Basic concepts of strain and stress and the behavior of earth materials during deformation, linked to regional and structural data, and construction of geologic maps and cross-sections. Lecture, 3 hours; laboratory, 3 hours.
Prerequisite(s): 'C-' or better in both ESC 201 and ESC 311.
Last Offered: Fall 2018
4 credits

ESC 359 - Engineering Geology
Geological factors which influence engineering practice and environmental impact of engineering works. Soils, groundwater, materials of construction, tunnels, foundations, dams, shoreline installations. Lecture, 2 hours; Laboratory, 2 hours.
Prerequisite(s): 'C-' or better in ESC 200 or GEO 201.
Last Offered: Spring 2019
3 credits
ESC 404 - Air Pollution Meteorology
Physical aspects of the atmosphere that determine air quality. Emphasis on modeling. 3 hours lecture. Prerequisite(s): 'C-' or better in ESC 205.
Last Offered: Spring 2016
3 credits

ESC 420 - Earth Resources
Geologic occurrence, methods of exploration, production, and use of the principal metallic and non-metallic ores. Lecture, 2 hours; laboratory, 2 hours.
Prerequisite(s): 'C-' or better in both ESC 201 and ESC 311.
Last Offered: Spring 2018
3 credits

ESC 421 - Marine Geology
Provides a comprehensive survey of modern marine geology with an emphasis on the deep sea. It will examine the physical and chemical processes that control the geology and structure of the continental margins and ocean basins including plate tectonics and marine sedimentation. Lecture, 2 hours; laboratory, 3 hours.
Prerequisite(s): 'C-' or better in (ESC 200 or ESC 201) and ESC 220 and one ESC course at the 300 or 400 level.
Last Offered: Spring 2020
3 credits

ESC 430 - Field Methods
The techniques of geologic mapping and surveying by brunnont compass and plane table. Geologic reports and problem solving based on field observations. Lecture, 1 hour; laboratory, 7 hours.
Prerequisite(s): 'C-' or better in ESC 312 or ESC 350 or ESC 325.
Last Offered: Fall 2019
3 credits

ESC 457 - Hydrology
The development and utilization of water resources; ground-water occurrence, stream flow, and flooding. Lecture, 2 hours; laboratory, 2 hours.
Prerequisite(s): 'C-' or better in ESC 200 or ESC 201, and 'C-' or better in one course above ESC 300.
Last Offered: Fall 2018
3 credits

ESC 458 - Soil Science
Study of the soil-forming processes and properties of soil, with special attention to soils in land use decision making. Lecture, 2 hours; Laboratory, 3 hours.
Prerequisite(s): 'C-' or better in ESC 311.
Last Offered: Fall 2019
3 credits

ESC 460 - Geochemistry
The chemistry of natural materials and systems including the chemical evolution of the earth over geological time. Covers both practical and theoretical geochemistry, with an emphasis on how chemical principles are used to study earth sciences. Laboratory exercises focus on chemical analysis of earth materials from field collection to common instrumental methods and data analysis. Lecture, 2 hours; Laboratory, 3 hours.
Prerequisite(s): 'C-' or better in ESC 311.
Last Offered: Spring 2020
3 credits

ESC 492 - Undergraduate Thesis Proposal
Preparation of an undergraduate thesis proposal in the earth sciences. Pass/fail only.
Prerequisite(s): Junior or senior ESC majors who have completed a minimum of 24 ESC credits and permission of instructor (faculty mentor).
Last Offered: Fall 2017
1 credits
ESC 493 - Undergraduate Thesis

The completion of a research project and reporting of this work in an undergraduate thesis, which must be defended successfully before the department.
Prerequisite(s): ESC 492 and permission of instructor (faculty mentor).
Last Offered: Fall 2018
3 credits

ESC 499 - Independent Study and Research

No Description Available
Prerequisite(s): Departmental permission.
Last Offered: Fall 2018
1 to 3 credits