Geoscience, B.S.

Learning Outcomes
Geoscience B.S. graduates will:
• understand the structure, composition, and physical processes of the Earth;
• understand the coevolution of the Earth-Life System;
• have the ability to interpret the geologic record in the field;
• understand how to assess and utilize our natural resources in a sustainable manner; and
• develop a quantitative analytical skill set to integrate the diverse array of Earth sciences and related disciplines.

Overview
The B.S. in geoscience offers students an extensive and comprehensive background in the Earth sciences and related scientific disciplines, and is geared toward a career in the geosciences. Strengths of the department include environmental geology, geochemistry, geophysics, paleontology, stratigraphy, tectonics, basin analysis, surficial processes, petrology, and volcanology. Students gain extensive field experience and training, and are able to integrate field studies and analytical research, with knowledge gained in the classroom. Opportunities are provided for local, regional, and international field experiences as well as for individual research projects.

Requirements
The Bachelor of Science with a major in geoscience requires a minimum of 120 s.h., including at least 74 s.h. of work for the major (at least 43 s.h. in earth and environmental sciences courses and at least 31 s.h. in supporting disciplines). Students must maintain a g.p.a. of at least 2.00 in all courses for the major and in all UI courses for the major. Transfer students must complete a minimum of 15 s.h. of course work in the Department of Earth and Environmental Sciences.

The department recommends that students fulfill the GE CLAS Core World Languages requirement with French, German, Russian, or Spanish and the Social Sciences requirement with approved course work in economics, geography, or anthropology.

The B.S. with a major in geoscience requires the following course work.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Earth and Environmental Sciences Courses</td>
<td>43-44</td>
</tr>
<tr>
<td></td>
<td>Mathematics Courses</td>
<td>11-12</td>
</tr>
<tr>
<td></td>
<td>Chemistry Courses</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Physics Courses</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Biology Course</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Independent Research Option</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total Hours</td>
<td>74-76</td>
</tr>
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</table>

Earth and Environmental Sciences

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td></td>
<td>One of these: EES:1030 Introduction to Earth Science</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>EES:1050 Introduction to Geology</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>All of these: EES:1040 Evolution and the History of Life</td>
<td>4</td>
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<tr>
<td></td>
<td>EES:2200 Historical Geology</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>EES:2410 Mineralogy</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>EES:2831 Geologic Field Methods</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>EES:3300 Sedimentary Geology</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>EES:3500 Igneous and Metamorphic Petrolgy</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>EES:3840 Structural Geology</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>EES:4832 Geologic Field Analysis</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>One of these: EES:3210 Principles of Paleontology</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>EES:4490 Elements of Geochemistry</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>EES:4630 Hydrogeology</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>EES:4790 Engineering Geology</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>EES:4800 Solid Earth Geophysics</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>And: Earth and environmental sciences electives numbered EES:3000 or above; see &quot;Recommended Electives&quot; below</td>
<td>6-7</td>
</tr>
</tbody>
</table>

Mathematics

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>One of these: MATH:1550 Engineering Mathematics I: Single Variable Calculus</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>MATH:1850 Calculus I</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>One of these: MATH:1560 Engineering Mathematics II: Multivariable Calculus</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>MATH:1860 Calculus II</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>And: An additional mathematics course numbered MATH:2000 or above, or a computer science course numbered CS:1110 or above, or a statistics course numbered STAT:2010 or above, or EES:3100, or EES:4300 (if the EES courses are not used to satisfy the earth and environmental sciences electives requirement)</td>
<td>3-4</td>
</tr>
</tbody>
</table>

Chemistry

Students must complete at least 8 s.h. of college-level chemistry, including the following sequence or equivalent courses or more advanced courses. Chemistry courses numbered below CHEM:1110 Principles of Chemistry I do not count toward this requirement.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CHEM:1110 &amp; CHEM:1120 Principles of Chemistry I-II</td>
<td>8</td>
</tr>
</tbody>
</table>
**Physics**

Students must complete at least 8 s.h. of college-level physics, as follows. Physics courses numbered below PHYS:1511 College Physics I do not count toward this requirement.

**Code** | **Title** | **Hours**
--- | --- | ---
One of these sequences:  
PHYS:1511-  
PHYS:1512 | College Physics I-II | 8
PHYS:1611-  
PHYS:1612 | Introductory Physics I-II | 8

**Biology**

Students must complete at least one biology course that includes a laboratory (4 s.h.). Students with an interest in paleontology are encouraged to take BIOL:1411 Foundations of Biology and BIOL:1412 Diversity of Form and Function.

**Code** | **Title** | **Hours**
--- | --- | ---
One biology course (includes a lab) | 4

**Recommended Electives**

All students should take elective courses from the following groups in order to broaden their undergraduate experience and prepare themselves for graduate study or professional employment. Students who have clear career goals are advised to take three or more elective courses from the group that fits their needs most closely. Students also may seek a broad education in geoscience by choosing elective courses from a number of groups.

**Quaternary Geology**

**Code** | **Title** | **Hours**
--- | --- | ---
EES:3020 | Earth Surface Processes | 3
EES:3060 | Ecology and Natural History of Iowa | 3
EES:3100 | Introduction to Applied Remote Sensing | 4
EES:3360 | Soil Genesis and Geomorphology | 3
EES:3380 | Fluvial Geomorphology | 3
EES:4490 | Elements of Geochemistry | 3
EES:4520 | Isotope Geochemistry | 3
EES:4630 | Hydrogeology | 3
EES:4790 | Engineering Geology | 3
EES:4820 | Tectonics and Basin Analysis | 3
EES:3390 | Integrated Watershed Analysis | 3
EES:4490 | Elements of Geochemistry | 3
EES:4520 | Isotope Geochemistry | 3
EES:4630 | Hydrogeology | 3
EES:4680 | Field Methods in Hydrologic Science | 3
EES:4790 | Engineering Geology | 3
EES:4800 | Solid Earth Geophysics | 3

**Geochemistry**

**Code** | **Title** | **Hours**
--- | --- | ---
EES:4410 | Analytical Methods Seminar | 2
EES:4490 | Elements of Geochemistry | 3
EES:4520 | Isotope Geochemistry | 3
EES:4630 | Hydrogeology | 3
EES:4820 | Tectonics and Basin Analysis | 3

**Tectonics/Petrology**

**Code** | **Title** | **Hours**
--- | --- | ---
EES:3350 | Active Tectonics | 3
EES:4410 | Analytical Methods Seminar | 2
EES:4490 | Elements of Geochemistry | 3
EES:4520 | Isotope Geochemistry | 3
EES:4530 | Volcanology | 3
EES:4750 | Mineral and Petroleum Exploration Geology | 3
EES:4800 | Solid Earth Geophysics | 3
EES:4820 | Tectonics and Basin Analysis | 3

**Sedimentary Geology**

**Code** | **Title** | **Hours**
--- | --- | ---
EES:3080 | Introduction to Oceanography | 2
EES:3300 | Sedimentary Geology | 4
EES:3380 | Fluvial Geomorphology | 3
EES:3770 | Global Stratigraphy | 3
EES:4490 | Elements of Geochemistry | 3
EES:4520 | Isotope Geochemistry | 3
EES:4750 | Mineral and Petroleum Exploration Geology | 3
EES:4820 | Tectonics and Basin Analysis | 3

**Paleobiology**

**Code** | **Title** | **Hours**
--- | --- | ---
EES:3030 | Conservation Paleobiology | 4
EES:3070 | Marine Ecosystems and Conservation | 3
EES:3080 | Introduction to Oceanography | 2
EES:3210 | Principles of Paleontology | 3
EES:3220 | Evolution of the Vertebrates | 3
EES:3300 | Sedimentary Geology | 4
EES:3770 | Global Stratigraphy | 3
EES:4420 | Vertebrate Osteology and Phylogeny | 3
EES:4490 | Elements of Geochemistry | 3
EES:4520 | Isotope Geochemistry | 3
EES:4700 Evolution of Ecosystems 3
EES:4710 Evolution of Plants 3
EES:4820 Tectonics and Basin Analysis 3

**Independent Research Option**

A junior or senior who is ready to pursue independent research for credit in geoscience may assist a faculty member or graduate student with a current research project EES:2190 Directed Study or may initiate a small-scale project involving a combination of field, laboratory, and library investigation in EES:3190 Directed Study. Independent study is encouraged and may lead to an honors thesis in EES:4999 Honors Thesis in Geoscience or a senior thesis in EES:4990 Senior Thesis in Geoscience that may be published subsequently.

**Teacher Licensure**

Majors interested in earning licensure to teach in elementary and/or secondary schools must complete the College of Education’s Teacher Education Program (TEP) in addition to the requirements for the major and all requirements for graduation. The TEP requires several College of Education courses and student teaching. Contact the Office of Student Services in the College of Education for details.

Students must satisfy all degree requirements and complete TEP licensure before degree conferral.

Students with a strong interest in science teaching may complete a science education major. Students choose one of five emphases—biology, chemistry, earth science, physics, or all-science. They may apply for admission to the TEP. See the B.S. in science education in the Teaching and Learning (College of Education) section of the Catalog.

**Honors**

**Honors in the Major**

Students have the opportunity to graduate with honors in the major. Departmental honors students must maintain a cumulative g.p.a. of at least 3.33 in all University of Iowa course work and in all geoscience courses. Students must complete a senior thesis, registering in EES:4999 Honors Thesis in Geoscience. They must obtain approval of their honors thesis contract from their advisor and the department's undergraduate committee, and they must earn a grade of B or higher in EES:4999.

**National Honor Society**

The department sponsors a chapter of Sigma Gamma Epsilon National Honor Society for the Earth Sciences. Students with an overall g.p.a. of at least 2.80 and at least 3.20 in geoscience courses are considered for membership after they have completed a minimum of 16 s.h. of course work in geoscience. Consult the departmental honors advisor for more information.

**University of Iowa Honors Program**

In addition to honors in the major, students have opportunities for honors study and activities through membership in the University of Iowa Honors Program; visit Honors at Iowa to learn about the University’s honors program.

Membership in the UI Honors Program is not required to earn honors in the geoscience major.

**Academic Plans**

**Four-Year Graduation Plan**

The following checkpoints list the minimum requirements students must complete by certain semesters in order to stay on the University's Four-Year Graduation Plan. Courses in the major are those required to complete the major; they may be offered by departments other than the major department.

These checkpoints show the range of required course work; the Bachelor of Science requires a minimum of 19 courses.

The major requires field trip experiences, many of which take place during breaks in or between semesters or during the summer session. These checkpoints do not include the field trip requirements.

Before the third semester begins: competence in math through trigonometry and the first required chemistry course

Before the fifth semester begins: three to five courses in the major, including the remainder of the chemistry requirement and continuation of the mathematics requirement

Before the seventh semester begins: 7-11 courses in the major and at least 90 s.h. earned toward the degree

Before the eighth semester begins: 10-14 courses in the major

During the eighth semester: enrollment in all remaining course work in the major, all remaining GE CLAS Core courses, and a sufficient number of semester hours to graduate

**Sample Plan of Study**

Sample plans represent one way to complete a program of study. Actual course selection and sequence will vary and should be discussed with an academic advisor. For additional sample plans, see MyUI.

**Geoscience, B.S.**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Academic Career</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any Semester</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Research: students are strongly encouraged to be active participants in research within the department.</td>
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<td></td>
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<tr>
<td>While only two field courses are required, students are encouraged to participate in additional field experiences, whenever possible.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>First Year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EES:1030 or EES:1050</td>
<td>Introduction to Earth Science or Introduction to Geology</td>
<td>4</td>
</tr>
<tr>
<td>CHEM:1110</td>
<td>Principles of Chemistry I b, c</td>
<td>4</td>
</tr>
<tr>
<td>MATH:1850</td>
<td>Calculus I b, d</td>
<td>4</td>
</tr>
<tr>
<td>ENGL:1200 or RHET:1030</td>
<td>The Interpretation of Literature or Rhetoric</td>
<td>3 - 4</td>
</tr>
<tr>
<td>CSI:1600</td>
<td>Success at Iowa</td>
<td>2</td>
</tr>
<tr>
<td><strong>Hours at Iowa</strong></td>
<td></td>
<td>17-18</td>
</tr>
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</table>
Spring
ENGL:1200 The Interpretation of Literature or Rhetoric 3 - 4
EES:2200 Historical Geology 4
CHEM:1120 Principles of Chemistry II 4
MATH:1860 Calculus II 4

Hours 15-16

Summer
EES:2831 Geologic Field Methods 3

Hours 3

Second Year

Fall
EES:2410 Mineralogy 4
EES:1040 Evolution and the History of Life 4
PHYS:1611 Introductory Physics I 4
GE CLAS Core: World Languages First Level Proficiency or elective course 4 - 5

Hours 16-17

Spring
EES:3500 Igneous and Metamorphic Petrolgy 4
PHYS:1612 Introductory Physics II 4
GE CLAS Core: Values and Culture f 3
GE CLAS Core: World Languages Second Level Proficiency or elective course 4 - 5

Hours 15-16

Third Year

Fall
EES:3300 Sedimentary Geology 4
Major: geoscience elective course prefix EES numbered 3000 or above 3 - 4
GE CLAS Core: Historical Perspectives f 3
GE CLAS Core: World Languages Second Level Proficiency or elective course 4 - 5

Hours 14-16

Spring
EES:3840 Structural Geology 4
Major: biology lab science course (prefix BIOL) 4
GE CLAS Core: Social Sciences f 3
GE CLAS Core: World Languages Fourth Level Proficiency or elective course 4 - 5

Hours 15-16

Summer
EES:4832 Geologic Field Analysis 3

Hours 3

Fourth Year

Fall
Major: math/statistics/computer science course 3 - 4
Major: geoscience elective course prefix EES numbered 3000 or above 3 - 4
GE CLAS Core: Literary, Visual, and Performing Arts f 3
GE CLAS Core: International and Global Issues f 3
Elective course h 1 - 3

Hours 13-17

Spring
Major: geoscience "select one" course 3 - 4
GE CLAS Core: Diversity and Inclusion f 3
Elective course h 3

Elective course h 3

Degree Application: apply on MyUI before deadline (typically in February for spring, September for fall) f

<table>
<thead>
<tr>
<th>Hours</th>
<th>15-16</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Hours</td>
<td>126-138</td>
</tr>
</tbody>
</table>

Career Advancement

The B.S. in geoscience is designed to prepare students for immediate employment after graduation or for admission to graduate study in earth and environmental sciences. Degree recipients also have been employed in the ancillary fields of public policy, environmental engineering, law, business, archaeology, science education, museum curation, and other allied fields. Nearly all University of Iowa geoscience graduates gain employment or move on to graduate programs following completion of their degree.

Employment opportunities for graduates are typically in environmental corporations and consulting agencies; natural resource corporations; local, state, and federal agencies, such as geological surveys, educational institutions, conservation agencies, museums, and departments of urban planning, natural resources, and water resource management; nonprofit organizations; research institutions; and ecotourism. Companies such as ExxonMobil recruit Iowa graduates on campus.

The Pomerantz Career Center offers multiple resources to help students find internships and jobs.