GEOLOGY - BACHELOR OF ARTS (BA)

The options available in the undergraduate program in geological sciences are geology and geophysics and lead to the BA degree. Both options provide a strong basis for understanding the functioning of the Earth system. Students who are uncertain as to which option best suits their needs should contact a departmental advisor or faculty member. In each option, the undergraduate program emphasizes course work in theoretical, laboratory and field-oriented aspects of the geological sciences. The nearby Rocky Mountains provide a natural laboratory for many of these courses.

Students interested in the geological sciences may also wish to consider the Baker Residential Academic Program. Students who do not wish to pursue a career in the geosciences, or who would like to combine a basic knowledge of geologic sciences with that of some other field, should consider using geological sciences as one subject in a distributed studies major or as a minor. Students who intend to graduate study in the geological sciences are encouraged to consider developing an honors thesis as part of their undergraduate studies.

The two options available in the undergraduate major offer different focus areas of instruction. Both options offer excellent preparation for students interested in pursuing professional careers, or graduate study, in the geological sciences.

Each option emphasizes knowledge in:

- the ways in which Earth responds to internal and external forces; the physical, chemical and biological evolution of Earth; and the nature of the materials of which the Earth is made
- the role of physics, chemistry, mathematics and biology in understanding geological processes
- the history of discoveries and ideas that have contributed to our current knowledge of Earth and the planetary system

Geology Track

The geology option emphasizes processes that function both in the solid earth and at Earth's surface:

- the mineralogy and petrology of igneous, metamorphic and sedimentary rocks
- the processes of sedimentation and the applications of stratigraphy and paleobiology in the reconstruction of Earth history
- the role of geophysics and geochemistry in understanding the nature of Earth and its history
- the study of faults, folds and other rock structures and the tectonic processes that create those structures
- the methods used in the field to map and interpret the diverse variety of rock types and structures
- the function of the integrated Earth system including the atmosphere, hydrosphere, biosphere and geosphere
- the fundamental controls on surface Earth processes including energy balance, hydrology, geomorphology, geochemistry and biogeochemistry
- the role of humans in the Earth system

Geophysics Track

The geophysics option emphasizes:

- applications of fundamental mathematical formulations and physical principles to an understanding of the Earth
- methods utilized to map and characterize those portions of the planet that lie below the surface, from just beneath our feet down to the core

International Bachelor of Arts

The International Bachelor of Arts (IBA) is a joint degree between CU Boulder and the University of Wollongong, Wollongong, Australia. To earn an IBA in geology, in addition to completing all the current requirements for the BA with a major in geology at the home institution, students must complete one full-time semester experiential, customized, international learning experience at the non-home institution.

Required Courses and Credit Hours

Students in either the geology option or the geophysics option must take the following course work in GEOL.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOL 1010</td>
<td>Introduction to Geology or GEOL 2100 Environmental Geology</td>
<td>3</td>
</tr>
<tr>
<td>GEOL 1030</td>
<td>Introduction to Geology Laboratory 1</td>
<td>1</td>
</tr>
<tr>
<td>GEOL 2001</td>
<td>Planet Earth</td>
<td>4</td>
</tr>
<tr>
<td>GEOL 2005</td>
<td>Introduction to Earth Materials</td>
<td>4</td>
</tr>
<tr>
<td>GEOL 2700</td>
<td>Introduction to Field Geology</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td><strong>Total Credit Hours</strong></td>
<td><strong>14</strong></td>
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</table>

Ancillary Course Work

Students in either the geology option or the geophysics option must take the following course work from outside GEOL.

Complete a general chemistry sequence:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 1113 &amp; CHEM 1114</td>
<td>General Chemistry 1 and Laboratory in General Chemistry 1</td>
<td></td>
</tr>
<tr>
<td>CHEM 1133 &amp; CHEM 1134</td>
<td>General Chemistry 2 and Laboratory in General Chemistry 2</td>
<td></td>
</tr>
</tbody>
</table>

Select one of the following Calculus 1 & 2 sequences: 8-10

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 1300 &amp; MATH 2300</td>
<td>Calculus 1 and Calculus 2</td>
<td>8</td>
</tr>
<tr>
<td>APPM 1350 &amp; APPM 1360</td>
<td>Calculus 1 for Engineers and Calculus 2 for Engineers</td>
<td>10</td>
</tr>
</tbody>
</table>

Complete a calculus-based general physics sequence:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 1110</td>
<td>General Physics 1</td>
<td>8</td>
</tr>
<tr>
<td>PHYS 1120</td>
<td>General Physics 2</td>
<td></td>
</tr>
<tr>
<td>PHYS 1140</td>
<td>Experimental Physics 1</td>
<td></td>
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</tbody>
</table>

Geology Option

Students electing the geology option are required to take the following additional courses:

Select one of the following solid earth courses: 3-4

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOL 3010</td>
<td>Introduction to Mineralogy</td>
<td>3</td>
</tr>
<tr>
<td>GEOL 3020</td>
<td>Petrology</td>
<td>4</td>
</tr>
<tr>
<td>GEOL 3120</td>
<td>Structural Geology</td>
<td>4</td>
</tr>
</tbody>
</table>
GEOL 3320 Introduction to Geochemistry
GEOL 3430 Sedimentology and Stratigraphy
GEOL 4130 Principles of Geophysics
GEOL 4160 Introduction to Biogeochimstry
GEOL 4241 Principles of Geomorphology

Select one of the following surface processes courses: 3-4
GEOL 3030 Introduction to Hydrogeology
GEOL 3320 Introduction to Geochemistry
GEOL 3410 Paleobiology
GEOL 3430 Sedimentology and Stratigraphy
GEOL 3820 The Fluid Earth
GEOL 4060 Oceanography
GEOL 4160 Introduction to Biogeochimstry
GEOL 4241 Principles of Geomorphology

Select one of the following quantitative geoscience courses: 3
GEOL 3010 Introduction to Mineralogy
GEOL 3030 Introduction to Hydrogeology
GEOL 3820 The Fluid Earth
GEOL 4130 Principles of Geophysics
GEOL 4241 Principles of Geomorphology

Select two of the following advanced-field modules: 4-5
GEOL 4711 Igneous and Metamorphic Field Geology
GEOL 4712 Structural Field Geology
GEOL 4714 Field Geophysics
GEOL 4715 Field Techniques in Hydrogeology
GEOL 4716 Environmental Field Geochimstry
GEOL 4717 Field Seminar in Geology and Tectonics
GEOL 4721 Field Methods in Active Tectonics
EVEN 4100 Environmental Sampling and Analysis

Upper-division electives
Sufficient additional upper-division course work from following list to total 27 upper-division credits. (Of these, a minimum of 18 upper division credits must be GEOL.)

Any GEOL 3000- to 4000-level course (with exceptions, see footnote) 2
Or approved non-GEOL courses from following list:
APPM 3050 Scientific Computing in Matlab
ASTR 3710 Formation & Dynamics of Planetary Systems
ASTR 3720 Planets and Their Atmospheres
ASTR 3750 Planets, Moons, and Rings
ASTR 4800 Space Science: Practice and Policy 1
ATOC 4720 Introduction to Atmospheric Dynamics
ATOC 4800 Policy Implications of Climate Controversies 1
CHEM 4511 Physical Chemistry 1
CVEN 4404 Water Chemistry
CVEN 4718 Mechanics and Dynamics of Glaciers
EBIO 3080 Evolutionary Biology
EBIO 3270
EBIO 3850 Animal Diversity: Invertebrates
EBIO 4030 Limnology
EBIO 4060 Landscape Ecology
EBIO 4410 Biometry
EBIO 4500 Plant Biodiversity and Evolution
ECON 3403 International Economics and Policy 1
ENVD 4023 Environmental Impact Assessment 1
ENVS 3434 Introduction to Applied Ecology
EVEN 4100 Environmental Sampling and Analysis
GEOG/ENVS Biogeochimstry
GEOG 4251 Fluvial Geomorphology
GEOG 4261 Glaciers and Permafrost
GEOG 4321 Snow Hydrology
GEOG 4401 Soils Geography
MCDB 4350 Microbial Diversity and the Biosphere
MUSM 4914 Museum Practicum in Geology
PSCI 4183 International Law 1

Total Credit Hours 27-30

1 Note: A maximum of 3 of these credit hours may consist of a policy course from the following list:
   - ASTR 4800 Space Science: Practice and Policy
   - ATOC 4800 Policy Implications of Climate Controversies
   - ECON 3403 International Economics and Policy
   - ENVD 4023 Environmental Impact Assessment
   - PSCI 4183 International Law

2 GEOL 3040, GEOL 3070, GEOL 3520, GEOL 3720, GEOL 3950, and GEOL 4500 cannot be used to fulfill the upper division elective requirements.

Geophysics Option

Students electing the geophysics option are required to take the following additional courses:

The following solid earth, surface processes and quantitative geoscience courses:

| GEOL 3010 | Introduction to Mineralogy | 3 |
| GEOL 3020 | Petrology | 3 |
| GEOL 3320 | Introduction to Geochemistry | |
| GEOL 3120 | Structural Geology | 4 |
| GEOL 4130 | Principles of Geophysics | 3 |
| GEOL 4714 | Field Geophysics | 2 |

Ancillary non-GEOL courses:

| APPM 2350 | Calculus 3 for Engineers | 4 |
| APPM 2360 | Introduction to Differential Equations with Linear Algebra | 4 |
| PHYS 2130 | General Physics 3 | 3 |
| PHYS 2210 | Classical Mechanics and Mathematical Methods 1 | 3 |

Select two of the following non-GEOL courses: 6

| APPM 4350 | Methods in Applied Mathematics: Fourier Series and Boundary Value Problems |
| MATH 4470 | Partial Differential Equations |
| PHYS 3210 | Classical Mechanics and Mathematical Methods 2 |
| PHYS 3310 | Principles of Electricity and Magnetism 1 |

Total Credit Hours 35

Additional information on required courses and other departmental requirements may be obtained from the departmental office. Students should contact the department for a list of current major requirements.
Transfer students must satisfactorily complete a minimum of 12 credit hours of advanced work (3000-level or above) in the Department of Geological Sciences in Boulder if they wish to obtain a degree in geology from CU Boulder. Before registering for the first time, or within the first week of the semester, such students must see a geological sciences department undergraduate advisor to have previous course work in geology, math and allied sciences evaluated.

**Graduating in Four Years**

Consult the Four-Year Guarantee Requirements for information on eligibility. The concept of "adequate progress" as it is used here refers only to maintaining eligibility for the four-year guarantee; it is not a requirement for the major. To maintain adequate progress in geology, students should meet all college requirements plus specific departmental requirements. These departmental requirements vary slightly between the two major options. Detailed information is available from the department office, but in general these requirements include:

- Declare a geology major and begin course work in the major during the first semester freshman year.
- Meet with a departmental advisor prior to the second and fifth semesters and during the seventh semester.
- Complete at least 33 credit hours (geology option; 44 credit hours for geophysics option) required for the major by the end of the fourth semester.
- Complete at least 47 credit hours (geology option; 63 credit hours for geophysics option) required for the major by the end of the sixth semester.
- Complete the remaining requirements for the major by the end of the eighth semester.