GEOLOGICAL SCIENCES, B.S.

The geological sciences encompass the study of the interaction of physical, chemical and biological processes and systems that shape Earth's environments and their human impacts. Students in the geological science degree program work closely with the SEOE's large and diverse faculty with broad scientific expertise on earthquakes, volcanoes, groundwater, climate change and coastal oceans. The degree program offers optional concentrations in environmental geosciences and geophysics. All degree options emphasize field work and include a required capstone course in Field Geology that is taught annually in Colorado, Utah and New Mexico.

The Bachelor of Science in geological science prepares students for graduate or professional school but is also sufficient for entry-level positions on a variety of career paths including energy and mineral resources, as well as geotechnical and environmental consulting, especially in areas related to groundwater and water resources.

Learning Outcomes

1. Students will demonstrate their knowledge of fundamental concepts and laboratory skills in the geosciences by responding to written and laboratory-practical exam questions in at least one of the following courses: GEOL 302, GEOL 305, GEOL 315
2. Students will demonstrate knowledge of geological field skills by demonstrating a competency at the proficiency level on a geologic mapping exercise, preferably the Sheep Mountain project, in GEOL 500.

Admissions

Entrance Requirements

New freshmen who meet University admissions standards are eligible for admission to degree programs offered by the college. A student who wishes to enter the College of Arts and Sciences from another college on the Columbia campus must be in good standing and have a cumulative GPA of 2.00 or higher. A student who wishes to enter the College of Arts and Sciences from another USC campus must fulfill one of the following requirements:

1. Be in good standing, meet the admission requirements for a baccalaureate degree on the Columbia campus, and have a cumulative GPA of 2.00 or higher.
2. Be in good standing and have completed 30 semester hours with a GPA of 2.00 or higher on a USC campus.

Some programs in the College of Arts and Sciences have special admission requirements established by the department or committee that supervises the specific degree program, for example, Cardiovascular Technology, Biological Sciences, Chemistry, Biochemistry and Molecular Biology, Economics, Environmental Science, the Bachelor of Arts in Interdisciplinary Studies, and the Bachelor of Science in Interdisciplinary Studies. These requirements are listed in the sections of this bulletin that describe department and special degree programs.

Degree Requirements (120 hours)

Program of Study

<table>
<thead>
<tr>
<th>Requirements</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carolina Core</td>
<td>32-44</td>
</tr>
<tr>
<td>College Requirements</td>
<td>15-18</td>
</tr>
</tbody>
</table>

3. Program Requirements 12-46

4. Major Requirements 27-43

Founding Documents Requirement

All undergraduate students must take a 3-credit course or its equivalent with a passing grade in the subject areas of History, Political Science, or African American Studies that covers the founding documents including the United States Constitution, the Declaration of Independence, the Emancipation Proclamation and one or more documents that are foundational to the African American Freedom struggle, and a minimum of five essays from the Federalist papers. This course may count as a requirement in any part of the program of study including the Carolina Core, the major, minor or cognate, or as a general elective. Courses that meet this requirement are listed here (https://academicbulletins.sc.edu/undergraduate/founding-document-courses/).

1. Carolina Core Requirement (32-44 hours)

CMW – Effective, Engaged, and Persuasive Communication: Written (6 hours)

*must be passed with a grade of C or higher*

- any CC-CMW courses (https://academicbulletins.sc.edu/undergraduate/carolina-core-courses/)

ARP – Analytical Reasoning and Problem Solving (6-8 hours)

Students pursuing the General Geological Sciences Major with Geophysics Concentration must complete MATH 141 and MATH 142 for the ARP requirement.

- MATH 122* or MATH 141*
- MATH 170* or MATH 142*

SCI – Scientific Literacy (8 hours)

- CHEM 111* & CHEM 111L*
- PHYS 211* & PHYS 211L*

GFL – Global Citizenship and Multicultural Understanding: Foreign Language (0-6 hours)

Demonstration of proficiency in one foreign language equivalent to the minimal passing grade on the exit examination in the 122 course is required. Students can demonstrate this proficiency by successfully completing Phase II of the Proficiency Test or by successfully completing the 122 course, including the exit exam administered as part of that course.

- CC-GFL courses (https://academicbulletins.sc.edu/undergraduate/carolina-core-courses/)

It is strongly recommended that students continuing the study of a foreign language begin college-level study of that language in their first semester and continue in that language until their particular foreign language requirement is completed.

GHS – Global Citizenship and Multicultural Understanding: Historical Thinking (3 hours)

- any CC-GHS course (https://academicbulletins.sc.edu/undergraduate/carolina-core-courses/)
2. College Requirements (15-18 hours)

Foreign Language (0-3 hours)
- only if needed to meet 122-level proficiency

Analytical Reasoning (6 hours)
Students pursuing the General Geological Sciences Major with Geophysics Concentration must complete CSCE 106 as part of this requirement.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT 515</td>
<td>Statistical Methods I (*)</td>
<td>3</td>
</tr>
</tbody>
</table>

Select one of the following: 3

- CSCE 102 General Applications Programming (*)
- or a higher level CSCE course
- MSCI 305 Ocean Data Analysis (*)
- MSCI 509 MATLAB-Based Data Analysis in Ocean Sciences (*)

Total Credit Hours 6

Note: Courses used to fulfill the College requirements may not also be used to fulfill other degree requirements.

History (3 hours)
The College of Arts and Sciences requires one additional GHS course beyond the Carolina Core GHS requirement.

- If the Carolina Core GHS requirement is fulfilled by a U.S. history course, the College of Arts and Sciences history requirement must be fulfilled by a non-U.S. history course.
- If the Carolina Core GHS requirement is fulfilled by a non-U.S. history course, the College of Arts and Sciences history requirement must be fulfilled by a U.S. history course.

Please select the College of Arts and Sciences history requirement from the approved list of U.S. and non-U.S. history courses (https://academicbulletins.sc.edu/undergraduate/arts-sciences/history-requirement/).

Social Science and Fine Arts or Humanities (6 hours)
- Social Science (3 hours)
  - The College of Arts and Science requires one 3-hour Social Science Course (https://academicbulletins.sc.edu/undergraduate/arts-sciences/courses-acceptable-social-science/)
- Fine Arts/Humanities (3 hours)
  - A Bachelor of Science from the College of Arts and Sciences requires one 3-hour Fine Arts/Humanities Course (https://academicbulletins.sc.edu/undergraduate/arts-sciences/courses-acceptable-fine-arts-humanities/)

3. Program Requirements (15-34 hours)

Supporting Courses (12 hours)
Select one of the following: 4

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOL 101</td>
<td>Introduction to the Earth (*)</td>
<td></td>
</tr>
<tr>
<td>GEOL 103</td>
<td>Environment of the Earth (*)</td>
<td></td>
</tr>
<tr>
<td>GEOL 201</td>
<td>Observing the Earth (*)</td>
<td></td>
</tr>
</tbody>
</table>

Select two of the following: 8

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 202 &amp; 202L General Physics II and General Physics Laboratory II (*) or PHYS 212 Essentials of Physics II &amp; 212L and Essentials of Physics II Lab</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHEM 112 &amp; 112L General Chemistry II and General Chemistry II Lab (*)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIOL 101 &amp; 101L Biological Principles I and Biological Principles I Laboratory (*)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIOL 102 &amp; 102L Biological Principles II and Biological Principles II Laboratory (*)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total Credit Hours 12

Minor (18 hours) optional

A student in the College of Arts and Sciences may choose a minor consisting of at least 18 credit hours of prescribed courses.

The minor is intended to develop a coherent basic preparation in a second area of study. It differs from the cognate inasmuch as the courses must follow a structured sequence.

Courses applied toward general education requirements cannot be counted toward the minor. No course may satisfy both major and minor requirements. All minor courses must be passed with a grade of C or higher. At least half of the courses in the minor must be completed in residence at the University.
A list of minor programs of study can be found at Programs A-Z (https://academicbulletins.sc.edu/undergraduate/programs-az/).

**Electives (0-22 hours)**

120 (or 128) degree applicable credits are required to complete any degree at USC. After the minor or second major is complete, any additional credits needed to reach 120 (or 128) total credits can be fulfilled by electives. No courses of a remedial, developmental, skill-acquiring, or vocational nature may apply as credit toward degrees in the College of Arts and Sciences. The College of Arts and Sciences allows the use of the Pass-Fail option on elective courses. Further clarification on inapplicable courses can be obtained from the College of Arts and Sciences.

**4. Major Requirements (39-43 hours)**

*a minimum grade of C is required in all major courses*

**Major Courses (39-42 hours)**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOL 302</td>
<td>Rocks and Minerals</td>
<td>4</td>
</tr>
<tr>
<td>GEOL 305</td>
<td>Earth Systems through Time</td>
<td>4</td>
</tr>
<tr>
<td>GEOL 325</td>
<td>Stratigraphy and Sedimentary Basins</td>
<td>4</td>
</tr>
<tr>
<td>GEOL 345</td>
<td>Igneous and Metamorphic Processes</td>
<td>4</td>
</tr>
<tr>
<td>GEOL 355</td>
<td>Structural Geology and Tectonics</td>
<td>4</td>
</tr>
<tr>
<td>GEOL 500</td>
<td>Field Geology</td>
<td>4-6</td>
</tr>
</tbody>
</table>

Select one of the following: 3-4

- GEOL 310 Surface and Subsurface Hydrology
- GEOL 315 Surface and Near Surface Processes
- GEOL 335 Processes of Global Environmental Change
- GEOL 371 A View of the River
- GEOL 570 Environmental Hydrogeology

Select 12 or more hours of the following: 12

- GEOG 263 Geographic Information Systems
- GEOG 563 Advanced Geographic Information Systems
- MATH 241 Vector Calculus
- MATH 242 Elementary Differential Equations
- MATH 300 Transition to Advanced Mathematics
- GEOL course(s) 300 or higher

Only one of the following may apply:

- GEOG 346 Climate and Society
- GEOG 347 Water as a Resource
- GEOG 517 Siconatural Coasitines in Global Perspective
- GEOG 530 Environmental Hazards
- ENVR 348 Environmental Racism and Justice
- ENVR 352 Energy, Society and Sustainability
- MSCI 390 Policy and Marine Science

**Total Credit Hours**

39-42

**Concentrations (39-43 hours) optional**

As an alternative to the general Geological Sciences major, students may choose one of the following concentrations:

**General Geologic Sciences Major with Environmental Geosciences Concentration (40-43 hours)**

<table>
<thead>
<tr>
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<tr>
<td>GEOL 335</td>
<td>Processes of Global Environmental Change</td>
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<td>4</td>
</tr>
<tr>
<td>GEOL 500</td>
<td>Field Geology</td>
<td>4-6</td>
</tr>
</tbody>
</table>

Select one of the following: 3-4

- GEOL 305 Earth Systems through Time
- GEOL 371 A View of the River
- GEOL 548 Environmental Geophysics

Select 9 hours of 300-level or higher GEOL, MSCI or ENVR courses 9

**Total Credit Hours**

40-43

**General Geological Sciences Major with Geophysics Concentration (39-43 hours)**

Students complete the requirements for the General Geological Sciences Major (28-30 hours) with the MATH 141 and MATH 142 Carolina Core option, CSCE 106 as the College Requirement option, and also complete an additional 12-13 credit hours from the courses listed here:

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<tr>
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<td>GEOL 355</td>
<td>Structural Geology and Tectonics</td>
<td>4</td>
</tr>
<tr>
<td>GEOL 365</td>
<td>Data Science in Earth, Ocean and Environmental Science</td>
<td>3</td>
</tr>
<tr>
<td>MATH 241</td>
<td>Vector Calculus</td>
<td>3</td>
</tr>
<tr>
<td>MATH 242</td>
<td>Elementary Differential Equations</td>
<td>3</td>
</tr>
</tbody>
</table>

Select one of the following: 3-4

- GEOL 310 Surface and Subsurface Hydrology
- GEOL 315 Surface and Near Surface Processes
- GEOL 335 Processes of Global Environmental Change
- GEOL 371 A View of the River
- GEOL 570 Environmental Hydrogeology

Select one of the following: 3-4

- GEOL 501 Principles of Geomorphology
- GEOL 502 Principles of Coastal Geomorphology
- GEOL 520 Isotope Geology and Geochronology
- GEOL 531 Plate Tectonics
- GEOL 546 Marine Geophysics
- GEOL 548 Environmental Geophysics
- GEOL 575 Numerical Modeling for Earth Science Applications

**Total Credit Hours**

39-43
**Intensive Geological Sciences Major (41-43 hours)**

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<td>GEOL 355</td>
<td>Structural Geology and Tectonics</td>
<td>4</td>
</tr>
<tr>
<td>GEOL 500</td>
<td>Field Geology (senior capstone experience)</td>
<td>4-6</td>
</tr>
</tbody>
</table>

Select 3 credits from:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOL 399</td>
<td>Independent Study</td>
</tr>
<tr>
<td>GEOL 498</td>
<td>Undergraduate Research</td>
</tr>
<tr>
<td>GEOL 499</td>
<td>Undergraduate Research</td>
</tr>
<tr>
<td>GEOL 699</td>
<td>Senior Thesis</td>
</tr>
</tbody>
</table>

Select 6 hours of GEOL courses numbered 399 or higher 6

**Total Credit Hours** 41-43

**Degree with Distinction in Geological Sciences**

Available to students majoring in Geological Sciences who wish to participate in significant research activities in their major field under the supervision of a faculty mentor. Students who successfully fulfill all of these requirements will be awarded their degree with “Distinction in Geological Sciences” upon graduation. South Carolina Honors College students taking this route would graduate with both Honors in SCHC and “Distinction in Geological Sciences”.

**Requirements:**

- A minimum GPA of 3.5 in the major and 3.3 institutional.
- A written sponsorship agreement from the faculty mentor on file in the department.
- Public presentation of the Senior Thesis research accompanied by a written document approved by the faculty mentor and a second reader that follows the guidelines of the School of the Earth, Ocean and Environment.
- 3 courses (9 hours) in addition to the general major requirements, including:
  - GEOL 498 or GEOL 499
  - GEOL 699
  - A minimum of one GEOL 500-level course appropriate to the research

**Major Map**

A major map is a layout of required courses in a given program of study, including critical courses and suggested course sequences to ensure a clear path to graduation.

Major maps are only a suggested or recommended sequence of courses required in a program of study. Please contact your academic advisor for assistance in the application of specific coursework to a program of study and course selection and planning for upcoming semesters.