GEOLOGICAL SCIENCES
MAJOR, B.S.–ENvironmenTAL GEOSCIENCE CONCENTRATION

Contact Information
Department of Geological Sciences
Visit Program Website (http://www.geosci.unc.edu)
104 South Road, Mitchell Hall, CB# 3315
(919) 966-4516
Drew Coleman, Chair
Kevin Stewart, Director of Undergraduate Studies
kgstewar@email.unc.edu
Deborah Harris, Student Services Manager
djharris@email.unc.edu

The study of earth's dynamic systems is a field that has seen major advances over the last few decades. Geologists investigate diverse systems that play a large role in controlling the environment at the earth's surface.

Department Programs

Majors

• Geological Sciences Major, B.S.–Environmental Geoscience (p. 1)

Minor

• Geological Sciences Minor (http://catalog.unc.edu/undergraduate/programs-study/geological-sciences-minor)

Graduate Programs

• M.S. in Geological Sciences (http://catalog.unc.edu/graduate/schools-departments/geological-sciences)
• Ph.D. in Geological Sciences (http://catalog.unc.edu/graduate/schools-departments/geological-sciences)

Student Learning Outcomes

Upon completion of the geological sciences program (B.S.), students should be able to:

• Demonstrate broad knowledge of core geological concepts
• Produce written synthesis of professional journal articles dealing with topics covered in advanced courses
• Make a clear and effective oral presentation
• Apply knowledge and skills from coursework in a significant field experience in an area of geological sciences
• Gain admission to graduate study or obtain employment in a field that uses geological training

In addition to the program requirements, students must

• attain a final cumulative GPA of at least 2.0
• complete a minimum of 45 academic credit hours earned from UNC–Chapel Hill courses
• take at least half of their major course requirements (courses and credit hours) at UNC–Chapel Hill
• earn a minimum of 18 hours of C or better in the major core requirements (some majors require 21 hours).

For more information, please consult the degree requirements section of the catalog (http://catalog.unc.edu/undergraduate/general-education-curriculum-degree-requirements/#degreerequirementstext).

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOL 200</td>
<td>The Solid Earth</td>
<td>3</td>
</tr>
<tr>
<td>GEOL 201</td>
<td>Earth's Surface: Processes, Landforms, and History</td>
<td>3</td>
</tr>
<tr>
<td>GEOL 324 &amp; 324L</td>
<td>Water in Our World: Introduction to Hydrologic Science and Environmental Problems and Water in Our World Laboratory</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>13 credit hours from the following options:</td>
<td>13</td>
</tr>
<tr>
<td>GEOL 301</td>
<td>Earth Materials: Minerals</td>
<td></td>
</tr>
<tr>
<td>GEOL 302</td>
<td>Structural Geology</td>
<td></td>
</tr>
<tr>
<td>GEOL 303</td>
<td>Sedimentology and Stratigraphy</td>
<td></td>
</tr>
<tr>
<td>GEOL 304</td>
<td>Petrology and Plate Tectonics</td>
<td></td>
</tr>
<tr>
<td>GEOL 310</td>
<td>Coastal Environmental Change</td>
<td></td>
</tr>
<tr>
<td>GEOL 405</td>
<td>Geochemistry</td>
<td></td>
</tr>
<tr>
<td>GEOL 417 &amp; 417L</td>
<td>Geomorphology and Geomorphology Laboratory</td>
<td></td>
</tr>
<tr>
<td>GEOL 432</td>
<td>Paleoclimatology</td>
<td></td>
</tr>
<tr>
<td>GEOL 435</td>
<td>Groundwater</td>
<td></td>
</tr>
<tr>
<td>GEOL 436</td>
<td>Geochemistry of Natural Waters</td>
<td></td>
</tr>
<tr>
<td>ENEC 203</td>
<td>Introduction to Environmental Science Problem Solving</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Three geology (GEOL) courses numbered above 300 and not otherwise required for the major</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Capstone requirement (one of the following combinations):</td>
<td>6</td>
</tr>
<tr>
<td>GEOL 485 &amp; GEOL 486</td>
<td>Summer Field Course in Geology and Summer Field Course in Geology</td>
<td></td>
</tr>
<tr>
<td>GEOL 691H &amp; GEOL 692H</td>
<td>Honors and Honors</td>
<td></td>
</tr>
<tr>
<td>GEOL 395</td>
<td>Undergraduate Research in Geology</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Science-oriented Experiential Education (EE) course.</td>
<td>2</td>
</tr>
</tbody>
</table>

Additional Requirements

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 101 &amp; 101L</td>
<td>General Descriptive Chemistry I and Quantitative Chemistry Laboratory I</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 102 &amp; 102L</td>
<td>General Descriptive Chemistry II and Quantitative Chemistry Laboratory II</td>
<td>4</td>
</tr>
</tbody>
</table>
Geological Sciences Major, B.S. – Environmental Geoscience Concentration

MATH 231  Calculus of Functions of One Variable I  4
MATH 232  Calculus of Functions of One Variable II  4

One of the following courses:

- Any COMP course numbered COMP 110 or above, except COMP 380
- GEO 520  Data Analysis in the Earth Sciences  3
- Any MATH above MATH 232
- Any STOR course numbered STOR 155 or above

One of the following courses:

- PHYS 104  General Physics I
- PHYS 114  General Physics I: For Students of the Life Sciences
- PHYS 116  Mechanics
- PHYS 118  Introductory Calculus-based Mechanics and Relativity

One of the following courses:

- BIOL 101  Principles of Biology
- PHYS 105  General Physics II
- PHYS 115  General Physics II: For Students of the Life Sciences
- PHYS 117  Electromagnetism and Optics
- PHYS 119  Introductory Calculus-based Electromagnetism and Quanta

At least five science electives not otherwise required for the major (see below chart)

Remaining General Education (http://catalog.unc.edu/undergraduate/general-education-curriculum-degree-requirements) requirements and enough free electives to accumulate 122 academic hours

Total Hours  122

H  Honors version available. An honors course fulfills the same requirements as the nonhonors version of that course. Enrollment and GPA restrictions may apply.

1  Six credits total of independent research.
2  Must be pre-approved by the Director of Undergraduate Studies.
3  This course may also be used to satisfy one of the required GEOL courses numbered above 300.

Science Electives Not Otherwise Required for the Major

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANTH 143</td>
<td>Human Evolution and Adaptation</td>
<td>3</td>
</tr>
<tr>
<td>ANTH 220</td>
<td>Principles of Archaeology</td>
<td>3</td>
</tr>
<tr>
<td>ANTH 315</td>
<td>Human Genetics and Evolution</td>
<td>3</td>
</tr>
<tr>
<td>ANTH 317</td>
<td>Evolutionary Perspectives on Human Adaptation and Behavior</td>
<td>3</td>
</tr>
<tr>
<td>ANTH 412</td>
<td>Paleanthropology</td>
<td>3</td>
</tr>
<tr>
<td>ANTH 414</td>
<td>Laboratory Methods: Human Osteology</td>
<td>3</td>
</tr>
<tr>
<td>ANTH 451</td>
<td>Field School in North American Archaeology H</td>
<td>6</td>
</tr>
<tr>
<td>ASTR —</td>
<td>any Astronomy course except a first-year seminar, BIOC 107 and BIOC 108</td>
<td></td>
</tr>
<tr>
<td>BIOC —</td>
<td>any Biochemistry course except a first-year seminar</td>
<td></td>
</tr>
</tbody>
</table>

BIOL —  any Biology course above BIOL 113
CHEM —  any Chemistry course above CHEM 102
COMP —  any Computer Science course COMP 110 or above, except COMP 380
ENE 201  any Environment and Ecology course above ENE 201
GEOW 370  Introduction to Geographic Information  3
GEOW 410  Modeling of Environmental Systems  3
GEOW 412  Synoptic Meteorology  3
GEOW 414  Climate Change  3
GEOW 416  Applied Climatology: The Impacts of Climate and Weather on Environmental and Social Systems  3
GEOW 477  Introduction to Remote Sensing of the Environment  3
GEOW 491  Introduction to GIS  3
GEOW 577  Advanced Remote Sensing  3
GEOW 591  Applied Issues in Geographic Information Systems  3
GEOW 592  Geographic Information Science Programming  3
GEOW 594  Global Positioning Systems and Applications  3
GEOW 597  Ecological Modeling  3
GEOG —  any Geological Sciences course course
MASC —  any Marine Sciences course MASC 101 and above
MATH —  any Mathematics course above MATH 232
PHYS —  any Physics course except a first-year seminar, PHYS 101, PHYS 132, and PHYS 313
STOR —  any Statistics and Operations Research course STOR 155 and above

H  Honors version available. An honors course fulfills the same requirements as the nonhonors version of that course. Enrollment and GPA restrictions may apply.

Course descriptions for:

- Astronomy (ASTR) and Physics (PHYS) (http://catalog.unc.edu/undergraduate/departments/physics-astronomy/#coursestext)
- Biochemistry (BIOC) (http://catalog.unc.edu/undergraduate/departments/biochemistry-biophysics/#coursestext)
- Biology (BIOL) (http://catalog.unc.edu/undergraduate/departments/biology/#coursestext)
- Chemistry (CHEM) (http://catalog.unc.edu/undergraduate/departments/chemistry/#coursestext)
- Computer Science (COMP) (http://catalog.unc.edu/undergraduate/departments/computer-science/#coursestext)
- Geography (GEOG) (http://catalog.unc.edu/undergraduate/departments/geography/#coursestext)
- Geological Sciences (GEOL) (http://catalog.unc.edu/undergraduate/departments/geological-sciences/#coursestext)
- Marine Sciences (MASC) (http://catalog.unc.edu/undergraduate/departments/marine-sciences/#coursestext)
- Mathematics (MATH) (http://catalog.unc.edu/undergraduate/departments/mathematics/#coursestext)
Special Opportunities in Geological Sciences

Honors in Geological Sciences
The honors program in the Department of Geological Sciences is open to undergraduates with an overall grade point average of 3.3 or better as of the beginning of the fall semester of the senior year. To participate in this program, the student chooses a research topic in consultation with his or her chosen faculty sponsor and conducts the research during the last two semesters in residence. The research project should represent the equivalent time expenditure of six hours of course credit and is taken as GEOL 691H (fall semester) and GEOL 692H (spring semester).

Upon recommendation of the faculty, students may be awarded the degree with honors or highest honors. Highest honors is reserved for students who have distinguished themselves in both coursework and independent research. In order to obtain this distinction the student must maintain a grade point average of 3.60 or higher and complete a research project that is worthy of peer-reviewed publication.

Departmental Involvement
The Department of Geological Sciences encourages the active participation of undergraduates in department research, teaching, and social life. In addition to opportunities for experiential education and teaching internships described below, the department has an active Geology Honor Fraternity and Geology Club and regularly sponsors field excursions, career information sessions, and social events. Dates, times, and locations for all events are posted on the Web site and in the main lobby on the first floor of Mitchell Hall.

Experiential Education
Many geology courses emphasize experiential learning through field and laboratory work. Most degree tracks include a field geology course (GEOL 485 and GEOL 486 or a similar course in another department) that fulfills the experiential education General Education requirement. Additionally, all students are encouraged to contact faculty members about conducting independent research, either as an honors thesis or a senior thesis project.

UNC–BEST
The UNC Baccalaureate Education in Science and Teaching (UNC–BEST) Program is a collaboration between the School of Education and the College of Arts and Sciences and is designed to allow undergraduate science majors interested in teaching high school science the opportunity to earn their science degree and obtain licensure as a North Carolina high school science teacher in four years.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDUC 516</td>
<td>Introduction to the Education of Exceptional Learners</td>
<td>3</td>
</tr>
<tr>
<td>EDUC 689</td>
<td>Foundations of Special Education</td>
<td></td>
</tr>
<tr>
<td>EDUC 532</td>
<td>Human Development and Learning</td>
<td>3</td>
</tr>
<tr>
<td>EDUC 615</td>
<td>Schools and Community Collaboration</td>
<td>3</td>
</tr>
<tr>
<td>EDUC 593</td>
<td>Internship/Student Teaching</td>
<td>1-12</td>
</tr>
<tr>
<td>EDUC 601</td>
<td>Education Workshops</td>
<td>1-3</td>
</tr>
</tbody>
</table>

Teaching methods course
GEOL 412 Principles and Methods of Teaching Earth Science 4 For more details on admission requirements, application deadlines, and submitting an online application, visit the School of Education Web site (http://soe.unc.edu/academics/uncbest).

Study Abroad
Although the department has no formalized study abroad program, many students participate in a study abroad program, and some receive credit for geology coursework completed abroad. Students interested in a study abroad program should contact the director of undergraduate studies. Students must receive approval from the director of undergraduate studies prior to taking courses abroad for geology credit.

Undergraduate Awards
The Op White Prize in Geology, established in 1966, consists of a cash prize and an engraved bronze plaque displayed in the geology office. The award is given annually to the outstanding senior in geology.

Field Camp Scholarships
Several scholarships for geology field camp are awarded each year from the Grover Murray and Anadarko funds.

Undergraduate Research
The Department of Geological Sciences encourages qualified undergraduate students to conduct independent research on an interesting geologic topic under the direction of a geological sciences faculty member. This research can be conducted as a one- to four-credit hour project (GEOL 395) or in conjunction with the geology honors program.

Code Title Hours
Core education courses
EDUC 516 Introduction to the Education of Exceptional Learners 3
or EDUC 689 Foundations of Special Education
EDUC 532 Human Development and Learning 3
EDUC 615 Schools and Community Collaboration 3
EDUC 593 Internship/Student Teaching 1-12
EDUC 601 Education Workshops 1-3