Department of Geosciences

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Courses in the Department of Geosciences are designed to meet the General Education needs of all students, to broaden their knowledge of the physical environment, to enhance their cultural development, and to provide a solid foundation for those planning to enter fields in which geographical and geological knowledge is essential.

The department offers programs leading to a Bachelor of Science degree with a major in Geoscience and concentrations in Geography or Geology. To provide the student with maximum opportunities for career preparation, the two concentrations are subdivided into six career patterns: geography for teachers, geography, and geographic techniques within the Geography concentration; and geology, earth science, and earth science for teachers within the Geology concentration. Proper selection of courses will permit a student to work as a professional in a chosen area, pursue graduate studies, or be licensed to teach.

Minors in Geography, Geology/Earth Science, and Remote Sensing are offered, and the department participates in the Environmental Science and Technology major.

The Geosciences Department also sponsors an internship program which provides opportunities to receive on-the-job training with various agencies employing persons with geographic/geologic training. Details of this program may be obtained from the department.

Curricular listings include General Education requirements in Communication, History, Humanities and/or Fine Arts, Mathematics, Natural Sciences, and Social/Behavioral Sciences categories as outlined on pages 60–63.

Major in Geoscience

All students pursuing the major in Geoscience must complete the General Education requirements and the departmental core requirements as follows:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>GEOL 1030</td>
<td>Introduction to Earth Science</td>
<td>3</td>
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<tr>
<td>GEOL 1031</td>
<td>Introduction to Earth Science Lab</td>
<td>1</td>
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<tr>
<td>OR GEOL 1040 Physical Geology for GEOL 1030/1031</td>
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<tr>
<td>GEOG 2000</td>
<td>Introduction to Regional Geography</td>
<td>3</td>
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* Geology courses are offered online through eLearning. Additional courses may be offered on campus.  

** Geology courses are offered online through eLearning. Additional courses may be offered on campus.
Additionally:

For Geography concentration:
GEOG 4380 Cartography, 4 hours

For Geology concentration:
GEOL 3050 Field Methods in Geology, 2 hours
GEOL 3060 Computer Methods in Geology, 3 hours

*Can also serve as part of General Education requirement for Natural Sciences
**Can also serve as part of General Education requirement for Social/Behavioral Sciences

Following is a suggested pattern of study for the first two years; however, consultation with the assigned advisor is necessary before registration.

Recommended Curriculum

FRESHMAN
ENGL 1010, 1020 (Comm) 6
Natural Sciences (2 prefixes) 8
Social/Behavioral Sciences 3
COMM 2200 (Comm) 3
Requirements as advised 10

SOPHOMORE
ENGL 2020 or 2030 or HUM 2610 (Hum/FA) 3
Social/Behavioral Sciences (2 prefixes) 6
HIST 2010, 2020, or 2030 6
Social/Behavioral Sciences 3
Mathematics 3
Requirements as advised 9

Concentration: Geography

Career Pattern: Geography for Teachers
This program offers preparation for the student to meet professional requirements for teaching geography in the public schools and for graduate studies. This career pattern requires a minimum of 75 hours (in addition to the departmental core requirements).

Required courses (7 hours)
GEOG 3401 or 3402 Field Course
GEOG 4360 Cultural Geography

17 hours from
GEOG 3120 Geography of Tennessee
GEOG 3410 Geography of the United States and Canada
GEOG 3420 Geography of Latin America
GEOG 3430 Geography of Europe
GEOG 3440 Geography of Asia
GEOG 3470 Geography of Africa
GEOG 4280 Special Problems and Topics in Geography
GEOG 4310 Resource Management and Conservation
GEOG 4320 Economic Geography
GEOG 4330 Political Geography
GEOG 4340 Historical Geography
GEOG 4370 Urban Geography
GEOG 4470 Rural Settlement
GEOG 4500 Geography of the Middle East
GEOG 4540 Geography of Native Americans
GEOG 4550 Global Issues

Departmental Elective (3 hours)

In addition to major courses, the student must meet the following requirements:

1. A cognate (additional general education requirements) of 18 hours:
   ANTH 2010 Cultural Anthropology
   PS 1100 Foundations of Government
   PS 3210 International Relations
   PS 4220 World Politics
   PS 4240 American Foreign Policy
   SOC 1010 Introductory Sociology

2. A minor in Secondary Education (30 hours), involving education courses and directed teaching. Student must contact Secondary Education minor advisor for approval of appropriate courses for licensure. For specific procedures and additional requirements for teacher licensure, see appropriate catalog section.

NOTE: Please see the Educational Leadership Department on page 201 for information on Secondary Education minor.

Concentration: Geography

Career Pattern: Geography
This program is designed for students who plan to become professional geographers or who wish to pursue graduate study in geography and/or related fields. This career pattern requires a minimum of 75 hours (in addition to the departmental core requirements).

Required courses: (21 hours)
GEOG 1030 Physical Geography
GEOG 4360 Cultural Geography
GEOG 3401 or 3402 Field Course
GEOG 4550 Global Issues
GEOG 4490 Remote Sensing OR GEOG 4520 Image Interpretation
GEOG 4530 Geographic Information Systems

Two of the following regional courses: (6 hours)
GEOG 3120 Geography of Tennessee
GEOG 3410 Geography of the United States and Canada
GEOG 3420 Geography of Latin America
GEOG 3430 Geography of Europe
GEOG 3440 Geography of Asia
GEOG 3460 Geography of the Former Soviet Union
GEOG 3470 Geography of Africa
GEOG 4500 Geography of the Middle East

Two of the following topical courses: (6 hours)
GEOG 4310 Resource Management and Conservation
GEOG 4320 Economic Geography
GEOG 4330 Political Geography
GEOG 4340 Historical Geography
GEOG 4370 Urban Geography
GEOG 4470 Rural Settlement
GEOG 4480 Recreational Geography
GEOG 4540 Geography of Native Americans

General Electives (6 hours)

Two minors (18 hours each) are required. These are to be selected in consultation with and approved by the major academic advisor.
Concentration: Geography
Career Pattern: Geographic Techniques
This program provides basic skills in the methods used to acquire, analyze, and present spatial information about the Earth’s surface. These techniques are widely employed by government and industry in natural resource and environmental management, urban and regional planning, utility management, and transportation planning. This career pattern requires a minimum of 75 hours (in addition to the departmental core requirements).

Required courses: (30 hours: 26 in GEOG and 4 in GEOL)
GEOG 1030 Physical Geography
GEOG 3401 or 3402 Field Course
GEOG 4490 Remote Sensing
GEOG 4510 Laboratory Problems in Remote Sensing
GEOG 4520 Image Interpretation
GEOG 4530 Geographic Information Systems
GEOG 4570 Advanced Geographic Information Systems
GEOL 4020 Geomorphic Regions of the United States

Departmental Elective (3 hours)
General Electives (6 hours)

Two minors (18 hours each) are required. These are to be selected in consultation with and approved by the major academic advisor.

Minor in Geography
The minor in Geography requires 18 hours (all in courses with a GEOG designation) to be selected by the student and approved by a member of the faculty assigned as advisor. The minor will be specific enough to support the student’s career plans.

Concentration: Geology
Career Pattern: Geology
This program is designed for students who plan to become professional geologists or who wish to pursue graduate study in geology. The Geology career pattern consists of 93 hours distributed between major field core requirements (12 hours), career pattern requirements (39 hours), two cognates (19 hours and 18 hours), and general electives (5 hours). An additional 27 hours of General Education requirements are required.

Required courses: 39-43 hours
GEOL 1040 Physical Geology*
GEOL 1050 Historical Geology
GEOL 3000 Mineralogy
GEOL 3050 Field Methods in Geology**
GEOL 3060 Computer Methods in Geology**
GEOL 3160 Geologic Literature and Report Writing
GEOL 4000 Petrology and Petrography
GEOL 4020 Geomorphic Regions of the United States
GEOL 4030 Invertebrate Paleontology
GEOL 4070 Sedimentation and Stratigraphy
GEOL 4080 Structural Geology
GEOL 4100 Geophysical Prospecting
GEOL 4130 Hydrogeology
GEOL 4580 Seminar in Geology

Geology elective to be chosen from the following: (3 hours)
GEOL 3010 Oceanography
GEOL 4140 Inorganic Geochemistry
GEOL 4110 Earth Geophysics
GEOL 4130 Environmental Applications of Hydrogeology
GEOL 4160 Geologic Remote Sensing

Two cognates consisting of the following:
Cognate 1: 19 hours
CHEM 1110 General Chemistry (w/lab)
CHEM 1120 General Chemistry (w/lab)
MATH 1910 Calculus I
MATH 1920 Calculus II
GEOL 4530 Geographic Information Systems

Cognate 2: 18 hours
BIOG 1110 General Biology
PHYS 2110, 2111 Non-Calculus-Based Physics (w/lab) OR
PHYS 2130, 2131 Calculus-Based Physics (w/lab)
GEOG 4510 Advanced Geographic Information Systems
GEOG 4570 Geographic Information Systems

Second semester physics (PHYS 2110 or 2131 with lab) may be substituted for BIOL 1110, Computer Science I, CSCI 1170, and Probability and Statistics, MATH 2030, are strongly recommended.

Concentration: Geography
Career Pattern: Earth Science
The earth science program has two curricula. One, technical curriculum, is designed for those desiring a general background in earth science. The second, Earth Science for Teachers, is for those planning to teach the earth sciences.

The technical curriculum consists of 89 hours distributed between major field core requirements (12 hours), career pattern requirements (11 hours), career pattern electives (18 hours), a cognate (18 hours), a minor (18 hours), and general electives (12 hours). The minor, which must be in Chemistry, Physics, Biology, Mathematics, or Computer Science, will be selected by the student and approved by the major academic advisor. An additional 31 hours of General Education requirements are required.

Required courses: (16-20 hours)
GEOL 1040 Physical Geology*
GEOL 1050 Historical Geology
GEOL 3010 Oceanography
GEOL 3050 Field Methods in Geology**
GEOL 3060 Computer Methods in Geology**
GEOL 4020 Geomorphic Regions of the United States

*Not required of students with an A or B in both GEOL 1030 and GEOL 1031
**Departmental core requirements

Electives to be chosen from the following: (18 hours)*
ABAS 3340 Soil
GEOL 3000 Mineralogy
GEOL 4000 Petrology and Petrography
GEOL 4030 Invertebrate Paleontology
GEOL 4050 Meteorology
GEOL 4070 Sedimentation and Stratigraphy
GEOL 4080 Structural Geology
GEOL 4090 Problems in Geology
GEOL 4100 Geophysical Prospecting
GEOL 4130 Hydrogeology
GEOL 4150 Environmental Applications in Hydrogeology

*22 hours if GEOL 1040 not taken

*Not required of students with an A or B in both GEOL 1030 and GEOL 1031
**Departmental core requirements
Technical Cognate: (18 hours)
GEOG 4530 Geographic Information Systems
MATH 1720 Plane Trigonometry
Additional 12 hours of technical electives to be approved by major academic advisor

Science or Math Minor: (18 hours approved by major academic advisor)

Concentration: Geology
Career Pattern: Earth Science for Teachers
The Earth Science for Teachers curriculum is designed for those who plan to teach earth science in the secondary school system. This curriculum consists of 97 hours distributed between major field core requirements (12 hours), career pattern requirements (8 hours), career pattern electives (14 hours), a cognate (33 hours), and a minor in Secondary Education (30 hours) involving education courses and directed teaching. An additional 27 hours are required for General Education. Student must contact Secondary Education minor advisor for approval of appropriate courses for licensure. For specific procedures and additional requirements for teacher licensure, see appropriate catalog section.

NOTE: Please see the Educational Leadership Department on page 201 for information on the Secondary Education minor.

Required Courses: (8 hours)
GEOL 1050 Historical Geology
GEOL 3401 or 3402 Field Course

Fourteen (14) hours of electives to be chosen from:
GEOL 3000 Mineralogy
GEOL 3010 Oceanography
GEOL 4000 Petrology and Petrography
GEOL 4020 Geomorphic Regions of the United States
GEOL 4030 Invertebrate Paleontology
GEOL 4070 Sedimentation and Stratigraphy
GEOL 4080 Structural Geology
GEOL 4130 Hydrogeology
GEOG 3401- Field Course.

Math/Science Cognate: (33 hours)
CHEM 1010 General Chemistry (w/lab)
CHEM 1020 General Chemistry (w/lab)
PHYS 2010, 2011 Non-Calculus-Based Physics (w/lab)
PHYS 2020, 2021 Non-Calculus-Based Physics (w/lab)
BIOL 1110, 1120 General Biology (w/lab)
MATH 1720 Plane Trigonometry
GEOL 4050 Meterology
ASTR 1030 Exploring the Universe OR
ASTR 3400 Fundamentals of Astrophysics

Minor in Geology/Earth Science
The minor in Geology/Earth Science requires GEOL 1040 (or GEOL 1030 and 1031 with a grade of A or B) and GEOL 1050 plus 10-14 additional hours at the 3000 level or above.

Minor in Remote Sensing
The minor in Remote Sensing consists of 19 semester hours to be taken in the sequence listed below:
GEOG 1030 Physical Geography
GEOG 4490 Remote Sensing
GEOG 4510 Laboratory Problems in Remote Sensing
GEOG 4520 Image Interpretation
GEOG 4530 Geographic Information Systems

Courses in Geography [GEOG]

Basic Courses
1030 Physical Geography. Four credits. The physical earth as the home of humans. The global earth in space, tools of the discipline, the atmosphere, the hydrosphere, and the biosphere. Field trips may be required. Three hours lecture and two hours laboratory per week.

2000 Introduction to Regional Geography. Three credits. Examination of world regions using the geographical perspective, identifying the main physical and cultural features, especially through the use of maps.

3120 Geography of Tennessee. Three credits. Focuses on the diverse physical and human landscapes of the state. Topics covered include weather and climate, landforms, vegetation and soils, population patterns and trends, economic activities (including agricultural and geographical perspectives on social and environmental issues).

Regional Geography
2105 Introduction to Latin American Studies. Three credits. (Same as SPAN 2105, PS 2105, SOC 2105, ART 2105, ANTH 2105.) A multidisciplinary, team-taught introduction to Latin America. Covers the cultures and societies of the region: pre-history, history, geography, politics, art, languages, and literatures. Required course for all Latin American Studies minors.

3401 Field Course. Four credits each. Supervised study in some geographical area, preceded by classroom preview and concluded by a time of evaluation. Emphasis on natural and cultural elements of the environment with special attention directed toward the pattern of human occupancy. For fees and specific credit, consult the instructor.

3410 Geography of the United States and Canada. Three credits. Natural, cultural, and geographic environment of these regions.

3420 Geography of Latin America. Three credits. Geographic regions of Mexico, Central America, the West Indies, and South America.

3430 Geography of Europe. Three credits. General distribution of natural and cultural features of Europe followed by a detailed study of the regions and countries of the southern, central, and northwestern parts of the continent.

3440 Geography of Asia. Three credits. Survey of the entire continent followed by a detailed study of the geographic regions outside the former Soviet Union with special emphasis on the Indian Realm, China, and Japan.

3460 Geography of the Former Soviet Union. Three credits. Analysis of the natural, cultural, and human-use regions of the former Soviet Union.

3470 Geography of Africa. Three credits. Survey of the physical and cultural features of Africa, followed by a detailed study of the geographic regions of the continent.

4500 Geography of the Middle East. Three credits. An analysis of the problems, issues, and theories involved in understanding the physical, cultural, and regional geography of the area.

Topical Courses
3720 Cultural Ecology. Three credits. (Same as ANTH 3720.) Prerequisites: 3 hours anthropology or geography. Comparison of eco-
4280 Special Problems and Topics in Geography. One to six credits. (Variable credit.) Prerequisite: Must have equivalent of a minor in Geography. Research participation or guided readings in a particular area or topic appropriate to the student’s interest and professional objectives.

4300 Military Geography. One credit. An examination of geography applied to the conduct of military forces in pursuing and securing national objectives.


4320 Economic Geography. Three credits. Relationship of the physical factors of the environment to the productive occupations of humans and the distribution of products.

4330 Political Geography. Three credits. Significance of geographical factors in understanding political relationships within and among nations; spatial implications of political decision-making processes.

4340 Historical Geography. Three credits. Prerequisite: GEOG 2000 or permission of instructor. The changing human geography of the United States during four centuries of settlement and development. Emphasis on changing population patterns as well as patterns of urban and rural settlement.

4350 Cultural Geography. Three credits. Prerequisite: GEOG 2000 or permission of instructor. Description and explanation of spatial patterns and ecological relationships in human culture. Emphasis on “reading” the cultural landscapes.

4360 Urban Geography. Three credits. An introduction to the development of towns, cities, and associated urban areas. Environmental problems also examined. Classroom analysis of various theories of urban development and data collected by field work.

4370 Rural Settlement. Three credits. Prerequisite: GEOG 2000 or permission of instructor. A geographical analysis of forms, structures, and distribution of rural settlements in distinctive parts of the earth based upon their origin, function, and development. Special emphasis in analyzing rural settlements of middle Tennessee.

4380 Cartography. Four credits. General knowledge of the field including familiarity with the techniques and tools of professional cartography and graphics. Selected lectures, class discussions, and a series of map construction assignments. Three hours lecture and two hours laboratory per week.

4390 Remote Sensing. Four credits. The various aspects of remote sensing such as radar, satellite imagery, and infrared data. Use of data in preparation of maps and application to land use and environmental problems examined. Three hours lecture and two hours laboratory per week.

4510 Laboratory Problems in Remote Sensing. Four credits. Prerequisite: GEOG 4490. Computer processing of selected satellite imagery. Laboratory will provide practical experience through design, execution, and completion of an applied remote sensing project.

4520 Image Interpretation. Four credits. Principles, methods, and techniques of image interpretation, including maps, satellite data, and aerial photos.

4530 Geographic Information Systems. Three credits. Lecture and laboratory work relative to computer-manipulated geographic data base. Laboratory work will involve experience in practical application of a geographic information system (GIS) to problem solving.

4540 Geography of Native Americans. Three credits. Prerequisite: GEOG 2000 or permission of instructor. Lecture and field exercise format viewing America’s native population from a geographic perspective. Native Americans will be examined archeologically using geo-techniques to explore their past, present, and future; cultural ecologically—their symbiotic relationship with their surroundings; and through their economic and resource development—how they utilize natural and cultural resources that are presently on tribal lands.

4550 Global Issues. Three credits. An examination of current global issues in the context of their geographic environment. Emphasis on geographic factors impacting those issues. Topics examined vary from year to year.

4570 Advanced Geographic Information Systems. Three credits. Prerequisites: GEOG 4330 or introductory course in geographic information systems or equivalent; coursework in statistics and computer programming recommended. Advanced course in spatial analysis. Using spatial statistics, Visual Basic programming, and databases to solve problems involving proximity, density, clustering, the cost of travel paths, etc. Other major topics include environmental modeling and error analysis.

4571 Internship in Geography. Three credits each. Prerequisites: GEOG 4571 or 4572. Major or minor in geography; 15 hours of geography/geology as HIST 4870.) Prerequisites: HIST 4860; ANTH 3210; or permission of instructor. Archaeological resources and procedures and the interpretation of historical evidence undertaken at a field archaeological site.

Courses in Geology [GEOL]

1030 Introduction to Earth Science. Three credits. The earth and its relationship to its space and environment emphasized. Forces and processes which combine to mold the face of the earth and its atmosphere, as well as the internal constitution of the earth. Three hours lecture. GEOL 1031 must be taken concurrently. Together, GEOL 1030 and 1031 satisfy 4 hours of the Natural Sciences portion of the General Education requirement.

1031 Introduction to Earth Science Lab. One credit. Laboratory to accompany GEOL 1030.
1040 Physical Geology. Four credits. The origin, composition, and structure of the solid earth: rock-forming minerals; igneous, sedimentary, and metamorphic rocks; earthquakes and plate tectonics; surface processes; geologic time. Identification and description of minerals and rocks in hand sample. Use of topographic and geologic maps. Three hours lecture and two hours laboratory per week.

1050 Historical Geology. Four credits. Prerequisites: GEOL 1030 and 1031 or GEOL 1040. The major divisions of geologic time with emphasis on earth movements, sea fluctuations, life of the time, and the effect these have had on our present environment. Close attention to the development of the physiographic regions of North America, which are correlated with chronologically similar events in other parts of the world. Topographic maps, geologic maps, and fossil animals and plants. Three hours lecture and two hours laboratory per week.

3000 Mineralogy. Five credits. Prerequisites: GEOL 1030 and 1031 or 1040 or permission of instructor. Crystallography and crystal chemistry. Physical and chemical properties of silicate and non-silicate mineral groups. Examination of the common rock-forming minerals in hand sample and thin section. Four hours lecture and two hours laboratory per week.

3010 Oceanography. Three credits. Prerequisites: GEOL 1030 and 1031 or 1040 or GEOG 1030; or consent of instructor. Physical and chemical properties of ocean water, current movements, waves, and tides. Examination of the ocean floor, coastal and oceanic environments; and the nature of sea water, currents, waves, and tides. Geological processes, geophysical studies, and oceanographic instrumentation discussed.

3050 Field Methods in Geology. Two credits. Prerequisites: MATH 1730 or equivalent; GEOL 1030 and 1031 or 1040 and 1050; major or minor in Geoscience; or consent of instructor. Introduction to field observation in geoscience. Topics include tape and compass surveys, triangulation, orientation of rock strata, measurement of stratigraphic section, map preparation, and use of GPS. Two hours lecture/field work per week.

3060 Computer Methods in Geology. Three credits. Prerequisites: GEOL 1030 and 1031 or 1040 and 1050; CSCI 1000 or equivalent; or consent of instructor. Extensive use of personal computers for processing field data, map contouring, geologic reports and illustrations, lettering and cartography, image processing, geologic databases, and digital maps. Brief treatment of classical cartography. Four to five hours lecture/laboratory per week.

3160 Geologic Literature and Report Writing. One credit. Prerequisites: CSCI 1000; GEOL 1030 and 1031 or 1040, and GEOL 3060; at least 8 semester hours of upper-division Geology coursework. Acquisition and presentation of geological data from traditional library and database sources. Preparation of geologic field and laboratory reports in addition to professional reports and papers.

3401-Field Course. Four credits each. Prerequisite: GEOL 1030 and 1031 or 1040. Supervised study in some geological area preceded by classroom preview and concluded by a time of evaluation. Emphasis on the natural and physical elements of the environment, with special attention directed toward the geomorphology and geology of specific areas. For fees and specific credit, consult the director, division of geology.

4000 Petrology and Petrography. Four credits. Prerequisite: GEOL 3000. Igneous, sedimentary, and metamorphic rocks. Theories of formation and evolution based upon mineralogical and geochemical evidence. Examination and classification of rocks in hand sample and thin section. Three hours lecture and two hours laboratory per week.

4020 Geomorphic Regions of the United States. Four credits. Prerequisites: GEOL 1030 and 1031 or 1040; GEOL 1050. Origin, regional distribution, and geomorphic features and history of landforms of the United States. Students will be required to analyze maps, structure sections, and aerial photography to determine geomorphic forms and the forces and processes that produced these forms. Three hours lecture and two hours laboratory per week.

4030 Invertebrate Paleontology. Four credits. Prerequisite: GEOL 1050. Invertebrate and microscopic life of the past, including recently preserved representatives and their ancient fossilized ancestors. Numerous field trips to local fossil-collecting sites. Designed to aid in the preparation of earth science teachers, geologists, and biologists. Three hours lecture and two hours laboratory per week.

4050 Meteorology. Three credits. A general, non-mathematical introduction to the atmosphere. Emphasis on main elements such as temperature, precipitation, clouds, and humidity. In-depth analysis of storms, tornadoes, and hurricanes and human alteration of the atmosphere such as the ozone hole. Weather forecasting and climate change.

4070 Sedimentation and Stratigraphy. Four credits. Prerequisites: GEOL 1050 and 3000 or consent of instructor. Sedimentary rocks, the processes of sedimentation, the alteration of sediments through time, and examination of resulting stratigraphic units. Designed for geoscience majors and those with interests in soil mechanics and civil engineering. Three hours lecture and two hours laboratory per week.

4080 Structural Geology. Three to four credits. Variable credit. Prerequisites: MATH 1730 or equivalent; GEOL 1030 and 1031 or 1040; GEOL 1050 recommended. Orientation and deformation of rock. Geometric, analytical, and statistical solutions to structural problems. Emphasis on three-dimensional visualization, problem solving, geological map interpretation, and the mechanics of deformation. Lecture and laboratory.

4090 Problems in Geology. One to six credits. Variable credit. Prerequisites: A minimum of 12 semester hours of geology (excluding GEOL 1030 and 1031) at least 6 hours of which must be upper division; consent of instructor. A problem-solving course. Includes an independent research-oriented project commensurate with the student’s interests and qualifications. May be repeated up to a maximum of 6 hours.

4100 Geophysical Prospecting. Four credits. Prerequisites: GEOL 3060; MATH 1910; PHYS 2010 or 2110; or consent of instructor. (PHYS 2020 or 2120, GEOL 1030 and 1031 or 1040, and MATH 1920 also recommended.) Survey of seismic, gravimetric, and magnetic/electrical exploration methods. An applied course covering some elementary theory, basic field practice, computation fundamentals, interpretation techniques. Three hours lecture and two hours laboratory per week.

4120 Environmental Geology. Four credits. Prerequisites: GEOL 1030 and 1031 or 1040 or GEOG 1030 or consent of instructor. Application of geologic information to minimize possible environmental degradation and maximize utilization of resources in the natural and modified environment; local examples and field trips. Topics include engineering properties of earth materials, natural hazard prediction and reduction, water supply, solid and hazardous wastes, mineral resources, global change, land-use plan-
ning, environmental impact analysis. Three hours lecture and
two hours laboratory per week.

4130 Hydrogeology. Four credits. Prerequisites: MATH 1730 or
equivalent; GEOL 1030 and 1031 or 1040; 4 hours of geology;
or consent of instructor. Basic processes and measurement of
the hydrologic cycle, including precipitation, evaporation, sur-
face runoff, stream flow, soil moisture, and ground water. Em-
phasis on ground water including geology of occurrence, prin-
ciples of flow, conceptual models of regional flow, chemistry
and quality, well hydraulics, aquifer characteristics, resource
development, detection of pollutants, and contaminant trans-
port. Lecture and laboratory.

4140 Inorganic Geochemistry. Three credits. Prerequisite: GEOL
4000. Principles of inorganic geochemistry. Geochemistry of
the earth and solar system, isotopic geochronometers, thermo-
dynamics and rates of geochemical processes, chemical weath-
ering, chemical compositions of surface and groundwater. Three
hours lecture per week.

4150 Environmental Applications of Hydrogeology. Three credits.
Prerequisite: GEOL 4130. An advanced course in hydrogeology
that emphasizes applied methods for assessing hazardous and
solid waste facilities and contaminated ground water remediation
methods. Included will be site characterization methods,
ground water sampling procedures, and monitoring well instal-
lation techniques. Three hours lecture per week.

4170 Applied Geochemistry. Three credits. Prerequisites: GEOL 1030
and 1031 or 1040 plus CHEM 1010 and 1011 or CHEM 1110
and 1111. Theory and application of geochemical techniques
to the study of geologic problems. Sample preparation and analy-
sis of geologic materials using departmental instrumentation. Two
hours lecture and two hours laboratory per week.

4571- Internship in Geology. Three credits each. Prerequisites: Major
4572 or minor in geology; 15 hours of geology/geography with junior
or senior standing; permission of employer and department.
Practical experience for students in a professional setting relat-
ing to geologic work. Counted as a free elective, not as a part of
major or minor requirement. After completion of one intern-
ship, 4571 or 4572, the other may be taken (total of six credits).

4580 Seminar in Geology. One credit. Prerequisite: Senior standing
in geology. A reading and discussion seminar in which current
topics in the geological sciences are examined to broaden the
major’s knowledge of the scope and literature of the discipline.

Some departmental courses may be accepted in either con-
centration; others are accepted only in one concentration.
Substitutions are made at the discretion of the department
chair in consultation with the academic advisor.

Honors College
The Department of Geosciences offers the following courses
in Honors: GEOG 2000, GEOL 1030.

Graduate Study
The department offers minors in Geography and Earth Sci-
ence/Geology at the graduate level and a graduate certifi-
cate in Geoscience. The list of available courses offered can
be found in the Graduate Catalog.