GEOLOGY

Robinson Foundation

PROFESSORS SCHWAB, SPENCER
ASSOCIATE PROFESSOR HARBOR
ASSISTANT PROFESSOR KNAPP, CONNORS

MAJORS

BACHELOR OF SCIENCE

A major in **geology** leading to a Bachelor of Science degree consists of 50 credits as follows:

1. Geology 160, 185, 211, 311, 330, 350, and a comprehensive examination in geology; Chemistry 111, 112; Physics 111, 112, 113, 114
2. Geology 247 or 340
3. Additional courses to bring the total to 50 must be selected from among Biology 111, 112; Geology 108, 209, 247, 275, 340, 373, 376 (or an approved summer field course), 395, 396, 397, and 472 (four credits) or 493 (six credits)

Additional courses required as prerequisites for completion of the above include Geology 100 or 101 and Mathematics 101.

Independent majors in geophysics or engineering geology may be developed with guidance from the geology department for students interested in these areas of study.

BACHELOR OF ARTS

A major in **geology** leading to a Bachelor of Arts degree requires 40 credits as follows:

1. At least 26 credits in geology Geology 185 and 211 and at least 12 credits numbered 200 or above
2. Additional courses must be selected from among Accounting 201, 202; Biology 111 or higher; Chemistry 111 or higher; Computer Science 111 or higher; Economics 101, 102, 201; all engineering; all geology; Management 201, 221; all mathematics; Philosophy 108; Physics 111 or higher; Politics 230, 232

A major in **environmental studies in geology** is designed to provide general background in environmental studies with emphasis on geological aspects of the field. Graduate programs in environmental studies and environmental sciences are offered at many universities. Some of the programs are centered around particular disciplines such as geology, geography, ecology, engineering, or oceanography. Some are concerned with public policy issues such as land use planning; others are truly interdisciplinary. Students who expect to undertake scientific work in environmental geology should complete the geology major leading to a Bachelor of Science degree. Students with an interest in environmental issues are advised to define their interests as precisely as possible and to consult with faculty members regarding major and course selection.

Students may not complete both the Program in Environmental Studies and this major in environmental studies in geology.

The major in environmental studies in geology leading to a Bachelor of Arts degree requires 40 credits as follows:

1. Geology 100 or 101
2. Geology 135, 160, 185, 201, 211, 247, 260 and 340
3. Geology 397 or 472 (four credits) or 493 (six credits) on an environmental topic
4. Additional courses must be selected from among Biology 111, 112, 230, 240, 245, 330; Chemistry 111; Economics 101, 102; Geology 146, 275, 311, 330, 350; Philosophy 108; Politics 230, 232.

HONORS: An Honors Program in geology is offered for qualified students; see department head for details.

★GEOLOGY 100 (4)—General Geology with Field Emphasis

Prerequisite: Permission of the instructor. Same as Geology 101 with special emphasis on field study in the region near Lexington. Contact the instructor for additional information. No credit for students who have completed Geology 101. Laboratory course. *Spencer, Harbor, Knapp.*

Fall

★GEOLOGY 101 (4)—General Geology

The study of our physical environment and the processes shaping it. The materials and structure of the earth's crust, the origin of the landforms, the concept of geologic time, and the nature of the earth's interior are considered. No credit for students who have completed Geology 100. Laboratory course. *Staff.*

Fall

★GEOLOGY 102 (3)—History and Evolution of the Earth

An introductory examination of the origin and physical evolution of the earth as inferred from the rock record. Areas of particular emphasis include: (1) the origin of the solar system and differentiation of the planets; (2) the evolution of the terrestrial atmosphere and hydrosphere; (3) explanations for the development of life; (4) organic evolution and interpretations of "mass extinctions"; (5) the changing configuration of continental blocks and ocean basins by continental drift, sea-floor spreading, and plate tectonics; and (6) the growth of continental blocks and their mountain systems. *Schwab.*

Winter

★GEOLOGY 104 (3)—Planetary Geology

Large scale geological features of the earth will be examined and compared with surface features visible on images of other planets and planetary satellites of the solar system. Features examined include those resulting from volcanism, impact cratering, and structure; eolian, fluvial, glacial and periglacial processes; and mass movement. The composition of terrestrial and lunar rocks and extraterrestrial objects is examined. Models of the origin and evolution of planets and their satellites are discussed. *Staff.*

Not offered in 2000-2001

★GEOLOGY 108 (3)—Origin and Evolution of Life

A general survey of the science of paleontology summarizing the changing character of the biosphere over the past four billion years as documented by the fossil record. Major topics include the chemical origin of early organisms; the Cambrian explosion of skeletonization and the Paleozoic conquest of land; mass extinctions; the interplay between the biosphere, atmosphere and hydrosphere; and the use of the fossil record for tracking the origin, development and physical distribution of ancient continental blocks and ocean basins. Students desiring experience in recognition and practical identification from the fossil record should register concurrently for Geology 209. *Schwab.*

Fall 2001 and alternate years

★GEOLOGY 135 (1)—Meteorology

A brief survey of weather and climate including the physical properties of air, planetary circulation, storms, and weather forecasting. *Spencer.*

Winter

★GEOLOGY 141 (3)—Global Climate Change

A study of Earth's complex climate system and the impact of human activities on future climates. Through readings, discussion, data analysis and modeling exercises, the past and future changes in temperature, ocean circulation, rainfall, storminess, biogeochemistry, glacial ice extent and sea level are explored. The course includes the relationship of the science of global change to the politics of mitigation. *Harbor.*

Winter 2002 and alternate years

★GEOLOGY 146 (3)—Geology of Natural Resources

Prerequisite: Geology 100 or 101. Geology and geography of mineral, fuel, soil, and water resources. Exploitation techniques, patterns of distribution and use, and environmental aspects are considered. *Schwab.*

Winter 2001 and alternate years

★GEOLOGY 150 (3)—Water Resources

Prerequisite: Geology 100 or 101. A seminar examining the quality and quantity of water resources as a limiting factor for future generations. Issues include resource depletion, pollution, historical use and abuse, remediation, and habitat maintenance. Resource constraints are analyzed from a scientific perspective in order to understand or predict water resource problems and solutions. *Harbor.*

Winter 2001 and alternate years

★GEOLOGY 160 (3)—Field Geology

Prerequisite: Geology 100 or 101. An introduction to the study of geology in the field with special attention to the methods used by geologists to make, record, and interpret field observations. The course includes study of and field trips in the central Appalachian region. *Spencer, Schwab.*

Spring

GEOLOGY 185 (1)—Computer Applications in Geology

Prerequisite: Geology 100 or 101 and either freshman or sophomore standing. Pass/Fail only. A brief introduction to the computer tools most useful to geology students for courses and research. Covers spreadsheets, graphing, modeling, graphics, digitizing, web pages and modeling software. *Staff.*

Fall

★GEOLOGY 195 (1)—Selected Topics

Selected topical coverage of various subject areas in geology of particular interest for reasons of timeliness, general interest, etc. The topic selected will vary from year to year and be announced in advance of the registration period. Impact and extinction of the dinosaurs, geology of natural resources, computer applications in geology, climatology, and geologic consideration in land use planning are among topics previously studied. May be repeated for a maximum of four degree credits with permission and in different topics. *Staff.*

Winter

★GEOLOGY 201 (3)—Oceanography

Prerequisite: Geology 100 or 101; Biology 111 or 112; Chemistry 111; or Physics 111 and 113. Introduction to physical oceanography and marine geology; tides, waves, currents, and the interaction of oceans and atmosphere, submarine landscapes; and sedimentary, volcanic, and tectonic activity in the ocean basins. *Spencer.*

Winter

GEOLOGY 209 (1)—Laboratory Study of the Fossil Record

Prerequisite or corequisite: Geology 108. Examination of the fossilized remains of representative species of major groups of organisms. Emphasis is given to those organisms which, due to uneven distribution in the record, are particularly useful in interpreting the age and setting of ancient rocks. *Schwab.*

Fall 2001 and alternate years

GEOLOGY 211 (4)—Earth Materials I: Rocks and Minerals

Prerequisite: Geology 100 or 101. A laboratory course introducing earth materials, including minerals and rocks, with an emphasis on a hands-on approach to identifying and interpreting minerals and their associations in igneous and metamorphic rocks. Students learn the techniques and principles of hand sample identification, optical mineralogy and petrography, x-ray diffraction and scanning electron microscopy. *Knapp*

Winter

★GEOLOGY 247 (4)—Geomorphology

Prerequisite: Geology 100 or 101. Investigation of landforms from maps, aerial photographs, digital data, and the analysis of the surficial processes by which they are formed. Laboratory activities include identification and interpretation of topography, field measurements of landscape form and process, and a weekend field trip. Laboratory course. *Harbor.*

Fall

GEOLOGY 260 (4)—GIS and Remote Sensing

Prerequisites: Geology 185 and either Geology 100, 101 or permission of the instructor. A laboratory course introducing the use of a Geographic Information System (GIS) and remote sensing in geological/environmental analyses and decision-making. Students use state-of-the-art software with a wide variety of spatial geologic, environmental, economic and topographic data derived from satellites, remote databases and published maps to evaluate geologic conditions, local landscape processes, environmental conditions and hypothetical land-use cases. *Harbor.*

Winter

GEOLOGY 275 (3)—Introductory Geophysics

Prerequisite: Geology 100 or 101 or Physics 111 and 113. A review of the geophysical methods used to study the interior of the earth, the magnetic field, isostasy, and earthquake seismology. Attention is given to the methods used in geophysics to collect and analyze data. A gravimeter, a magnetometer, seismic refraction and electrical resistivity equipment are used to collect field data. The data, corrections, and interpretations are incorporated into a technical report for each of the four surveys. *Spencer.*

Fall 2001 and alternate years

GEOLOGY 311 (4)—Earth Materials II: Geochemistry

Prerequisite: Geology 211 or permission of the instructor. A laboratory course emphasizing the principles and tools of the chemical composition of earth materials to interpret petrogenesis. The course focuses on processes occurring below and at the Earth's surface. Topics include thermodynamics and phase diagrams, crystal chemistry, ion packing and symmetry, magmatic and metamorphic processes, and trace element and isotope geochemistry. The laboratory includes both a local field and laboratory component and focuses on using analytical techniques to evaluate chemical composition including electron microscopy, ion chromatography, atomic absorption spectroscopy, and inductively coupled plasma mass spectrometry. *Knapp.*

Fall 2001

GEOLOGY 330 (4)—Sedimentation and Stratigraphy

Properties, origins, and dynamics of sediments and sedimentary rocks. Correlation, organization, and historical interpretation of the sedimentary rock record. Field and laboratory analyses of sedimentary rocks. Laboratory course. *Schwab.*

Fall 2000 and alternate years

GEOLOGY 340 (4)—Hydrology

Prerequisites: Geology 100 or 101. Systems and processes of water movement on and below the earth's surface. Encompasses the theoretical and applied aspects of soil moisture, runoff, flooding, groundwater movement, and water well use. Numerical evaluation of flow properties from field and lab data describing water movement in soils, aquifers, and streams. Laboratory course. *Harbor.*

Spring 2002 and alternate years

GEOLOGY 350 (4)—Structural Geology and Tectonics

Prerequisites: Geology 160 and Mathematics 101. Description and methods of analysis of large and small scale structural features of the Earth's crust. Rock and soil mechanics, application of structural geology in environmental engineering and resource exploration, structural analysis of satellite imagery, plate tectonics, geometric techniques used in structural analysis, interpretation of geologic maps, and the structural development of mountain systems. Laboratory course. *Spencer.*

Fall 2000 and alternate years

GEOLOGY 373 (3), 376 (6)—Advanced Field Study

Prerequisite or Corequisite: Geology 160 and permission of the instructor. The emphasis and location of the study area will differ from year to year. Information will be made available by the end of the fall term. *Staff.*

Spring

GEOLOGY 395 (1), 396 (2), 397 (3)—Seminar

Prerequisite: Permission of the instructor. The title, term of meeting, and credits for seminars will be announced to all geology majors. May be repeated for degree credit with permission and if the topics are different. In Winter 2000, Geology 397 topics will include one devoted to environmental studies and another dealing with geographical information systems (GIS) and remote sensing. *Staff.*

Offered when interest is expressed and departmental resources permit

GEOLOGY 401 (1), 402 (2), 403 (3)—Directed Individual Study

Prerequisite: Permission of the instructor. Advanced work and reading in topics selected by the instructor and meeting the special needs of advanced students. This course may be repeated for degree credit with permission and if the topics are different. *Staff.*

Offered when interest is expressed and departmental resources permit.

GEOLOGY 472 (2-2)—Senior Research Thesis

Candidates for the Bachelor of Science degree in geology are urged to undertake research on a field or laboratory problem which can lead to the presentation of a senior thesis. Work on this project should be started in the spring term of the junior year. Interested students should consult members of the faculty who will help define the problem and provide guidance during research.

Fall-Winter

GEOLOGY 493 (3-3)—Honors Thesis

Fall-Winter