

Geology

PROFESSORS **Bailey** (Chair), **Macdonald** (Chancellor Professor), **Owens**. ASSOCIATE PROFESSORS **Hancock** (Spears Professor) and **Lockwood**. ASSISTANT PROFESSOR **Kaste**, RESEARCH ASSOCIATES **Beach**, **Berquist**, **Campagna**, **Hodges**, and **Izett**.

The program of the Department of Geology is designed to provide each major with a strong, broad background in geology that is sufficiently flexible to allow students freedom to follow their own interests. The major may choose one of two options, either general geology or environmental geology. Ample opportunity is available for independent student research and such research is an integral part of the curriculum regardless of the option chosen.

The geologic setting of Williamsburg enhances the program in geology and offers a wide variety of areas for field study. Situated on the Coastal Plain with its excellent exposures of sediments and fossils, the College is only 50 miles from the Fall Zone beyond which are the igneous and metamorphic rocks of the Piedmont. The Blue Ridge and Valley and Ridge areas of the Appalachian Mountains are within a three-hour drive. Thus the field study area includes all major rock types and representatives of most geologic time periods from Precambrian to Holocene.

Requirements for Major

Required Credit Hours: 36 (or more, depending on options)

Major Computing Requirement: Geology 492 or Geology 496.

Major Writing Requirement: Senior Research (Geology 492) or the Honors Thesis (Geology 496); students must receive a grade of C- or better to satisfy the requirement.

Core requirements:

1. A core for all majors consisting of nine semester courses totaling 25 or more credits, which are Geology 101 or 110 or 150, 160, 320, 321, 322, 323, 404, and either 491 and 492 OR 495 and 496.
2. The Geology Option: Elective courses totaling at least eleven credits selected from 204, 303, 305, 306, 307, 311, 312, 314, 315, 316, 422, 423, 424, 425, 426, 427, 428, 429, 437. Only one of 314 or 315 can be used to satisfy this requirement.
3. The Environmental Geology Option: Elective courses totaling at least eleven credits selected from 204, 305, 312, 314, 315, 316, 427, 428, 429. One of the courses must be 314 or 315, but only one of 314 or 315 can be used to satisfy this requirement. Depending on the topic, 437 may be used to satisfy this requirement with permission of the chair.
 - c. Biology 220, 417, 426, or 427

Geology majors are required to take eight credits (two courses and associated laboratories) from the following list of five choices: Chemistry 103 and 103L, Chemistry 206 and 206L, Chemistry 308 and 354, Physics 101, and Physics 102.

A year of calculus, a year of chemistry, and a year of physics are strongly recommended for a career in the earth sciences.

Requirements for Minor

Required credit hours: 21 credits (or more depending on choices).

Core requirements: A minor in geology requires seven courses distributed as follows:

1. One from Geology 101, 110, 150
2. Geology 160
3. Two courses from Geology 320, 321, 322, 323
4. Three courses (with at least nine credits) from GEOL 303, 305, 306, 307, 312, 314, 316, 422, 423, 424, 425, 426, 427, 428, 429, 437. A course from group 3 may be substituted for one from group 4.

Description of Courses

101. The Dynamic Earth: Physical Geology.

(GER 2A) Fall and Spring (3,3) Kaste, Layou, Staff.

An investigation of the major features of the earth and its materials and the interaction of the geologic processes active on the surface and in the interior of the earth. Topics include volcanoes, rivers, glaciers, earthquakes, natural resources, and global change.

110. Earth's Environmental Systems: Physical Geography.

(GER 2A) Fall and Spring (3,3) Bailey, Lockwood.

Introduction to the interactions between the earth's environmental systems – the atmosphere, hydrosphere, biosphere, and solid earth. Emphasis will be placed on the relationship between the environment and the human condition.

150W. Freshman Seminar in Geology.

Fall (4) Macdonald.

A course designed to introduce first-year students to topics in the study of geology. Satisfies the freshman writing requirement. Topics will vary from semester to semester.

160. Investigating the Earth: Introductory Geology Laboratory.

(Lab) Fall and Spring (1,1) Morse, Staff. Prerequisite or corequisite: GEOL 101 or GEOL 110 or GEOL 150.

Investigating the Earth through exercises involving observations and interpretations of maps, minerals and rocks, groundwater and streams, coastal processes, and earthquakes. Required field trips. Three laboratory hours.

204. GIS in the Earth and Environmental Sciences.

Fall, Spring (3) Hamilton. Prerequisites: ENSP 101 OR GEOL 101, 110, or 150.

This course will provide an introduction to using Geographic Information Systems (GIS) as a tool in earth and environmental science and policy. Emphasis will be on hands-on application of GIS to create maps, to organize and visualize spatial data, and to query spatial data to elucidate answers to earth and environmental questions. (Cross-listed with ENSP 204)

303. Age of Dinosaurs.

Spring (3) Lockwood. Prerequisite: GEOL 101 or GEOL 110 or GEOL 150.

In this course, we'll use dinosaurs and the Mesozoic world to explore concepts of geologic time, extinction, climate change, evolution, and plate tectonics. Emphasis will also be placed on how science works and major discoveries in dinosaur paleontology.

305. Environmental Geology.

Fall (3) Kaste. Prerequisite: GEOL 101 or GEOL 110 or GEOL 150. Offered alternate years.

The application of geology toward understanding the connections between human activities and the environment. Topics include climate change, flooding and water pollution, coastal processes, and natural hazard prediction.

306. Marine Geology.

Fall (3) Kuehl, Macdonald. Prerequisite: GEOL 101 or GEOL 110 or GEOL 150. Offered alternate years.

The physical geology of the continental margins and ocean basins. Evolution of the ocean basins, oceanic circulation patterns, marine environment, and human impact are stressed.

307. Planetary Geology.

Fall (3) Bailey. Prerequisite: GEOL 101 or GEOL 110 or GEOL 150. (Not offered 2011-2012)

An investigation of planetary bodies in the Solar System. Topics include celestial mechanics, the formation of planets and satellites, planetary surfaces, and planetary atmospheres.

310. Regional Field Geology.

Spring, Summer (1-3,1-3) Staff. Prerequisite: GEOL 101 or 110 or 150, GEOL 160, and instructor consent.

Field techniques and their application in the study of the geology and geologic history of selected regions. One to four-week field trip with pre-field trip lecture sessions. This course may be repeated for credit. Fee Required.

311. Field Methods in the Earth Sciences.

Spring (3) Bailey. Prerequisite: GEOL 200. (Not offered 2011-2012)

Field techniques and their application to solve geological and environmental problems. Topics include GPS surveying, topographic surveying, bedrock and surficial mapping, and introduction to geophysical methods. Required Spring Break field project. Offered in alternate years.

312. Weather, Climate, and Change.

Fall (3) Bailey. Prerequisite: GEOL 101 or GEOL 110 or GEOL 150.

An introduction to meteorology and climate with an emphasis on the workings of the atmosphere. The course will consider weather forecasting, hazards, and the nature of climate and change through time.

314. Watershed Dynamics.

Spring (4) Chambers, Hancock. Prerequisite: GEOL 101 or GEOL 110 or GEOL 150 or BIOL 203 or 204. Offered in alternate years.

This team-taught course will combine biologic and hydrologic approaches to explore the interactions between the physical, biological, and chemical processes active in watersheds. Emphasis will be placed on understanding how interactions between these processes control water quality and biologic diversity, and how anthropogenic activities modify these processes. Laboratory is required. (Cross listed with ENSP 201)

315. Hydrology.

Spring (4) Hancock. Prerequisite: GEOL 101 or GEOL 110 or GEOL 150, MATH 111. Offered in alternate years.

Quantitative investigation of the major components of the hydrologic cycle and their interactions, including atmospheric water, surface water, and groundwater. Field trips required. Three class hours, three laboratory hours.

316. Environmental Geochemistry.

Fall (3) Kaste. Prerequisite: GEOL 101 or GEOL 110 or GEOL 150, CHEM 103.

This course examines the chemical interactions among water, rock, and biota. We will investigate the basic inorganic and organic chemistry of nutrients, metals, and carbon. Topics covered include weathering, oceanic and terrestrial biogeochemical cycles and heavy-metal deposition.

320. Earth Surface Processes.

Fall (4) Hancock. Prerequisite: GEOL 101 or GEOL 110 or GEOL 150, GEOL 160.

A quantitative investigation of processes that act to shape the Earth's surface. Explores the links between surface processes, tectonics, and climate; the mechanics and rates of landscape processes and evolution; and the movement of water on and near the surface.

321. Rock-Forming Minerals.

Fall (4) Owens. Prerequisite: GEOL 101 or GEOL 110 or GEOL 150, GEOL 160.

An introduction to the structures, compositions, characteristic features, and uses of the most common minerals. This course will emphasize the fundamental role that minerals play as the building blocks of sedimentary, igneous, and metamorphic rocks. Field trips.

322. The Sedimentary Record.

Spring (4) Macdonald. Prerequisite: GEOL 101 or GEOL 110 or GEOL 150, GEOL 160.

An introduction to the origin and interpretation of sediments, fossils, and sedimentary rocks with a focus on depositional environments, paleoclimates, and the use of sediments, fossils, and sedimentary rocks in the interpretation of earth history. Field trips.

323. Earth Structure & Dynamics.

Spring (4) Bailey. Prerequisite: GEOL 101 or GEOL 110 or GEOL 150, GEOL 160.

An introduction to the internal structure of the earth and its dynamics. Geological and geophysical characteristics of the earth are used to understand tectonic processes. Examines major earth structures and investigates the physics of deformation. Field trips.

330. Introduction to Marine Science

Spring (3) Bauer, Patterson. Prerequisite: GEOL 101 or GEOL 110 or GEOL 150. Offered alternate years.

Description of physical, chemical, biological, and geological processes operating in the world ocean. The interdisciplinary nature of oceanography is emphasized, providing an integrated view of factors which control ocean history, circulation, chemistry and biological productivity. (Cross listed with BIOL 330 and MS 330)

404. Introduction to Geological Research.

Spring (1) Bailey.

Analysis of journal articles, discussion of research topics, and instruction in the use of library resources including electronic databases. Class work will include oral and written presentations and students will develop a formal research proposal for a senior research or Honors project in consultation with their research advisor. Enrollment is restricted to geology majors, normally in their junior year.

***407. Special Topics in Geology.**

Fall and Spring (1-3,1-3) Staff. Prerequisite: Consent of instructor.

Advanced study of topics not routinely covered by existing courses. Subjects, prerequisites and instructor will vary from year to year. This course may be repeated for credit.

***409. Independent Study in Geology.**

Fall and Spring (1-3,1-3) Staff.

A program for geology majors who wish to pursue independent study of a problem or topic in geology. May be repeated for credit.

422. Igneous and Metamorphic Petrology.

Spring (3) Owens. Prerequisite: GEOL 321. (Not offered 2011-2012).

Mineral and rock genesis in the igneous and metamorphic environments. A study of hand specimens and thin sections, structures, textures, and areal distribution. Field trips. Two class hours, two laboratory hours.

423. Paleontology.

Spring (3) Lockwood. Prerequisite: GEOL 101 or 110 or 150 or both BIOL 203 and BIOL 204.

The taxonomy of fossil organisms and the role of fossils in the study of organic evolution and the time relations of rock sequences. The laboratory stresses invertebrate morphology and quantitative measurement of local marine fossils. Field trips. (Cross listed with BIOL 317)

424. Sedimentology Seminar.

Fall (1-3) Lockwood. Prerequisite: GEOL 322.

Advanced seminar in topics in Sedimentology.

425. Structural Geology Seminar.

Fall (1-3) Prerequisite: GEOL 323.

Advanced seminar in topics in Structural Geology.

426. Paleobiology Seminar.

Fall or Spring (1-3) Lockwood. Prerequisite: GEOL 423.

Advanced seminar in topics in Paleobiology.

427. Surface Processes Seminar.

Spring (1-3) Hancock. Prerequisite: GEOL 320.

Advanced seminar in topics in Surface Processes.

428. Geochemistry Seminar.

Fall (1-3) Kaste. Prerequisite GEOL 316.

Advanced seminar in topics in Geochemistry.

429. Hydrology Seminar.

Fall or Spring (1-3) Hancock. Prerequisite: GEOL 314 or 315.

Advanced seminar in topics in Hydrology.

437. Special Topics Seminar.

Fall or Spring (1-3) Staff. Prerequisites: GEOL 101 or 110 or 150, GEOL 160.

Advanced seminar.

491-492. Senior Research.

Fall and Spring (2-2) Staff. Prerequisite: GEOL 404.

Independent study throughout the senior year culminating in a written thesis and a formal presentation.

†495-496. Honors.

Fall, Spring (3,3) Staff. Prerequisite: GEOL 404.

The requirements of Honors study in geology include a program of research accompanied by readings from the original literature, the satisfactory completion of a comprehensive examination in geology, and the preparation and presentation of an Honors essay based on the student's reading and research. For College provisions governing the Admission to Honors, see the Department Honors section of the catalog under Requirements for the Baccalaureate Degree.