History


Sociology

(Same as Africana Studies 10.)

Geology

Associate Professors: Rachel J. Beane†, Edward P. Laine, Chair; Peter D. Lea
Laboratory Instructors: Cathryn Field, Joanne Urquhart
Department Coordinator: Marjorie Parker

Requirements for the Major in Geology
The major consists of nine courses. Four core courses are required of all majors: Geology 101, 202, 275 or 276, and 393. In addition, to experience the breadth of the discipline, one course must be taken from courses emphasizing the solid earth (220, 241, 262, 265) and one course must be taken from courses emphasizing oceans and surface processes (250, 255, 257, 267, 272). The three remaining elective courses for the major may be selected from the geology courses offered in the department. Note that: (a) 100 or 103—not both—may be counted toward the three elective courses; (b) up to two approved study-away courses may be counted toward the three elective courses; (c) all courses to be counted toward the major need to be completed with a C- or better; (d) independent study does not normally count toward the major requirements; and (e) AP Environmental Science is not accepted toward the major—students may consult the Environmental Studies Program for possible credit. Geology majors are advised that most graduate schools in the earth and environmental sciences require the equivalent of Chemistry 109, Physics 103, and Mathematics 171.

Interdisciplinary Majors
The department participates in formal interdisciplinary programs in geology and physics and in geology and chemistry. See page 207.

Requirements for the Minor in Geology
The minor consists of four courses in geology, including 101, 202, 275/276 and one other geology course. All courses to be counted toward the minor need to be completed with a C- or better.
Introductory, Intermediate, and Advanced Courses

100a - INS. Environmental Geology and Hydrology. Every spring. Peter Lea.
   An introduction to aspects of geology and hydrology that affect the environment and land use. Topics include watersheds and surface-water quality, groundwater contamination, coastal erosion, and landslides. Weekly labs and field trips examine local environmental problems affecting Maine rivers, lakes, and coast. (Same as Environmental Studies 100.)

101a - INS. Investigating Earth. Every fall. The Department.
   Dynamic processes, such as earthquakes and volcanoes, shape the earth on which we live. In-class lectures and exercises examine these processes from the framework of plate tectonics. Weekly field trips explore rocks exposed along the Maine coast. By the end of the course, students complete a research project on Casco Bay geology.

103a - INS. Marine Environmental Geology. Every fall. Edward Laine.
   An introduction to the aspects of marine geology and oceanography that affect the environment and marine resources. Topics include estuarine oceanography and sediments, eutrophication of coastal waters, primary productivity, waves and tides, sea-level history, glacial geology of coastal Maine, harmful algal bloom, and an introduction to plate tectonics. Weekly field trips and labs examine local environmental problems affecting Casco Bay and the Maine coast. A one-day weekend field excursion is required. (Same as Environmental Studies 103.)

202a - INS. Mineralogy. Every spring. The Department.
   Mineral chemistry and crystallography are explored through hand specimen identification, optical microscopy, scanning electron microscopy, energy-dispersive spectrometry, and phase diagrams. Emphasis is placed on mineral associations, and on the genesis of minerals in igneous and metamorphic rocks.
   Prerequisite: One course in geology or permission of the instructor.

   Focuses on two key processes that influence human and wildlife exposure to potentially harmful substances—chemical speciation and transformation. Equilibrium principles as applied to acid-base, complexation, precipitation, and dissolution reactions are used to explore organic and inorganic compound speciation in natural and polluted waters; quantitative approaches are emphasized. The kinetics and mechanisms of organic compound transformation via hydrolysis, oxidation, reduction, and photochemical reactions are examined; environmental conditions and chemical structural criteria that influence reactivity are emphasized. Weekly laboratory sections are concerned with the detection and quantification of organic and inorganic compounds in air, water, and soils/sediments. (Same as Chemistry 205 and Environmental Studies 205.)
   Prerequisite: Chemistry 109.

   Survey of earth’s depositional systems, both continental and marine, with emphasis on dynamics of sediment transport and interpretation of the depositional environment from sedimentary structures and facies relationships; stratigraphic techniques for interpreting earth history; and tectonic and sea-level controls on large-scale depositional patterns. Weekly lab includes local field trips.
   Prerequisite: One course in geology or permission of the instructor.

An exploration of the interface between geological and biological processes. Focuses on the mutual effects of microorganisms and earth’s land, air, and water chemistry. Topics include biomineralization, origin and evolution of life, microbial energetics and diversity, and biological contributions to weathering, soil and rock formation, and the creation and remediation of environmental problems. Laboratories will include fieldwork, experiments, and light, fluorescence, and electron microscopy. (Same as Biology 223 and Environmental Studies 223.)

Prerequisite: One course in geology or biology, or permission of the instructor.

241a - INS. Structural Geology. Fall 2009. The Department.

Geologic structures yield evidence for the dynamic deformation of the earth’s crust. This course examines deformation at scales that range from the plate-tectonic scale of the Appalachian mountains to the microscopic scale of individual minerals. A strong field component provides ample opportunity for describing and mapping faults, folds, and other structures exposed along the Maine coast. In-class exercises focus on problem-solving through the use of geologic maps, cross-sections, stereographic projections, strain analysis, and computer applications.

Prerequisite: Geology 101 or 202, or permission of the instructor.


The geological and geophysical bases of the plate-tectonic model. The influence of plate tectonics on major events in oceanographic and climatic evolution. Deep-sea sedimentary processes in the modern and ancient ocean as revealed through sampling and remote sensing. Focus in the laboratory on the interpretation of seismic reflection profiles from both the deep ocean and local coastal waters.

Prerequisite: One course in geology or permission of the instructor.


A mathematically rigorous analysis of the motions of the atmosphere and oceans on a variety of spatial and temporal scales. Covers fluid dynamics in inertial and rotating reference frames, as well as global and local energy balance, applied to the coupled ocean-atmosphere system. (Same as Environmental Studies 253 and Physics 257.)

Prerequisite: Physics 104 or permission of the instructor.


Rocks contain many clues about the processes of their formation. This course uses these clues to explore the processes by which igneous rocks solidify from magma, and metamorphic rocks form in response to pressure, temperature, and chemical changes. Laboratory work emphasizes field observations, microscopic examination of thin sections, and computer-based geochemical modeling. Class projects introduce students to aspects of geologic research.

Prerequisite: Geology 101 or 202. Credit for both is recommended.


An introduction to the interior of the earth, the geophysical basis of plate tectonics, and exploration geophysics. Emphasis on seismic methods. A problem-based service learning course involving work on projects in support of community partners.

Prerequisite: Mathematics 161 or Physics 103, and Geology 100 (same as Environmental Studies 100), 101, 103 (same as Environmental Studies 103), or Physics 104.
Courses of Instruction

Principles and problems in coastal oceanography, with an emphasis on interdisciplinary inquiry. Topics include circulation and sediment transport within estuaries and on the continental shelf, impact of human systems on the marine environment, and issues and controversies of eutrophication and hypoxia in the coastal environment. (Same as Environmental Studies 267.)
Prerequisite: One course in geology or permission of the instructor.

During recent ice ages, glaciers covered a third of the world’s land area and had profound impacts on earth’s landscapes and climates. Uses lectures, labs, field trips, and reading of the primary literature to examine the controls of current and former glacier distribution and movement, landforms and landscapes of glacial and meltwater systems, and the interaction of glaciers and the earth’s climate system.
Prerequisite: One course in geology or permission of the instructor.

The interaction of water and geological materials within the hydrologic cycle, with emphasis on groundwater resources and quality. Qualitative and quantitative examination of the movement of groundwater in aquifers. (Same as Environmental Studies 275.)
Prerequisite: One course in geology or permission of the instructor.

Everyone lives in a watershed, but how do watersheds function, both naturally and increasingly as impacted by humans? Examines the movement and modification of water through the landscape, emphasizing such topics as natural and human controls of water quality, streamflow generation and surface-groundwater interactions, watershed modeling, and approaches to watershed management. Students perform an integrated investigation of a local watershed, examining natural and human controls on hydrologic processes. (Same as Environmental Studies 276.)
Prerequisite: One course in geology or Biology 158 (same as Chemistry 105 [formerly Chemistry 180] and Environmental Studies 201.)

291a–294a. Intermediate Independent Study in Geology. The Department.

A rigorous treatment of the earth’s climate, based on physical principles. Topics include climate feedbacks, sensitivity to perturbations, and the connections between climate and radiative transfer, atmospheric composition, and large-scale circulation of the oceans and atmospheres. Anthropogenic climate change will also be studied. (Same as Environmental Studies 357 and Physics 357.)
Prerequisite: Physics 229, 255, 256, or 300, or permission of the instructor.

Offers students the opportunity to synthesize work done in geology courses, to critically read and discuss articles, to listen to speakers prominent in the discipline, and to write scientific essays. Specific topic varies by year; possible topics include Global Environmental Changes in the Oceans, Estuaries, and Mountain Belts. Required for the major in Geology. Open to junior or senior geology majors or minors, or interdisciplinary majors in geology-chemistry and geology-physics. (Same as Environmental Studies 393.)
Prerequisite: Geology 101 and 202, and 275 or 276, or permission of the instructor.

401a–404a. Advanced Independent Study and Honors in Geology. The Department.