

Geology

Professors Dunn (on leave spring 2010), Kebbete, McMenamin, Werner; Associate Professors Markley, Millette (*chair*); Assistant Professor Ahmed.

Contact Persons

Thomas Millette, *chair*
Cecile Vasquez, *senior administrative assistant*

The geology major provides students with an understanding of earth processes, properties, and history, as well as the evolution of life and the interactions between humans and Earth's environments. For students considering graduate work or professional employment in the earth sciences, we recommend as many courses as possible in the cognate sciences (biology, chemistry, and physics), as well as calculus and/or statistics. We also strongly recommend a summer field course in geology. Early consultation with the department is encouraged.

Requirements for the Major

Credits

- A minimum of 36 credits

Courses

Required for the major are:

- An introductory survey course: Geology 100, 101, 102, or 103
- Geology 201, Rocks and Minerals
- Geology 203, Surface Processes
- Geology 224, Paleontology-Stratigraphy
- Geology 322, Petrology and Petrography
- Geology 333, Structural Geology and Orogenesis
- Geology 334, History of the Earth
- 8 additional credits in geology at the 200 level or above

No more than 4 credits of independent study (Geology 295 or 395) may be counted toward the major. A summer field course may count for 4-6 credits in geology. Other geology

courses in the Five Colleges may also apply toward the major.

Requirements for the Minor

Credits

The geology minor consists of any geology course at the 100 level (100, 101, 102, or 103) and at least 16 credits at the 200 level or above. At least four of these credits must be at the 300 level.

Teacher Licensure

Students interested in pursuing licensure in the field of earth science can create a special earth science major and combine this course work with a minor in education. For specific course requirements for licensure in earth science within the field of geology (and related disciplines), please consult your advisor or the chair of the geology and geography department. For information about the requirements for the minor in education, please consult "Teacher Licensure" in the Other Degree and Certificate programs chapter and Sarah Frenette (sfrenett@mholyoke.edu or x3300) of the psychology and education department. Licensure also requires a formal application as well as passing scores on the Massachusetts Test of Educator Licensure (MTEL) in both the literacy component and the subject matter component. Copies of the test objectives for the MTEL are available in the Department of Psychology and Education. Licensure application information and materials are available in the Department of Psychology and Education.

Course Offerings

100s Physical Geology

From earthquakes to landscapes, deserts to glaciers, landslides to limestone, this course introduces the surficial and internal processes of the earth. Learn to interpret the geology of your surroundings when traveling to new places and understand how geologic setting influences how people live. Lectures focus on

exploring and explaining geological features and processes using concept sketches. Labs focus on mineral and rock identification, map reading, and local field trips.

Meets Science and Math II-B requirement
M. Markley

Prereq. Preference given to first- and second-year students; 4 credits

101f Environmental Geology

Our existence on the planet is greatly affected by changing environmental conditions. Some of these changes are “natural” (e.g., floods, earthquakes), but many directly result from human mismanagement (groundwater contamination, acid rain, the greenhouse effect). Although some of these problems are of local concern, an increasing number are of global scale. In this course, students develop an appreciation for the way the Earth’s environment affects our lives and the impact humans are having on the environment. In the laboratory, students learn techniques to recognize and interpret environmental hazards and develop strategies to address environmental problems.

Meets Science and Math II-B requirement
A. Werner

2 meetings (75 minutes), 1 lab (3 hours), field trips; 25 spaces allocated to first-year students; 4 credits

102f History of Life

Life forms have inhabited the surface of our planet for most of its history. Earth, as a result, has a unique geology that is unlike that of any other planet. In this course we will examine the interrelations between life processes and Earth’s crust and atmosphere and how they work together to create the geology of the planet. Using both the rock and fossil record, we will study the origin and evolution of life, the history of continents and oceans, and the diversification of complex life forms. Laboratory and field trips will emphasize identification and analysis of sediments, rocks, and fossils.

Meets Science and Math II-B requirement
M. McMenamin

4 credits

103s Oceanography

Because more than seventy percent of our planet is covered by ocean water, the study of

marine systems is crucial to our understanding of the Earth. In this course, we will examine chemical, physical, geological, and biological processes in the oceans at a variety of scales in time and space. We will explore how the Earth’s oceans formed, how they provided the foundations for life, and how they continue to affect weather and climate, stabilize global chemical cycles, interact with the terrestrial environment, and give us access to resources.

Does not meet a distribution requirement

A. Werner

4 credits

115s Emergence of Animals

(First-year seminar; writing-intensive course)

The origin of animals was perhaps the most important event in the history of our planet. In this course we will review the history of earth, learn basic geology, and then examine the problem of the origin of animals by studying Mount Holyoke’s unequalled collection of Precambrian and Cambrian fossils. The origin of animals has been called the Cambrian Explosion. We will examine what this means for our understanding of evolutionary theory.

Does not meet a distribution requirement

M. McMenamin

4 credits

201f Rocks and Minerals

In this course you will learn to recognize the common rock-forming minerals and principal rock types, and to understand their origins, properties, associations, and geological significance. Observational skills and hand sample identification will be emphasized in lab and on field trips.

Meets Science and Math II-B requirement

S. Dunn

Prereq. Prereq. high-school earth science and high-school chemistry, or any 100 level geology course; 4 credits

203f Surface Processes

The surface of the Earth is a history book of past environmental change. Every hill and valley, every erosional feature, every deposit is the result of processes acting at the Earth’s surface. In this course we study these processes (e.g., glaciers, rivers, slopes, coastlines, windblown sand, frozen ground, cave

formation, soil development) to better understand how they work and to understand the resulting landforms and deposits. With this understanding we can then observe different landforms and deposits and infer past process (environments of deposition). Fieldwork and trips allow students to explore firsthand the processes that have created and modified the Earth's surface.

Meets Science and Math II-B requirement

A. Werner

Prereq. Geology 100 or 101; 4 credits

***210f Plate Tectonics**

(Speaking- and writing-intensive course)

Plate tectonic theory explains the origins of volcanoes and earthquakes and the locations of mountain belts and oceans. This course focuses on the geometry of plate tectonics. Topics include continental drift, relative plate motion, earthquake analysis, the creation and destruction of ocean crust, marine magnetic anomalies, triple point junctions, and stereographic projection. Work includes individual research projects on active plate boundaries.

Meets Science and Math II-C requirement

M. Markley

Prereq. Comfort with geometry and trigonometry; 4 credits

224s Paleontology-Stratigraphy

This course provides an intensive study of fossils, fossil preservation, depositional environments, sediments, sedimentary rocks, and the processes of sedimentation. We will employ the principles of stratigraphic analysis and correlation to interpret ancient environments and paleoclimate, reconstruct paleogeography, and probe the characteristics of sedimentary basins. Laboratory exercises and field trips will introduce a variety of analytical techniques used to study sedimentary rocks.

Meets Science and Math II-B requirement

M. McMnamin

Prereq. 1 course in geology at the 100 or 200 level or permission of instructor; 4 credits

***227s Groundwater**

The demand for and the contamination of groundwater resources are major societal concerns. To better understand the dynamics of the groundwater system, we cover topics including the hydrologic cycle, surface and

subsurface hydrology, groundwater resource evaluation, and groundwater geotechnical problems. Students prepare weekly problem sets, a term paper, and an oral presentation. Many of the homework problems involve computer applications.

Meets Science and Math II-B requirement

A. Werner

Prereq. Any 100-level geology course; 4 credits

295fs Independent Study

Does not meet a distribution requirement

The department

Prereq. soph and permission of instructor; 1-4 credits

316f Scanning Electron Microscopy

(Same as Biological Sciences 316f)

Does not meet a distribution requirement

M. Rice

2 credits

***322s Igneous and Metamorphic Petrology**

Studies mineralogical and chemical compositions, classification, genesis, and mode of occurrence of igneous and metamorphic rocks. Special attention paid to the relationships between rock-forming processes and global plate tectonics. Laboratory study of representative rock suites in hand specimen and thin section, introduction to analytical techniques, including mineral optics, and one or more field trips.

Does not meet a distribution requirement

S. Dunn

Prereq. Geology 201 or Permission of instructor; 4 credits

326s Seminar: Global Change

The Earth's climate system is dynamic. Relatively small changes have been associated with profound environmental change; therefore, understanding historic and geologic climate change is paramount to predicting future change. This course reviews the evidence of past climatic change and the prospects of a warmer world.

Does not meet a distribution requirement

A. Werner

Prereq. 1 200-level geology course or permission of instructor; 4 credits

333f Structural Geology and Orogenesis

This course covers the basic techniques of field geology and structural analysis. Lectures

concentrate on field techniques, stress, strain, faulting, folding, rock strength, deformation mechanisms, and multidisciplinary approaches to mountain building (orogenesis). Most labs are field trips that involve data collection. Weekly writing assignments focus on presenting original research and distinguishing between observations and interpretations. During the final weeks of the semester, oral presentations emphasize fluency in the published literature of structural geology.

Meets Science and Math II-B requirement

M. Markley

Prereq. Geology 201 (can be taken concurrently); 4 credits

334s History of the Earth

This course explores the interaction of the earth systems during the past 4 billion years of earth history. Some topics covered are: ice ages and greenhouse atmospheres, continental drift, extinctions and radiations of flora and fauna, the early evolution of earth, absolute and relative dating of rocks, and the geologic time scale. Labs teach geologic map interpretation and critical analysis of recently published research on earth history. Writing assignments focus on proposal writing and the design and testing of earth science hypotheses.

Meets Science and Math II-B requirement

M. Markley

Prereq. Geology 201, Geology 203, or Geology 224 (can be taken concurrently); 4 credits

***341f Seminars: Bedrock Geology Maps**

Seminars offer directed study and discussion of one or more selected topics in geology. Topics vary from year to year.

A bedrock geologic map shows the distribution of different kinds of rocks at the surface of the earth. "A geologic map is a subtle combination of observed facts and interpretations," says Lucien Platt. "Map making is a fine art. To appreciate fully and to understand a geologic map takes thoughtful and careful analysis." Through such analysis, this course focuses on: (1) using maps to infer regional geological histories, (2) drawing cross sections, and (3) visualization in three dimensions. This course meets for the first six weeks of the semester, and it is recommended for students who plan to pursue graduate degrees in the geosciences.

Does not meet a distribution requirement

M. Markley

Prereq. At least two 200- or 300-level geology courses; 2 credits

***342s Death Valley Field Course**

Seminars offer directed study and discussion of one or more selected topics in geology. Topics vary from year to year. Consult the department for information about future seminars.

This seminar will cover selected topics on the geology of Death Valley region, California.

We will meet for two hours per week up until spring break, then embark on a ten-day fieldtrip to Death Valley National Park, March 12-21. A participation fee is required. Students will be responsible for researching particular topics and presenting a final report.

Does not meet a distribution requirement

S. Dunn

Prereq. two geology courses and permission of instructor; 1 meeting (2 hours) and ten-day fieldtrip (Thursday, March 12 to Saturday, March 21); enrollment limited.; 2 credits

395fs Independent Study

Does not meet a distribution requirement

The department

Prereq. jr, sr, and permission of instructor; 1-8 credits