

# GEOLOGY

## Geology Major

The major leading to the B.S. degree emphasizes the fundamental of the science of geology with upper-level courses that provide both breadth and depth in the curriculum.

The program is designed to optimize classroom, lab, and field experiences and prepare students for the modern demands of a geoscientist or entry into graduate school.

Total credits - 122

## B.S. Geology Degree- Required Courses and Recommended Course Sequence

### First Semester Credits

[[CHM-115]] Elements & Compounds	3
[[CHM-113]] Elements & Compounds Lab	1
[[ENG-101]] Composition	4
[[FYF-101]] First-Year Foundations	3
[[MTH-111]] Calculus I	4
	<b>15</b>

### Second Semester

[[CHM-116]] The Chemical Reaction	3
[[CHM-114]] The Chemical Reaction Lab	1
[[GEO-101]] Intro to Geology	3
[[GEO-103]] Intro to Geology Lab	1
[[MTH-112]] Calculus II	4
Distribution Requirement	3
	<b>15</b>

### Third Semester

[[GEO-212]] Historical Geology	3
[[GEO-281]] Mineralogy	4
[[MTH-150]] Elementary Statistics	3
[[PHY-171]] Principles of Classical and Modern Physics	4
Distribution Requirement	3
	<b>17</b>

### Fourth Semester

[[EES-240]] Principles of Environmental Engineering & Science	3
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[[EES-241]] Principles of Environmental Engineering & Science Lab	1
[[GEO-282]] Petrology	3
[[PHY-174]] Appl of Classical and Modern Physics	4
Distribution Requirement	3
	<b>14</b>

### Fifth Semester

[[CE-346]] Rock Engineering	3
[[ENV-321]] Hydrology	3
[[ENV-323]] Hydrology Lab	1
[[GEO-345]] Stratigraphy and Sedimentation	4
[[GIS-271]] Intro to GPS & GIS	3
	<b>14</b>

### Sixth Semester

[[EES-302]] Science Research and Communication	1
[[EES-304]] Environmental Data Analysis	2
[[GEO-349]] Structure and Tectonics	4
[[GEO-351]] Paleoclimatology	3
[[GEO-352]] Hydrogeology	3
[[GIS-272]] Advanced GIS & Remote Sensing	3
	<b>16</b>

### Summer Session

[[GEO-380]] Geology Field Camp	4
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### Seventh Semester

[[GEO-390]] Applied Geophysics	3
[[GEO-391]] Senior Projects I	1
Distribution Requirements	6
Program Elective	3
	<b>13</b>

### Eighth Semester

[[GEO-370]] Geomorphology	3
[[GEO-392]] Senior Projects II	2
Distribution Requirements	3
Free Elective	3

Program Elective	3
	14

## GEO. GEOLOGY

### GEO-101. INTRODUCTION TO GEOLOGY

**Credits:** 3

Description, analysis, and studies of earth materials, structures, and processes, including Earth's surface, interior, age, and origin. Three hours of lecture per week.

### GEO-103. INTRODUCTION TO GEOLOGY LAB

**Credits:** 1

This lab entails lab and field experiences where rocks and minerals are studied. The interpretation of topographic and geologic maps and exercises in the fundamental procedures of geologic investigations are also included. Three hours of lab per week.

[Click here for course fees.](#)

#### Co-Requisites

[[GEO-101]]

### GEO-206. SOLID EARTH ENERGY AND MINERAL RESOURCES

**Credits:** 3

The distribution in both space and time of fossil fuel (crude oil, natural gas, and coal), nuclear fuel minerals, and geothermal sources in the earth's crust; the formation, accumulation and extraction of these energy resources, and historical, current and projected consumption trends. Additionally, the occurrences and formational processes of metal and non-metal deposits are examined in the context of plate tectonics, earth's geologic history and energy flow. Three hours of lecture per week. Open to majors and non-majors. GEO-206 qualifies for the Energy Minor and is cross-listed with [[EGY-206]].

### GEO-212. HISTORICAL GEOLOGY

**Credits:** 3

A study of the geologic record of the earth's formation and evolution, including methods of dating. Two hours of lecture and three hours of lab per week.

[Click here for course fee.](#)

#### Pre-Requisites

[[GEO-101]] and [[GEO-103]] or permission of the instructor.

### GEO-281. MINERALOGY

**Credits:** 4

The systematic study of the major classes of the mineral kingdom utilizing the department's collection. Concepts in crystal chemistry, crystal structure, mineral behavior, crystallography and optical mineralogy are studied and advanced techniques in mineral analysis are used. Three hours of lecture and three hours of lab per week.

[Click here for course fee.](#)

#### Pre-Requisites

[[GEO-101]] and [[CHM-115]].

### GEO-282. PETROLOGY

**Credits:** 3

A study of the identification, classification, composition, genesis, and alteration of igneous, sedimentary, and metamorphic rocks and their relation to crustal processes and tectonic environments. Two hours of lecture and three hours of lab per week.

[Click here for course fee.](#)

#### Pre-Requisites

[[GEO-281]]

### GEO-345. STRATIGRAPHY AND SEDIMENTATION

**Credits:** 4

The study of the formation and interpretation of sedimentary systems, from sediment grains to depositional basins. The course starts from the grain scale and moves up to basin and global scales. Three hours of lecture and three hours of lab per week.

[Click here for course fee.](#)

#### Pre-Requisites

[[GEO-101]] and [[GEO-103]], or permission of the instructor.

### GEO-349. STRUCTURE AND TECTONICS

**Credits:** 4

The study of rock deformational processes and resulting structures in the Earth's crust with application to global and regional tectonics. Lab work and field trips emphasize the use of methods to assist in the geometric and kinematic interpretation of rock structures. Three hours of lecture and three hours of lab per week.

[Click here for course fee.](#)

#### Pre-Requisites

[[GEO-282]], [[GEO-345]], [[MTH-111]], [[PHY-171]] or permission of the instructor

**GEO-351. PALEOCLIMATOLOGY****Credits:** 3

The goal of this course is to present an overview of the methods used to reconstruct the earth's climate history and the techniques used to determine the timing of environmental changes. Paleoclimate data from proxy records, such as ice cores or tree rings, provides a longer perspective on climatic variability than is possible from instrumental or historical records. Particular emphasis will be given to the natural controls on Earth's climate across a variety of timescales, including plate tectonic, orbital, and millennial, to centennial and sub-decadal variations. The course will focus on the climatic changes during the late Cenozoic – the time of the ice ages. Topics to be discussed will include: paleoclimatic reconstruction, climate and climatic variation, dating methods, ice cores, marine and lake sediments, corals, speleothems, soils, pollen, dendrochronology, documentary data, and paleoclimate models. Two hours of lecture and three hours of lab.

[Click here for course fee.](#)

**Pre-Requisites**

[[GEO-101]] and [[GEO-103]], or permission of the instructor.

**GEO-352. HYDROGEOLOGY****Credits:** 3

An introduction to the study of groundwater: groundwater flow, well hydraulics, groundwater quality and pollution, and resource exploration, evaluation, and management. Lab activities use a mix of field, wet lab, computer and mapping skills. Two hours of lecture and three hours of lab per week.

[Click here for course fee.](#)

**Pre-Requisites**

[[GEO-101]] and [[GEO-103]], or permission of the instructor.

**GEO-365. INTRODUCTION TO PALEONTOLOGY****Credits:** 3

This course examines the history of life on Earth as reflected in the fossil record. The course covers the oldest known forms of life from over three billion years ago through the origin of marine communities, the invasion of land, dinosaurs, and the age of mammals. Emphasis will be placed on common fossil groups and the interaction of organisms with their diverse environments. Two hours of lecture and three hours of lab per week.

[Click here for course fees.](#)

**Pre-Requisites**

[[GEO-101]], [[GEO-103]], and [[GEO-212]]

**GEO-370. GEOMORPHOLOGY****Credits:** 3**Fees:**

Land forms, their evolution, and the human role in changing the surface of the earth, utilization of geologic and hydrologic information, and field investigations. Two hours of lecture and three hours of lab per week.

[Click here for course fee.](#)

**Pre-Requisites**

[[GEO-101]] and [[GEO-103]], or permission of the instructor.

**GEO-375. GEOLOGICAL HAZARDS****Credits:** 3**Fees:**

This course examines geologic processes that are a natural consequence of plate tectonics and hazardous to life and property. After establishing a framework for geologic hazards study, principle geologic hazards will be investigated. Emphasis will be placed on current scientific understanding, event frequency, forecasting and monitoring and mitigation. Several case studies will be included. Three hours of lecture per week.

**Pre-Requisites**

[[GEO-101]], [[GEO-103]], and [[GEO-212]].

**GEO-380. GEOLOGY FIELD CAMP****Credits:** 4**Fees:**

A four-week summer field course designed to train students in traditional and modern methods of geologic investigations. Students learn to develop research strategies, collect field observations and measurements, compile detailed rock descriptions, measure stratigraphic sections and construct geologic maps and cross sections. Field locations may range from local/regional to western U.S. depending on course emphasis and resources.

[Click here for course fee.](#)

**Pre-Requisites**

[[GEO-281]], [[GEO-282]], [[GEO-345]], [[GEO-349]]

**GEO-383. GEOCHEMISTRY****Credits:** 3**Fees:**

Application of chemistry to study the distribution and cycling of elements in the crust of the earth. Includes chemical bonding and crystallization, phase rules and phase diagrams, chemical equilibria, radiogenic and stable isotopes and origin of elements. Geochemical environments of study include low-temperature aqueous solutions and high-temperature magmatic systems. Two hours of lecture and three hours of lab per week.

[Click here for course fee.](#)

**Pre-Requisites**

[[CHM-115]], [[CHM-116]], [[GEO-101]], [[GEO-103]], [[GEO-281]], and [[GEO-282]]

## Geology, B.S.

### **GEO-388. REGIONAL STUDIES**

**Credits:** 2

This capstone course is an in-depth geological study of a region (global, or more local) that requires students to apply fundamental knowledge and skills acquired through the course of their college education. The region of study will be selected by the instructor in advance of the course, taking into consideration student interest, accessibility, and unique field opportunities. The course furthers student scientific research skills and enhances learning through the involvement of advanced studies of primary rock/geologic/geophysical relationships in a field setting, critical reading of published geological literature, and interpretation and synthesis in oral/written formats. Topics and scale of examination will vary from local to global scales, but focus heavily on the regional scale. Students will be encouraged to think scientifically and creatively - to think from unique perspectives and explore versatile solutions. Field study will play a significant role in this course, and students will assist in organizing an optional research trip over spring break to locations within the region of interest, enhancing their overall geologic knowledge, research and interpretation skills, and application of principles and theories.

#### **Pre-Requisites**

Senior status and with permission from the course instructor.

### **GEO-390. APPLIED GEOPHYSICS**

**Credits:** 3

**Fees:**

An introduction to the application of geophysical methods to geological and environmental investigations. Topics include fundamentals of geophysics and hands-on instrument training and measurement. Instruments may include ground penetrating radar, seismic reflection and refraction, electrical resistivity and electromagnetic induction. Two hours of lecture and three hours of lab per week.

[Click here for course fee.](#)

#### **Pre-Requisites**

[[GEO-101]], [[GEO-103]], [[MTH-112]], [[PHY-174]], or permission of the instructor

### **GEO-391. SENIOR PROJECTS I**

**Credits:** 1

**Fees:**

Design and development of selected research projects in geology under the direction of a faculty member. Capstone research deliverables include a proposal, detailed progress reports and a formal mid-year report.

[Click here for course fee.](#)

#### **Pre-Requisites**

Department permission

### **GEO-392. SENIOR PROJECTS II**

**Credits:** 2

**Fees:**

Second semester continuation of Senior Projects I. Capstone research deliverables include detailed progress reports, a professional-grade poster, a final written report, and a formal oral presentation of research project.

[Click here for course fee.](#)

#### **Pre-Requisites**

[[GEO-391]]

### **GEO-395. INDEPENDENT STUDY**

**Credits:** Varies with topic

**Fees:**

Departmental courses on advanced topics of special interest, not extensively treated in regularly scheduled offerings, will be presented under this course number on an occasional basis. Available for either undergraduate or graduate credit. May be repeated for credit

#### **Pre-Requisites**

Senior or graduate standing

### **GEO-396. INDEPENDENT STUDY**

**Credits:** Varies with topic

**Fees:**

Departmental courses on advanced topics of special interest, not extensively treated in regularly scheduled offerings, will be presented under this course number on an occasional basis. Available for either undergraduate or graduate credit. May be repeated for credit.

#### **Pre-Requisites**

Senior or graduate standing