## Geology (GEO)

### GEO 1010  PP
**Introduction to Geology**
- **1:0:2**  Fall, Spring, Summer

Studies planet earth: its materials, structure, dynamics, and surface features. Taken alone it is designed for non-science students who want a broad introduction to earth science and a greater appreciation of their physical surroundings. Taken in conjunction with laboratory exercises in GEO 1015, the class is sufficiently rigorous to articulate as an introductory geology class.

### GEO 1015  PP
**Introduction to Geology Laboratory**
- **1:0:2**  Fall, Spring, Summer

Designed to be taken in conjunction with GEO 1010. Includes the identification of rocks, minerals, basic land forms and structures. Studies geologic processes occurring in desert, glacial, mountainous and other environments. Taken with GEO 1010, the class will articulate as an introductory earth science class. Course Lab fee of $11 for transportation, lab applies.

### GEO 101H  PP
**Introduction to Geology**
- **3:3:0**  Fall, Spring

Studies the structural and dynamic systems of the earth that create our environment. Stresses geology and related topics chosen for astronomy and meteorology. Course Lab fee of $10 for transportation, lab applies.

### GEO 1020 (Cross-listed with: BIOL 1200)  PP
**Prehistoric Life**
- **3:3:0**  Spring

* Prerequisite(s): BIOL 1010 or GEO 1010 recommended

Studies prehistoric life. Uses the concepts of biology and physical science. Studies major groups of ancient animals and plants as found in the rock record. Includes aspects and fundamental concepts of biology, ecology, and geology.

### GEO 1080  PP
**Introduction to Oceanography**
- **3:3:0**  Fall, Spring

Introduces the origin and development of the oceans, marine geology and its effect on life in the seas. Discusses waves, tides, currents, and their impact on shorelines, the ocean floor, and basins. Examines physical processes as they relate to oceanographic concepts. Includes media as an alternative to the actual oceanic experience. Completers should have a basic knowledge and appreciation of the ocean's impact to the world's ecology.

### GEO 1085  PP
**Introduction to Oceanography Laboratory**
- **1:0:2**  Fall

A basic laboratory experience in the physical aspects of Oceanography. Introduces applied skills in Oceanography such as Marine Geology and Oceanographic Chemistry. Studies the physical parameters that allow marine life to flourish. Uses maps to study the structure of the sea floor and its relationship to plate tectonics. Provides hands-on experiences with salinity and marine chemistry.

### GEO 1220  PP
**Historical Geology**
- **3:3:0**  Fall, Spring

* Prerequisite(s): GEO 1010

Examines the physical and biological evolution of the Earth from its origins 4.6 billion years ago up to present day. Reviews fundamental processes and principles of geology and biology. Develops tools for interpreting rocks and the fossil record. Explores important changes through geologic time, including plate tectonics, paleogeography, mountain building, geochemical cycles, climate, sea level, and the origin and evolution of the great diversity of life on Earth.

### GEO 1225  PP
**Historical Geology Laboratory**
- **1:0:2**  Fall, Spring

* Prerequisite(s): GEO 1010

* Prerequisite(s) or Corequisite(s): GEO 1220

Is designed to be taken in conjunction with GEO 1220. Reviews fundamental processes and principles of geology and biology. Develops skills for identifying main types of rocks, fossils, and fossils. Develops tools for interpreting Earth history through analysis of rocks, fossils, and paleoclimate data. Develops skills for correlating strata and reading geologic maps. Includes field trips to study local outcrops. Course lab fee of $10 applies.

### GEO 204R (Cross-listed with: BIOL 204R)  PP
**Natural History Excursion**
- **3:1:4**  Summer

* Corequisite(s): BIOL 2070

Addresses the geological component of the Natural History Course taught in conjunction with BIOL 2070 at the Capitol Reef Field Station during the summer months. Teaches students about the rocks and strata of the area, the processes that mold the landscape, and the relationships between the physical and biological aspects of the ecosystem, including humans. Provides an intense, hands-on field course where faculty and students participate together in a natural setting. Requires students to live and learn at the field station for most of the course.

### GEO 2070  PP
**Natural History of the Colorado Plateau**
- **3:1:4**  Summer

Provides an intense, hands-on field course where faculty and students participate together in a natural setting. Requires students to live and learn at the field station for most of the course.

### GEO 3000  PP
**Environmental Geochemistry**
- **3:3:0**  Fall

* Prerequisite(s): GEO 1010, (MATH 1050 or MATH 1055), CHEM 1210, University Advanced Standing

Introduces low temperature, environmental geochemistry with a focus on the use of quantitative measures to understand surficial geologic processes. Includes equilibrium thermodynamics and kinetics of chemical reactions, aqueous solutions, sorption and complexation, oxidation-reduction reactions, and the chemistry of the continental, marine, and atmospheric environments. Incorporates numerous examples to demonstrate how the conceptual framework can be applied in solving practical problems.
**GEO 3070** (Cross-listed with: BIOL 3070)  
Advanced Desert Natural History  
3:1:4  
On Sufficient Demand  
* Prerequisite(s): University Advanced Standing  
Integrates the geological and biological systems of the southwestern deserts. Includes discussion of the ecology and geology of unique desert ecosystems; the rocks and strata providing the foundation of the landscape; the evolutionary and geological processes that mold the landscape and the species within it over time; and, the relationships between the physical and biological aspects of the ecosystem, including humans. Provides an intense, hands-on field course where faculty and students participate together in daily activities and experimental design in a natural setting. Is held part of the time on the UVU main campus and part of the time at the Capitol Reef Field Station. Requires students to live and learn at the field station for approximately 1/3 of the course.

**GEO 3080**  
Earth Materials  
3:3:0  
Fall  
* Prerequisite(s): GEO 1010, GEO 1015, and University Advanced Standing; CHEM 1210 or other chemistry course recommended  
* Corequisite(s): GEO 3085  
Investigates the physical characteristics, chemical properties, formation, and distribution of geologically significant igneous and metamorphic rocks and minerals. Develops ability to examine rocks and minerals, and analyze their chemical properties to understand geologic processes. Involves field trips, including the possibility of weekend trips.  
Course lab fee of $22 for transportation, lab applies.

**GEO 3085**  
Earth Materials Laboratory  
1:0:3  
Fall  
* Prerequisite(s): GEO 1010, GEO 1015, and University Advanced Standing; CHEM 1210 or other chemistry course recommended  
* Corequisite(s): GEO 3080  
Focuses on identification and classification of common rocks and minerals in hand sample and introduces optical mineralogy and petrography. Investigates the occurrence and formation of common rocks and minerals through direct observation of their properties and occurrence. Involves field trips, including the possibility of weekend trips.

**GEO 3100**  
Isotope Geochemistry  
3:3:0  
Spring  
* Prerequisite(s): GEO 1010, (MATH 1050 or MATH 1055), CHEM 1210 and University Advanced Standing  
Provides an introduction to the principles and applications of isotope geochemistry, which plays an important role in a wide variety of geological, biological, chemical, and environmental investigations, and summarizes the analytical techniques used in the field. Examines the theory of radiometric dating and provides an overview of the most commonly used geochronometers. Focuses on stable isotopes with emphasis on oxygen, hydrogen, carbon, nitrogen, and sulfur and with applications in paleoecology, ecologic and paleoecology, archeology, and hydrology.

**GEO 3105**  
Isotope Geochemistry Laboratory  
1:0:2  
Spring  
* Prerequisite(s): GEO 1010, (MATH 1050 or MATH 1055), CHEM 1210 and University Advanced Standing  
Explores the analysis and interpretation of real isotope data and provides hands-on experience in their use to solve problems and answer questions in geochronology, paleoecology, hydrology, and archaeology. Requires data analysis utilizing Microsoft Excel.

**GEO 3200**  
Geologic Hazards  
4:3:3  
Fall  
* Prerequisite(s): GEO 1010, GEO 1015, and University Advanced Standing  
Investigates the ways in which geologic hazards (including earthquakes, landslides, and volcanoes) impact civilization. Studies the causes of these hazards, how to assess whether each of these hazards is a concern at a particular site, and how each type of hazard can be planned for. Includes field-based exercises.  
Course Lab fee of $16 for transportation, lab applies.

**GEO 3400**  
Forensic Geology  
4:3:3  
On Sufficient Demand  
* Prerequisite(s): (CHEM 1210 and CHEM 1215 or higher) and University Advanced Standing  
* Corequisite(s): CHEM 1220 and CHEM 1225 recommended  
Provides a survey of the uses of geology in solving crime. Emphasizes actual criminal cases, hands-on laboratory activities, and critical observation skills. Covers mineral-forming processes in rock, soil, and sediment, and teaches minerals identification with a hand lens and microscope. Examines some or all of the following: mineral pigments related to art forgery and cosmetics; imitation amber and other gems; environmental pollution; and crimes in archeology. Serves as an introduction to trace analysis.

**GEO 3500** (Cross-listed with: GEOG 3500)  
Geomorphology  
4:3:3  
Spring  
* Prerequisite(s): MATH 1050 or MATH 1055 or equivalent, University Advanced Standing, and one of the following lecture and lab pairs: (GEO 1010 and GEO 1015) or (GEOG 1000 and GEOG 1005)  
Examines the geologic processes operating at the Earth's surface to understand the origin of our planet's varied landscapes. Explores how landforms respond to climate change, tectonic forcing, and changes in land use. Addresses common geomorphic processes including weathering, soils, hill slope processes, fluvial processes and landforms, aeolian transport, glacial and periglacial environments, karst, and coastal processes.

**GEO 3700**  
Structure and Tectonics  
4:3:3  
Spring  
* Prerequisite(s): GEO 1220, GEO 3080, (PHYS 2010 or PHYS 2210), and University Advanced Standing  
Investigates the fundamentals of global plate tectonics and rock deformation. Includes applications to petroleum geology, environmental geology, and engineering geology. Explores geometric techniques of structural analysis in the laboratory. Involves field trips, possibly including weekend trips.  
Course lab fee of $21 for transportation, lab applies.

**GEO 4080**  
Petrology  
4:3:3  
Spring Even Year  
* Prerequisite(s): GEO 3080, CHEM 1220, and University Advanced Standing  
Intended for students pursuing graduate school in geology or a career in geology such as mining or petroleum geology. Examines mineral equilibrium in igneous, sedimentary, and metamorphic rocks as it pertains to the genesis of these rocks. Introduces students to techniques of petrographic microscopy. Surveys the use of analytical tools in researching igneous and metamorphic rocks, including the use of isotopes for dating and for tracing the origin of magma and the use of the electron microprobe for determining temperatures of metamorphism. Examines the diageneis of sandstones.
GEO 4200 (Cross-listed with: BIOL 4200, CHEM 4200, PHYS 4200)
Teaching Methods in Science
3:2:2 Spring
* Prerequisite(s): Acceptance into secondary education program, senior-level standing, instructor approval, and University Advanced Standing

Examines objectives, instructional methods and curriculum for teaching science in the secondary school. Includes developing, adapting, evaluating, and using strategies and materials for teaching biological and physical sciences, appropriate both to the special needs of the learners and the special characteristics of science discipline.

GEO 4500
Sedimentary Geology
4:3:3 Spring
* Prerequisite(s): GEO 3080, GEO 1220, GEO 1225, and University Advanced Standing; CHEM 1210 or other chemistry recommended

Exposes a great variety of topics encompassed within the broad field of sedimentary geology. Teaches knowledge of the origin and classification of the major groups of sedimentary rocks, as well as their spatial and temporal distribution as represented in the rock record. Describes the most fundamental stratigraphic principles. Course lab fee of $21 for transportation, lab applies.

GEO 4510
Paleontology
4:3:2 Fall Odd Year
* Prerequisite(s): GEO 1220, GEO 1225, GEO 3080, (BIOL 1010 or BIOL 1610), and University Advanced Standing; GEO 4500 recommended

Exposes students to a wide variety of topics encompassed within the field of paleontology. Offers substantial knowledge of the major groups of life represented in the fossil record. Discusses the most fundamental concepts in paleontology, such as key principles of evolution and paleoecology. Offers an understanding of what paleontologists do, why the field is so crucial, and why all earth scientists should have at least a basic understanding of paleontology. Requires two weekend field trips (dates will be discussed in class). Course lab fee of $21 for transportation, lab applies.

GEO 4600
Field Experience
6:0:18 Summer
* Prerequisite(s): GEO 3080, GEO 3700, GEO 4500, and University Advanced Standing

Is an intensive field course giving students hands-on experience with several aspects of Earth Science field work. Involves 8 to 10 hours of field work per day, for three to five days per week, for four to six weeks. Is the required capstone experience for Geology majors. Course lab fee of $650 for practical experience applies.

GEO 480R
Earth Science Seminar
.5:.5:0 Fall, Spring
* Prerequisite(s): (GEO 3080 or ENVT 3790 or Instructor Approval) and University Advanced Standing

Offers substantial knowledge of the major sciences, appropriate both to the special needs of the learners and the special characteristics of science discipline.

GEO 482R (Cross-listed with: ENVT 482R)
Geologic Environmental Internship
1 to 3:1 to 3:0 Fall, Spring, Summer
* Prerequisite(s): GEO 1010 or ENVT 1110; 12 credit hours of any GEO, GEOG, or ENVT courses; declared major in any Earth Science program and University Advanced Standing

Engages students in supervised geologic or environmental work in a professional setting. Requires approval by the Chair of the Department of Earth Science. Includes maintaining a journal of student experiences and preparing a paper summarizing their experience. A maximum of 3 credit hours may be counted toward graduation. May be graded Credit/No Credit.

GEO 489R
Student Research
1 to 4:0 to 12 Fall, Spring, Summer
* Prerequisite(s): GEO 1015, Junior or Senior standing, instructor approval, and University Advanced Standing

Provides students the opportunity to conduct research under the mentorship of an Earth Science department faculty member. Includes any combination of literature reviews, original research, and/or participation in ongoing departmental projects. Involves students in the methodology of original geologic research. Requires preparation and presentation of oral and/or written reports, typically presented in a public forum. May be repeated for a maximum of 8 credits toward graduation.

GEO 490R
Special Topics in Geology
1 to 4:1 to 4:0 Fall, Spring
* Prerequisite(s): GEO 1010, GEO 1015, Junior or Senior standing, instructor approval, and University Advanced Standing

Explores or examines special topics in geology. Topics vary depending on student demand and current topics of significance in geology. May be repeated for a maximum of 8 credits toward graduation.

GEO 495R
Independent Study
1 to 4:0:3 to 12 Fall, Spring, Summer
* Prerequisite(s): GEO 1010, GEO 1015, and University Advanced Standing

Requires an independent study program to be developed with one or more Earth Science faculty member and approved by a committee of Earth Science faculty. Includes some combination of literature review, field work, numerical analysis, and/or laboratory analysis. Involves the preparation of a written report. An oral presentation may also be required. May be repeated for up to 4 credits.

GEO 525R
Advanced Topics for Geology Teachers
1 to 5:1 to 5:0 to 10 On Sufficient Demand
* Prerequisite(s): Departmental Approval

For licensed teachers or teachers seeking to recertify their earth science or integrated science endorsements from the Utah State Office of Education. Teaches principles of geology and pedagogy of teaching geology for teachers in public or private schools. Emphasis will be placed on correlation with the Utah Core Curriculum, the National Science Education Standards, and the Benchmarks of Project 2061. Topics will vary.