

# Geology (GEO)

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## **GEO 1010. Introduction to Geology PP. (3 Credits)**

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. Introduction to Geology Laboratory. (1 Credit)**

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 \$10 for transportation, lab applies.

## **GEO 101H. Introduction to Geology PP. (3 Credits)**

Studies the structural and dynamic systems of the earth that create our environment. Stresses geology and related topics chosen for astronomy and meteorology.

## **GEO 1020. Prehistoric Life PP. (3 Credits)**

Cross-listed with: BIOL 1200

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 1030. Natural Disasters and the Environment PP. (3 Credits)**

Provides a broad introduction to Geology and the Earth Sciences through the lens of natural disasters and environmental interactions. Prepares students to think critically about what constitutes scientific knowledge and how such knowledge is produced and used. Studies the structure, composition, and dynamics of the Earth and how it changes through time. Examines how geologic processes, operating on many temporal scales, can impact humans and ecosystems through disasters related to tectonics (e.g., volcanism and earthquakes), surface processes (e.g., landslides, floods, sinkholes, permafrost melt) and environmental change (e.g., global warming and sea level rise). Builds foundation of knowledge about geology and pairs that with basic analytical skills to evaluate critical issues related to the environment and society.

## **GEO 1040. The Dinosaurian World PP. (3 Credits)**

Provides a broad introduction to Geology and the Earth Sciences through the lens of dinosaurs and other life during the Mesozoic Period of Earth's history. Prepares students to think critically about what constitutes scientific knowledge and how such knowledge is produced and used, especially when applied to organisms and ecosystems that no longer exist. Examines how plate tectonic processes and mass extinctions shaped dinosaurian evolution and how knowledge of rocks, minerals, and fossilization allows us to reconstruct ancient ecosystems. Encourages students to work collaboratively in evaluating paleontological data, thinking critically about unknown issues related to dinosaurian evolution, and to devise testable hypotheses to answer complex research questions.

## **GEO 1050. Geology of National Parks PP. (3 Credits)**

Teaches the fundamentals of physical geology through the lens of the United States National Parks with a special focus on Arches, Zion, Canyonlands, Capitol Reef, and Bryce Canyon National Parks of Utah.

## **GEO 1080. Introduction to Oceanography PP. (3 Credits)**

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. Introduction to Oceanography Laboratory. (1 Credit)**

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.

Course lab fee of \$10 applies.

## **GEO 1220. Historical Geology. (3 Credits)**

Prerequisite(s): GEO 1010 or GEO 1030 or GEO 1040 or GEO 1050

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. Historical Geology Laboratory. (1 Credit)**

Prerequisite(s): GEO 1010 or GEO 1030 or GEO 1040 or GEO 1050

Pre- or Corequisite(s): GEO 1220

Reviews fundamental processes and principles of geology and biology. Develops skills for identifying main types of minerals, rocks, 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 202R. Science Excursion. (1 Credit)**

Cross-listed with: BIOL 202R

For students interested in the natural world. Explores a wide variety of topics in science, including geology, botany, astronomy, zoology, ecology, and archeology. Consists of a minimum of a four-day field trip. Participants should gain an increased understanding of several fields of scientific study. May be repeated as many times as desired for interest, however a maximum of 3 credits may count toward graduation.

**GEO 204R. Natural History Excursion PP. (3 Credits)**

Cross-listed with: BIOL 204R

For students interested in the natural world. Promotes an in-depth look at a wide variety of topics in science, including geology, botany, astronomy, zoology, ecology, and archeology. Consists of 15 hours of lecture plus an appropriate field trip. Participants should gain an interdisciplinary understanding of science and nature. May be repeated for up to six credits toward graduation.

**GEO 2070. Desert Natural History. (3 Credits)**

Cross-listed with: BIOL 2070

Integrates the teaching of geological and biological systems of the southwestern deserts. Discusses 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 in a natural setting. Is held for 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 2500. Introduction to Field Geology. (3 Credits)**

Prerequisite(s): GEO 1015, GEO 1225

Introduces students to qualitative and quantitative methods used for field geology building upon introductory courses in physical geology and historical geology. Provides students an opportunity to learn and apply field geology skills at a lower-division level, and prepares students for upper-division classes, such as Earth Materials, Sedimentary Geology, Structure and Tectonics, Geomorphology, Paleontology, and Field Experience. Includes a weekly lecture, introducing students to geologic mapping concepts, and several practical field-based experiences occurring outside of normal class schedules. Course lab fee of \$311 applies for transportation and accommodations.

**GEO 3000. Environmental Geochemistry. (3 Credits)**

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. Advanced Desert Natural History. (3 Credits)**

Cross-listed with: BIOL 3070

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 WE. (3 Credits)**

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 Credit)**

Prerequisite(s): (GEO 1010 or GEO 1030 or GEO 1040 or GEO 1050), 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 Credits)**

Prerequisite(s): GEO 1010 or GEO 1030 or GEO 1040 or GEO 1050, (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, 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 paleoclimatology, ecology and paleoecology, archeology, and hydrology.

**GEO 3105. Isotope Geochemistry Laboratory. (1 Credit)**

Prerequisite(s): GEO 1010 or GEO 1030 or GEO 1040 or GEO 1050, (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, paleoclimatology, hydrology, and archaeology. Requires data analysis utilizing Microsoft Excel.

**GEO 3200. Geologic Hazards. (3 Credits)**

Prerequisite(s): (GEO 1010 or GEO 1030 or GEO 1040 or GEO 1050), GEO 1015, and University Advanced Standing

Corequisite(s): GEO 3205

Examines the ways in which geologic hazards (including earthquakes, landslides, volcanoes, problem soils, ground subsidence and earth fissures) impact civilization. Studies the processes responsible for these hazards, how to geologically assess whether each of these hazards is a concern at a particular site, how each type of hazard can be planned for, and what laws and regulations need to be considered during site investigations. Facilitates discussion of hazards, vulnerability, risk and societal planning/mitigation.

Course Lab fee of \$21 for transportation, lab applies.

**GEO 3205. Geologic Hazards Laboratory. (1 Credit)**

Prerequisite(s): (GEO 1010 or GEO 1030 or GEO 1040 or GEO 1050), GEO 1015, and University Advanced Standing

Corequisite(s): GEO 3200

Investigates geologic hazards through field observation, mapping, geospatial analyses, quantitative analyses, and report writing. Applies geologic hazards science to associated laws and regulations. Facilitates discussion of hazards, vulnerability, risk and societal planning/mitigation.

**GEO 3500. Geomorphology WE. (3 Credits)**

Cross-listed with: GEOG 3500

Prerequisite(s): GEO 1010 or GEO 1030 or GEO 1040 or GEO 1050 or GEOG 1000; University Advanced Standing

Corequisite(s): GEO 3505

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 and soils, hillslope processes, fluvial processes, aeolian transport, glacial and periglacial environments, coastal processes, and the interactions between climate and tectonics. Course lab fee of \$21 applies.

**GEO 3505. Geomorphology Lab. (1 Credit)**

Cross-listed with: GEOG 3505

Prerequisite(s): GEO 1010 or GEOG 1000 or GEO 1030 or GEO 1040 or GEO 1050; University Advanced Standing

Corequisite(s): GEO 3500

Investigates Earth surface processes through field observation and geospatial analyses to map and measure properties of landforms due to erosion and deposition. Addresses rock weathering, the formation of soils, major geomorphic processes including hillslope, river, wind, glacial, and coastal processes, as well as the underlying drivers (climate and tectonics) of geomorphic change.

**GEO 3700. Structure and Tectonics. (4 Credits)**

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. (3 Credits)**

Prerequisite(s): GEO 3080, CHEM 1220, and University Advanced Standing

Corequisite(s): GEO 4085

Examines the Earth's rock factories, specifically igneous and metamorphic processes and how they are related to plate tectonics. Delves into geochemistry, applied thermodynamics, and kinetics in igneous, sedimentary, and metamorphic rocks as it pertains to the genesis of these rocks. Further explores the techniques of petrographic microscopy and introduces other analytical techniques such as scanning electron microscopy, electron probe microanalysis, and mass spectrometry. Requires students to collect, analyze, and interpret petrologic data to gain insight into a petrogenetic process.

Course lab fee of \$21 applies.

**GEO 4085. Petrology Laboratory. (1 Credit)**

Corequisite(s): GEO 4080

Takes a hands-on approach to petrology. Provides opportunities for the student to collect and work with data to illuminate a variety of petrologic processes. Implements rock and mineral sample reference collections, field trip(s), petrographic microscopes, sample preparation labs, analytical instrumentation to investigate petrogenetic processes.

**GEO 4500. Sedimentary Geology WE. (4 Credits)**

Prerequisite(s): GEO 1220, GEO 1225, GEO 3080, and University Advanced Standing; CHEM 1210 or other chemistry recommended

Explores the origin, classification, and spatiotemporal distribution of sedimentary rocks. Examines the fundamental principles of sedimentology, petrology, and stratigraphy. Reviews weathering processes and soil formation. Develops analytical skills regarding particle erosion, transportation, and deposition. Develops skills for identifying and classifying sedimentary rocks. Develops tools for describing stratigraphic sections and interpreting the rock record. Develops skills for correlating strata and reading geologic maps. Develops critical thinking and writing skills. Includes field trips to study various outcrops in the state of Utah.

Lab access fee of \$21 applies.

**GEO 4510. Paleontology. (4 Credits)**

Prerequisite(s): GEO 1220, GEO 1225, GEO 3080, (BIOL 1010 or BIOL 1610), and University Advanced Standing; GEO 4500 recommended

Examines a wide variety of topics encompassed within the field of paleontology. Analyzes 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. Evaluates what paleontologists do, why the field is so crucial, and why all earth scientists should have at least a basic understanding of paleontology (dates to be discussed in class).

Course lab fee of \$21 for transportation, lab applies.

**GEO 4600. Field Experience. (6 Credits)**

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 4790. Hydrogeology. (4 Credits)**

Prerequisite(s): MATH 1050 or MATH 1080, GEO 1010 or GEO 1030 or GEO 1040 or GEO 1050, and University Advanced Standing (PHYS 2210 OR PHYS 2010, and GEOG 3600 Recommended)

Reviews concepts related to the occurrence and flow of groundwater and the management of these resources. Examines the governing equations, analyses of aquifer properties, well tests and construction, regional groundwater flow, field methods, groundwater modeling, and groundwater contamination. Provides opportunities for students to investigate a specific problem, field site, and/or service learning project related to hydrogeology. Course fee of \$21 applies.

**GEO 480R. Earth Science Seminar. (0.5 Credits)**

Prerequisite(s): University Advanced Standing

Exposes students to current research topics in Earth Science and related fields. Provides an opportunity for students to attend bi-weekly lectures presented by department faculty and invited speakers. Incorporates lectures that are usually a summary of the speaker's recent research results, or investigative projects in an earth science industry. May be repeated for a maximum of 1 credits toward graduation.

**GEO 482R. Geologic Environmental Internship. (1-3 Credits)**

Cross-listed with: ENVT 482R

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. (1-4 Credits)**

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 6 credits total toward graduation.

**GEO 490R. Special Topics in Geology. (1-4 Credits)**

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. (1-4 Credits)**

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. (1-5 Credits)**

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.