

# Geosciences (GEOL)

## Courses

### **GEOL 1100 The Dynamic Earth: 3 semester hours.**

Understanding the Earth as a dynamic system. Explores the interaction between four major earth components: the solid earth, the atmosphere, the ocean and biological communities, including humans. Specific focus on climate change, natural hazards, and Earth resources. Partially satisfies Objective 5 of the General Education Requirements. F, S, ASu

### **GEOL 1100L The Dynamic Earth Lab: 1 semester hour.**

Focuses on the Earth System and the interaction of humans with the environment. Topics include: earth, water and energy resources as well as natural and human-caused disasters. COREQ: GEOL 1100. Partially satisfies Objective 5 of the General Education Requirements. F, S, ASu

### **GEOL 1101 Physical Geology: 3 semester hours.**

Geological fundamentals: rocks and minerals, geologic time, plate tectonics, earthquakes, volcanoes, surface processes, earth resources and climatic change. Partially satisfies Objective 5 of the General Education Requirements. D

### **GEOL 1101L Physical Geology Lab: 1 semester hour.**

Classification and recognition of minerals and rocks, landforms on topographic maps and air photos. Geology of Pocatello area. PRE-OR-COREQ: GEOL 1101. Partially satisfies Objective 5 of the General Education Requirements. D

### **GEOL 1107 Real Monsters: 3 semester hours.**

A survey of nature's most impressive animals as viewed through the critical lens of science. Explore animal evolution, empirical limits on form and function, and ecosystem response to catastrophic change using evidence from fossils. Use the scientific method to hone skills of observation, deduction and induction. Satisfies Objective 7 of the General Education Requirements. F, S

### **GEOL 1118 Geology in the Movies: 1 semester hour.**

Geology, natural hazards, and human perception of risk, taught through analysis of disaster films. D

### **GEOL 1199 Experimental Course: 1-6 semester hours.**

The content of this course is not described in the catalog. Title and number of credits are announced in the Class Schedule. Experimental courses may be offered no more than three times with the same title and content. May be repeated.

### **GEOL 2204 Fluid Earth: 3 semester hours.**

Evolution of the Earth from crust to atmosphere, including water, climate and earth surface processes. Hands-on learning through lab and field activities. COREQ: GEOL 2204L F

### **GEOL 2204L Fluid Earth Lab: 1 semester hour.**

Evolution of the Earth from crust to atmosphere, including water, climate and earth surface processes. Hands-on learning through lab and field activities. F

### **GEOL 2205 Solid Earth: 3 semester hours.**

Evolution of the Earth from core to crust, including volcanoes, earthquakes, and mountain building. Hands-on learning through lab and field activities. COREQ: GEOL 2205L S

### **GEOL 2205L Solid Earth Lab: 1 semester hour.**

Evolution of the Earth from core to crust, including volcanoes, earthquakes, and mountain building. Hands-on learning through lab and field activities. S

### **GEOL 2282 Undergraduate Laboratory Experience: 1-3 semester hours.**

Participate in various laboratory or field-related tasks related to research projects, gaining practical experience via supervised operation of equipment, computers, and analytical instrumentation. PREREQ: Permission of instructor. Graded S/U. F, S, Su

### **GEOL 2299 Experimental Course: 1-6 semester hours.**

The content of this course is not described in the catalog. Title and number of credits are announced in the Class Schedule. Experimental courses may be offered no more than three times with the same title and content. May be repeated.

### **GEOL 3310 Geologic Field Methods: 3 semester hours.**

A hands-on introduction to geologic field methods including seeing rock outcrops in context; using topographic maps, geologic maps, and the Brunton compass; and visualizing geologic structures in three dimensions through in-class exercises and field trips. One weekend field trip is required. PREREQ: GEOL 2205. F

### **GEOL 3313 Earth Materials I: 4 semester hours.**

Introduction to physical and chemical composition of the Earth, emphasizing minerals, mineral associations and mineral formation, and determinative methods of mineralogy from microscopic to planetary scales. Course includes lecture and laboratory periods. PREREQ: GEOL 2205, CHEM 1111 and CHEM 1111L. F

### **GEOL 3314 Earth Materials II: 4 semester hours.**

Classifications, processes and environments of formation of igneous and metamorphic rocks. Determinative methods of rock identification, classification and interpretation. Course includes lecture and laboratory periods. PREREQ: GEOL 3313. S

### **GEOL 3315 Evolution of the Earth's Surface: 4 semester hours.**

Evolution of the Earth's surface in recent geologic time. Physical and climatic processes that govern landscape evolution. Examination of landforms and landscapes to interpret paleo-environments and modern Earth surface processes. Lectures, discussions, laboratory exercises, and field trips. PREREQ: GEOL 2204. S

### **GEOL 3392 Geosciences Careers Seminar: 1 semester hour.**

Discussion of current topics, research, and employment opportunities across the breadth of the geosciences. May be repeated once. S

### **GEOL 3399 Experimental Course: 1-6 semester hours.**

The content of this course is not described in the catalog. Title and number of credits are announced in the Class Schedule. Experimental courses may be offered no more than three times with the same title and content. May be repeated.

### **GEOL 4402 Geomorphology: 4 semester hours.**

Process approach to landforms and landscapes. Historical perspectives, endo- and exogenetic processes, equilibrium and relict landforms. Emphasis on interrelations among various geologic sub-disciplines. Field trips and lab exercises. PREREQ: GEOL 3315 or permission of instructor. AF

### **GEOL 4403 Principles of Geographic Information Systems: 3 semester hours.**

Study of GIS fundamentals, vector and raster data models, introduction to GPS and Global Navigation Satellite Systems, basic spatial analysis, geodatabases, and metadata. Practical application of industry standard software. Requires competence in computer operating systems. COREQ: GEOL 4403L. F, S

### **GEOL 4403L Principles of GIS Laboratory: 0 semester hours.**

Computer lab assignments to apply principles from GEOL 4403. COREQ: GEOL 4403. F, S

### **GEOL 4404 Advanced Geographic Information Systems: 3 semester hours.**

Study of relational databases, spatial analysis, and remote sensing. Practical application of industry standard software. Exercises include digitizing, querying, digital terrain modeling, and image processing. PREREQ: GEOL 4403 and GEOL 4403L or permission of instructor. F S

**GEOL 4405 Volcanology: 3 semester hours.**

Aspects of physical and chemical volcanology: types of volcanoes; interpretation of volcanic deposits; properties of magma; generation, rise and storage of magma; volcanic hazards and prediction. PREREQ: One of GEOL 3314, GEOL 3315, GEOL 4421 or GEOL 4452. AF

**GEOL 4407 GPS/GNSS Applications in Research: 3 semester hours.**

Overview of satellite positioning systems usage. Topics include GPS and Global Navigation Satellite Systems theory, basic mapping concepts, use of mapping-grade receivers and survey-grade systems for data collection. Sample design for data collection and spatial analysis in GIS. PREREQ: GEOL 4403. F

**GEOL 4408 GeoTechnology Seminar: 2 semester hours.**

GIS applications in natural and social sciences; ethical and legal issues, current status and recent advances in GeoTechnology. Lectures, discussion, readings. PREREQ: GEOL 4403 and GEOL 4403L or permission of instructor. F, S

**GEOL 4409 Remote Sensing: 3 semester hours.**

Fundamentals and applications of multispectral, hyperspectral, radar, and lidar remote sensing for the sciences. Emphasis on acquiring, processing, integrating, and interpreting imagery. Requires competence in computer operating systems. D

**GEOL 4410 Science in American Society: 2 semester hours.**

Observational basis of science; technology's historical influences on scientific developments; perceptions of science in contemporary America; tools/strategies for teaching science. AF

**GEOL 4411 Planetary Petrology: 3 semester hours.**

Chemistry, mineralogy, tectonic association and petrogenesis of the principal igneous and metamorphic rock types on Earth and other planetary bodies. PREREQ: GEOL 3314. D

**GEOL 4412 Petrology Laboratory: 2 semester hours.**

Microscopic identification of igneous and metamorphic minerals and rocks. COREQ: GEOL 4411. D

**GEOL 4413 Sedimentary Rocks in Thin Section: 2 semester hours.**

A variety of terrigenous, volcanoclastic, and carbonate rocks will be studied. PREREQ or COREQ: GEOL 4411. D

**GEOL 4415 Quaternary Global Change: 4 semester hours.**

Use and interpretation of landforms, sediments, and fossil life in understanding Ice Age climatic cycles that influenced geologic events and environments during the Quaternary Period. Lectures, discussions, laboratory exercises, and field trips. EF

**GEOL 4416 Global Environmental Change: 3 semester hours.**

Analysis of the causes and effects of both natural and human-induced environmental change. Integrates knowledge from other Earth Systems Science courses, and examines and analyzes relevant problems in global environmental change using scientific methods. PREREQ: GEOL 2204. D

**GEOL 4417 Introduction to Soils and Critical Zone Processes: 4 semester hours.**

Introduction to soils with emphasis on soil formation and classification and the physical, chemical and biological properties of soils. Lectures and laboratory exercises. PREREQ: CHEM 1112 and CHEM 1112L or permission of instructor. F

**GEOL 4418 Introduction to Unmanned Aerial Systems: 3 semester hours.**

Students will gain hands-on experience with UAS, learning the different types of platforms and sensors for environmental and earth science applications. This course will cover the entire UAS workflow from preflight preparation and mission planning to data acquisition, image processing, and analysis. Students will be prepared to complete the Federal Aviation Administration (FAA) Commercial Remote Pilot certification. F

**GEOL 4420 Principles of Geochemistry: 3 semester hours.**

Chemistry of the earth; discussion of factors controlling abundance, distribution, and migration of chemical elements within the earth. PREREQ: GEOL 3313, CHEM 1112 and CHEM 1112L, or permission of instructor. D

**GEOL 4421 Structural Geology: 4 semester hours.**

Structure of the Earth's crust. Investigation of behavior of materials; identification and interpretation of Earth structures. Lectures and laboratory exercises. PREREQ: MATH 1147 or both MATH 1143 and MATH 1144, and GEOL 3310. S

**GEOL 4422 Chemical Evolution of the Earth: 3 semester hours.**

Approaches to understanding Earth's geochemical evolution from core to clouds, including planetary differentiation, internal processes, plate tectonics, and surficial processes. PREREQ: GEOL 3313 or permission of instructor. S

**GEOL 4424 MATLAB for Geosciences: 3 semester hours.**

An introduction to the MATLAB? programming language and computing environment as a tool for studying the Earth. This course uses hands-on activities during each class period to cover the fundamentals of working in the command window, using arithmetic and logical operations, calling built-in functions, and writing scripts. No previous computer programming experience is necessary. PREREQ: MATH 1143 or MATH 1147 and GEOL 2204 or GEOL 2205, or permission of instructor.

**GEOL 4427 Information Technology for GIS: 3 semester hours.**

Study of servers, networks, system administration, relational database design and management, spatial database engines, and serving maps on the internet. The course uses traditional lectures along with demonstrations, and hands-on exercises. PREREQ: GEOL 4403 and GEOL 4403L or instructor approval. S

**GEOL 4428 Programming for GIS: 3 semester hours.**

Course introduces students to programming for GIS. Students will learn the fundamentals of coding (I/O, logical forks, loops, language standards) and integration of GIS libraries (ex., arcpy, GDAL). Students will complete a project where they develop a GIS tool of their choice. PREREQ: GEOL 4403 and GEOL 4403L. F

**GEOL 4429 Watershed Hydrology: 4 semester hours.**

Precipitation, snowmelt, evapotranspiration, infiltration and unsaturated flow, runoff processes, stream hydraulics, water quality, and modeling. Lectures and laboratory exercises. PREREQ: MATH 1147 or MATH 1144, GEOL 2204; or instructor permission. ES

**GEOL 4430 Principles of Hydrogeology: 3 semester hours.**

Surface and groundwater occurrence, principles of groundwater flow, water quality and pollution, and well construction principles.. PREREQ: MATH 1147 or both MATH 1143 and MATH 1144; and GEOL 2204 or permission of instructor. S

**GEOL 4431 Geobiology and the History of Life: 4 semester hours.**

Principles of biology and geology applied to the study of fossil invertebrates. Consideration is given to morphology, classification, evolution, paleoecology, and the stratigraphic significance of fossils. Lectures and laboratory exercises. PREREQ: Permission of instructor. F

**GEOL 4435 Vertebrate Paleontology: 4 semester hours.**

Phylogenetic history of the vertebrates outlined in the light of morphology, classification, evolution, paleoecology, and the significance of fossils. Field trips. Equivalent to BIOL 4435. PREREQ: GEOL 4431, BIOL 3314/BIOL 3314L or equivalent. F

**GEOL 4439 Principles of Taphonomy: 3 semester hours.**

Effects of processes which modify organisms between death and the time the usually fossilized remains are studied. Emphasis on vertebrates. Equivalent to ANTH 4439 and BIOL 4439. PREREQ: Permission of instructor. D

**GEOL 4440 Ore Deposits: 3 semester hours.**

Nature, mode of occurrence, origin of ores with each type related to a given rock association and as the product of a particular environment. PREREQ: One of: GEOL 3314, GEOL 4452 (recommended), or GEOL 4421. D

**GEOL 4450 Field Geology: 6 semester hours.**

Five-week summer field camp, applying standard geologic field instruments and geologic concepts to a series of field problems. PREREQ: GEOL 3314 (recommended) or GEOL 4420; GEOL 4421 and GEOL 4452. Su

**GEOL 4451 Field Methods in Environmental Sciences: 3 semester hours.**

Practical application of field methods. Students learn the techniques and concepts necessary to build water and carbon budgets for a small watershed. PREREQ: Permission of Instructor. D

**GEOL 4452 Sedimentation-Stratigraphy: 4 semester hours.**

Principles of sedimentation from source to diagenesis. The basis of stratigraphic nomenclature, classification, and correlation of rock units. Laboratory covers unconsolidated sediment, hand specimens, and field techniques. PREREQ: ENGL 1102 or permission of instructor. PRE-OR-COREQ: CHEM 1111 and CHEM 1111L, GEOL 2205. F

**GEOL 4454 Basic Engineering Geology: 3 semester hours.**

Geology applied to civil engineering projects; rock engineering classification systems and geotechnical parameters such as joint set orientation, ground behavior and underground construction. Preparation of baseline geotechnical reports. Equivalent to CE 4454. COREQ: GEOL 3314 or CE 3332. D

**GEOL 4455 Geologic Data Methods: 3 semester hours.**

Geotechnical investigations for civil works projects; geologic mapping for civil engineering purposes; development of engineering geologic profiles; core logging; preparation of Geotechnical Data Reports for civil works projects. Equivalent to CE 4455. PREREQ: CE 4454. D

**GEOL 4456 Geology of Idaho: 2 semester hours.**

Geologic provinces and plate tectonic history of Idaho. Topics include basement, Belt Supergroup, Phanerozoic passive margin, Cordilleran orogen, accreted terranes, Idaho batholith, Challis volcanics, Idaho mineral deposits, Basin and Range, Snake River Plain and Pleistocene floods. PREREQ: GEOL 1100 or GEOL 1101. AS

**GEOL 4458 Geology of North America: 3 semester hours.**

Regional geology and tectonics of North America emphasizing the Intermountain West. Graduate students will do extensive additional reading in current literature. PREREQ: GEOL 2205. ES

**GEOL 4460 Undergraduate Teaching Experience: 1 semester hour.**

Supervised teaching in an undergraduate laboratory. Graded S/U. May be repeated for up to 2 credits. PREREQ: Permission of instructor. F, S, Su

**GEOL 4465 Petroleum Geology: 3 semester hours.**

Occurrence of hydrocarbons, well logs, geophysical methods, generation and migration of petroleum, the reservoir, traps and seals, petroleum basins, nonconventional petroleum resources. PREREQ: GEOL 3310 or permission of instructor. D

**GEOL 4471 Historical Geography of Idaho: 3 semester hours.**

Influences of geography and geology on Idaho's economic, political and cultural history. May be team taught and include field trips and discussion sections. Equivalent to HIST 4471 and POLS 4471. AF

**GEOL 4475 Essentials of Geomechanics: 3 semester hours.**

Essentials of rock fracture relevant to geological engineering including stress and strain, properties and classification of rock masses, rock fracture mechanisms. Equivalent to CE 4475. PREREQ: GEOL 4421 or CE 3350/ME 3350. D

**GEOL 4476 Engineering Geology Project: 1 semester hour.**

Team projects studying actual problems in engineering geology. Equivalent to CE 4476. PREREQ: GEOL 4454 or CE 4454. D

**GEOL 4480 Special Topics in GIS: 1-3 semester hours.**

Discussion and/or practice of topics in the geotechnologies. PREREQ: GEOL 4403 and GEOL 4403L and permission of instructor. F, S

**GEOL 4481 GeoTechnology Internship: 1-3 semester hours.**

Choose a project with either Natural Resource or municipal GIS emphasis and work with real-world data at the Internship's off-campus location. Projects focus on using/creating geotechnical data. PREREQ: GEOL 4403 and GEOL 4403L or permission of instructor. F, S

**GEOL 4482 Independent Problems and Studies in Geology: 1-3 semester hours.**

Investigation of a geologic problem chosen by the student and approved by the staff. May be repeated for up to 6 credits. D

**GEOL 4483 Earthquake Engineering: 3 semester hours.**

Mechanism and characterization of earthquakes; seismic risk analysis; site and structural response; applications from points of view of engineer and geologist. Equivalent to CE 4480. PREREQ: GEOL 3313 or CE 3332, or permission of instructor. D

**GEOL 4490 Ecosystem Ecology and Global Changes: 4 semester hours.**

Examination of the structure and function of ecosystems and their responses to natural and anthropogenic changes emphasizing energy, water, carbon, and nitrogen cycling. Field trip. Equivalent to BIOL 4490. PREREQ: BIOL 2209 or permission of instructor. PRE-OR-COREQ: CHEM 1111. OS

**GEOL 4491 Field Seminar: 1 semester hour.**

Multi-day field trip with related discussion of geoscience literature and problems. May be repeated for credits. Graded S/U. F, S

**GEOL 4492 Earth and Environmental Systems Seminar: 1 semester hour.**

Discussion of current topics, research, and employment opportunities in environmental and geosciences. May be repeated once. PREREQ: Junior or senior standing or permission of instructor. D

**GEOL 4493 Senior Thesis: 1-4 semester hours.**

This is a course supervised by a committee of at least two faculty members, approved by the chairperson(s) of the department(s) involved. The thesis topic may be interdisciplinary, with credits conferred by one or more departments. A complete thesis requires total to 4 credits. PREREQ: 90 credits and invitation by (or permission of) department chairperson(s). F, S

**GEOL 4494 Expedition Seminar: 1 semester hour.**

Long-distance field trip to explore the landscape and geologic history of a region, discuss current geologic literature and geologic problems. May be repeated for up to 2 credits. Graded S/U. PREREQ: Permission of instructor. F, S

**GEOL 4495 Reading Seminar: 1 semester hour.**

Discussion of current topics and research in the Geosciences. Specific, evaluated graduate-level activities and/or performances are identified in the course syllabus. May be repeated two times. D

**GEOL 4499 Experimental Course: 1-6 semester hours.**

The content of this course is not described in the catalog. Title and number of credits are announced in the Class Schedule. Experimental courses may be offered no more than three times with the same title and content. May be repeated.