

# Geology

## LOWER DIVISION

**GEOL 106. Earthquake Country** (3). Understanding and preparing for earthquakes. Causes and effects of earth tremors; mechanics of earthquakes; how quakes are located and measured; earthquake risk and hazards; earthquake potential in California; earthquake prediction. Not intended for geology majors. May require 1-day weekend field trip. [GE.]

**GEOL 108. The Dynamic Earth** (3). Survey of general geology for non-science major. Continental drift, earthquakes, volcanism, mountain building, glaciation, landsliding, and other processes which have shaped earth's surface and affect humankind. Lab exercises in map reading, seismology, plate tectonics, environmental hazards, and at least two field trips. Not intended for majors in geology. [Weekly: 2 hrs lect, 3 hrs lab. GE.]

**GEOL 109. General Geology** (4). Physical geology. Origin and constitution of the earth, internal and external processes that determine crustal and surficial features, and methods in investigating and interpreting earth history. [Weekly: 3 hrs lect, 3 hrs lab. CAN GEOL 2. GE.]

## UPPER DIVISION

**GEOL 300. Geology of California** (3). Analyze major geological provinces, lithologic assemblages, economic resources. [Prereq: GEOL 108 or 109. Cannot count for geology majors as upper division geology area of specialization. GE.]

**GEOL 300L. Geology of California Field Trip** (1). Three weekends, or one 5-day field trip, through geologic provinces of northern California: the Coast Ranges, Klamath Mountains, Cascade Range, Modoc Plateau, northern Sierra Nevada, and Great Valley. [Prereq: GEOL 300 (C). Cannot count for geology majors as upper division geology area of specialization.]

**GEOL 303. Earth Resources & Global Environmental Change** (3). Origins, occurrence, and limits of important energy, mineral, and water resources. Societal and environmental impacts of resource use and global climate change. [Prereq: GEOL 108 or 109. GE. Cannot count for geology majors as upper division geology area of specialization.]

**GEOL 305. Fossils, Life & Evolution** (3). Origin, evolution, and fate of life on earth; history of evolutionary thought and study of fossils; development of life environments (habitats) and biotic communities; recent theories of evolution and mass extinction from an introductory paleontologic perspective. [GE. Cannot count for geology majors as upper division geology area of specialization. May require field trip.]

**GEOL 308. Natural Disasters** (3). Mitigating geologic hazards through technology, behavioral and cultural adaptation, risk assessment and pre-

dition, and communication of hazard information. Case studies of earthquakes, volcanoes, tsunamis, hurricanes, floods, landslides, and climate change. [Cannot count for geology majors as upper division specialization. Prereq: upper division standing, GEOL 106 recommended. GE.]

**GEOL 308L. Natural Disasters Laboratory** (1). Two-hour weekly laboratory introducing hazard and risk assessment tools including Geographic Information Systems, warning systems and emergency management, including a campus emergency exercise. Emphasis on countries in the Pacific Basin. May require field trip. Must be taken concurrently with GEOL 308. [Prereq: upper division standing, GEOL 308 (C). GE.]

**GEOL 310. Mineralogy & Optical Crystallography** (4). Crystal structure, chemistry, and optics of minerals. Minerals identified in hand specimens and under petrographic microscope. [Prereq: GEOL 109, CHEM 109 (C). Weekly: 3 hrs lect, 3 hrs lab.]

**GEOL 311. Petrography** (4). Optical properties of biaxial minerals. Characteristic textures and compositions of igneous, sedimentary, and metamorphic rocks. Methods for interpreting them. Compare major petrological theories. [Prereq: GEOL 310. Weekly: 2 hrs lect, 6 hrs lab/field trip; may require 3-day field trip.]

**GEOL 320. Invertebrate Paleontology** (4). Modes of preservation, skeletal anatomy, systematics and taxonomy, biostratigraphy, paleoecology, paleobiogeography, and evolutionary history of invertebrate groups of traditional importance to geologists. Recommended preparation: BIOL 105 or introductory invertebrate zoology course. [Weekly: 3 hrs lect, 3 hrs lab.]

**GEOL 322. Stratigraphy & Sedimentation** (4). Organization of sediments and sedimentary rocks in modern depositional environments and in the stratigraphic record. Processes of origin and features of sedimentary rocks; correlation and paleogeographic reconstruction methods; relationship of sedimentation and tectonics. [Prereq: GEOL 109. Weekly: 3 hrs lect, 3 hrs lab; may require two weekend field trips.]

**GEOL 330. Structural Geology** (4). Describe and analyze structural features of rocks. Interpret the strain significance of structures. Fundamentals of plate tectonics. Tectonic analysis of regional geologic structure. [Weekly: 3 hrs lect, 3 hrs lab; one or two all-day field trips.]

**GEOL 340. Methods of Air Photo Interpretation** (1). Air photo interpretation applied to geologic problems. Black-and-white, color, color infrared, side-looking radar, and satellite imagery. [Prereq: GEOL 109. Weekly: 1 hr lect, 3 hrs lab for half semester.]

**GEOL 350. General Geomorphology** (3). Origin and development of landforms, landform

classification, geomorphic processes. Methods of geomorphological analysis, topographic map interpretation, and aerial photo interpretation. [Prereq: GEOL 109 (C). Weekly: 2 hrs lect, 3 hrs lab; may require two weekend field trips.]

**GEOL 375. Planet Earth** (3). Evolution of earth as habitable planet, from stellar nucleosynthesis to photosynthesis; from inner core magnetism to upper atmosphere ozone. [Prereq: GEOL 109, PHYX 106. Weekly: 2 hrs lect, 3 hrs lab.]

**GEOL 399. Supplemental Work in Geology** (1-3). Directed study intended for transfer student whose prior course work is not equivalent to corresponding courses at HSU. [Prereq: DA. Rep up to 5 times.]

**GEOL 414. Igneous & Metamorphic Petrology** (3). Origin and modes of formation of igneous and metamorphic rocks. Major petrologic theories in light of theoretical, petrographic, and field studies. Mineralogical and textural features of classic terrains. [Prereq: GEOL 311. May require two 2-3 day field trips. Weekly: 2 hrs lect, 3 hrs Lab/field trip.]

**GEOL 415. Sedimentary Petrology** (3). Characteristics, classification, origin, and diagenesis of sediments and sedimentary rocks. [Prereq: GEOL 311, 322. Weekly: 2 hrs lect, 3 hrs lab/field trip.]

**GEOL 422. Paleocology** (1.5). Organism/environment and organism/organism interaction interpreted from fossils. Paleocommunity analysis and temporal dynamics. Fossils in paleoenvironmental reconstructions. [Prereq: GEOL 320 and 322 with grades of C or better. Course in benthic community ecology strongly recommended. Half semester; may require at least one field trip associated with class research project.]

**GEOL 425. Crustal Evolution & Tectonics** (2). Geologic evolution of earth's crust. Emphasis on western North America and the relationship of plate tectonic theory to stratigraphy, structure, and petrogenesis of igneous and metamorphic rocks. [Prereq: GEOL 311, 330 (C). May require weekend field trip.]

**GEOL 430. Advanced Structural Geology** (3). Numerical approaches to analysis of deformed rocks. Strain analysis techniques to solve tectonic problems. Deformation and displacement in orogenic belts. [Prereq: GEOL 330, MATH 110. Weekly: 2 hrs lect, 3 hrs lab/field trip; may require weekend field trip.]

**GEOL 445. Geochemistry** (2). Chemistry of the earth. Processes that determine distribution of elements and isotopes. [Prereq: GEOL 310 and CHEM 109. Weekly: 3 hrs lect, 3 hrs lab for half a semester.]

**GEOL 457. Engineering Geology** (2). Apply geologic methods, principles, and information to engineering and related fields. Analyze earth materials, properties, and processes significant to modern engineering projects. [Prereq: GEOL 330

or IA. Weekly: 3 hrs lect, 3 hrs lab/field trip for half semester; may require 4-day field trip.]

**GEOL 460. Solid Earth Geophysics** (3). Principles of seismology, gravity, geodesy, terrestrial heat flow, geomagnetism, and paleomagnetism. Emphasis on earth as a whole: its internal constitution and evolution. [Prereq: MATH 110, PHYX 107 (or 110). GEOL 330 strongly recommended. Weekly: 2 hrs lect, 3 hr lab.]

**GEOL 470. Field Methods** (2). Principles and methods of field mapping: use of photo imagery; preparing notes, illustrations, and reports; using field instruments. [Prereq: GEOL 330 and 350. Weekend field exercises or one 4- to 7-day field exercise. Field trip fees possible.]

**GEOL 471. Field Mapping Techniques** (1). Principles/methods for geological mapping of specific areas in the western US. May include preparing maps, cross sections, stratigraphic columns, and reports summarizing results of short field projects. Review geological literature. Take in same academic year as GEOL 472. [Prereq: GEOL 311, 470, and GPA of 2.0 or better for all geology courses.]

**GEOL 472. Extended Field Mapping** (4). Six weeks' supervised field work in the western US. Living expenses and a portion of camp expenses borne by student. May be available only during summer. Take concurrently with GEOL 473. [Prereq: GEOL 311, 470, 471, and GPA of 2.0 or better for all geology courses.]

**GEOL 473. Geologic Report Writing** (1). Supervised report preparation. Based on field studies conducted in GEOL 471 and 472, which must be concurrent. [Prereq: GEOL 311, 470.]

**GEOL 482. Advanced Instrumental Methods in Geology** (1-3). Principles of scanning electron microscope analysis, x-ray fluorescence analysis, or x-ray diffractometry. Sample preparation, instrument operation, and data analysis. [Prereq: PHYX 106-107 or 109-110.]

**GEOL 485. Seminar** (1). Discuss selected topics; correlated reading and reports. [Rep 3 times. Prereq: senior standing or IA.]

**GEOL 490 (1), 491 (1), 492 (2). Senior Thesis.** Prepare thesis based on field or lab investigation of subject chosen by student and approved by department. Generally undertaken during senior year, but may commence during junior year. [Prereq: GPA of 2.5 or better for all geology courses and DA.]

**GEOL 499. Independent Study** (1-5). Reading, conference, and/or research. [Rep 4 times. Prereq: DA.]

## GRADUATE

**GEOL 531. Advanced Physical Geology** (1-3). Topics may include hydrology, rock deformation, volcanology, regional stratigraphy, geophysics, trace element geochemistry, or experimental petrology. Field trip fees may be assessed. [Prereq: topic dependent, set by instructor. With consent, rep up to 4 times.]

**GEOL 531L. Advanced Physical Geology Lab** (.5-1). When offered, take concurrently with 531.

May involve weekend or week-long field trip(s).

**GEOL 550. Fluvial Processes** (3). Quantitative and qualitative description of river processes. Mechanics of flow and sediment transport in open channels; adjustments of channel form and pattern; fluvial sediment budgets; techniques for field measurement. [Prereq: GEOL 350, MATH 110, PHYX 107 (or 110); or IA. Weekly: 2 hrs lect, one 3-hr lab; may require 1-day weekend field trip(s).]

**GEOL 551. Hillslope Processes** (3). Quantitative and qualitative description of the mechanics of erosion and deposition on hillslopes. Develop and apply sediment budgets. Hillslope hydrology, weathering, mass movement, slope stability, sheet and rill erosion, slope development models, and techniques for field measurement of slope processes. [Prereq: GEOL 350, MATH 110, PHYX 107 (or 110), or IA. Weekly: 2 hrs lect, one 3-hr lab; may require 1-day weekend field trip(s).]

**GEOL 553. Quaternary Stratigraphy** (4). Concepts, theory, methods of Quaternary geology; soil stratigraphy, climate changes; glacial and periglacial processes and patterns. [Prereq: GEOL 350. Weekly: 3 hrs lect, 3 hrs lab/field trip; may require extended weekend field trip(s).]

**GEOL 554. Quaternary Geology Field Methods** (2). Week-long field excursion to study and interpret quaternary stratigraphic, volcanic, and tectonic problems using appropriate field techniques. Field trip fees may be assessed. [Rep twice.]

**GEOL 555. Quaternary Tectonics** (3). Critical review of Quaternary crustal deformation. Mechanics, rates and distribution of faulting, folding, uplift, subsidence. Methods of measuring/analyzing Quaternary and active tectonic processes. [Prereq: GEOL 330, 350. Weekly: 2 hrs lect, 3 hrs lab or field trip; may require extended weekend field trip(s).]

**GEOL 556. Hydrogeology** (2.5). Geologic factors controlling nature, occurrence, and flow of groundwater. Physics of saturated and unsaturated groundwater flow. Geologic and environmental factors affecting groundwater quality and contaminant transport. Physical/geological insight into modeling and solution of groundwater problems. [Prereq: GEOL 350, MATH 110, PHYX 107 (or 110); MATH 210 recommended. Weekly: 2 hrs lect; 3-hr lab every other week; may require 1-day weekend field trip(s).]

**GEOL 558. Geomorphology of Soils** (3). Physical and chemical weathering mechanisms; climosequences, toposequences, chronosequences; relation of soils to erosional and depositional processes; interpretation of paleosols; use of soils in relative dating of geologic deposits. [Prereq: GEOL 350 and CHEM 110, or IA. May require weekend field trip(s).]

**GEOL 561. Applied Geophysics** (3). Apply geophysical methods to mineral exploration, geological engineering, crustal studies. Seismic reflection, refraction, electrical resistivity, magnetic and gravity surveying. [Prereq: MATH 110, PHYX 107 (or 110), upper division standing in a technical or scientific field. GEOL 330 strongly recommended.

Weekly: 2 hrs lect, 3 hrs lab.]

**GEOL 690. Thesis** (1-6). Conduct research and prepare written thesis as required for grad degree. [Prereq: IA.]

**GEOL 699. Independent Study** (1-5). Possible modes: reading, conference, research. [Prereq: grad standing, DA. Rep 5 times.]

## CREDENTIAL/LICENSURE

**GEOL 700. In-Service Professional Development in Geology** (1-3). Directed studies for geology professionals desiring advanced or specialized instruction, especially that leading to credentialing or teacher certification. [Prereq: IA. May require 1-day weekend field trip(s). Rep 5 times.]