

Geosciences (GEOL)

Courses

GEOL 5502 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. Specific, evaluated graduate-level activities and/or performances are identified in the course syllabus.

GEOL 5503 Principles of Geographical Information System: 3 semester hours.

Study of GIS fundamentals, vector and raster 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. Specific, evaluated graduate-level activities and/or performances are identified in the course syllabus. COREQ: GEOL 5503L.

GEOL 5503L Principles of GIS Laboratory: 0 semester hours.

Computer lab assignments to apply principles from GEOL 5503. COREQ: GEOL 5503.

GEOL 5504 Advanced Geographic Information Systems: 3 semester hours.

Study of relational databases, including spatial analysis, and remote sensing. Practical application of industry standard software. Exercises include digitizing, querying, digital terrain modeling, and image processing. Specific, evaluated graduate-level activities and/or performances are identified in the course syllabus. LL at PC. PREREQ: GEOL 5503 and GEOL 5503L or permission of instructor.

GEOL 5505 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.

GEOL 5507 GPS/GNSS Applications in Research: 3 semester hours.

Overview of satellite positioning systems usage. Topics include GPS and Global Navigation Satellite theory, basic mapping concepts, use of mapping grade receivers for GIS data collection. Sample design for data collection and spatial analysis in GIS. Specific, evaluated graduate-level activities and/or performances are identified in the course syllabus. PREREQ: GEOL 4403 or GEOL 5503.

GEOL 5508 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.

GEOL 5509 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. Specific, evaluated graduate-level activities and/or performances are identified in the course syllabus.

GEOL 5510 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. Equivalent to PHYS 5510.

GEOL 5511 Planetary Geology: 3 semester hours.

Chemistry, mineralogy, tectonic association and petrogenesis of the principal igneous and metamorphic rock types on Earth and other planetary bodies. Specific, evaluated graduate-level activities and/or performances are identified in the course syllabus. D

GEOL 5513 Sedimentary Rocks in Thin Sections: 2 semester hours.

A variety of terrigenous, volcanoclastic, and carbonate rocks will be studied. Specific, evaluated graduate-level activities and/or performances are identified in the course syllabus. LL at PC. PRE-OR-COREQ: GEOL 5511. D

GEOL 5515 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. Specific, evaluated graduate-level activities

GEOL 5516 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.

GEOL 5517 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. Specific, evaluated graduate-level activities and/or performances are identified in the course syllabus. PREREQ: CHEM 1112 and CHEM 1112L or permission of instructor. F

GEOL 5520 Principles of Geochemistry: 3 semester hours.

Chemistry of the earth; discussion of factors controlling abundance, distribution, and migration of chemical elements within the earth. Specific, evaluated graduate-level activities and/or performances are identified in the course syllabus. LL at PC. PREREQ: GEOL 3313, CHEM 1112 and CHEM 1112L, or permission of instructor. D

GEOL 5522 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. Specific, evaluated graduate-level activities and/or performances are identified in the course syllabus. PREREQ: GEOL 3313 or permission of instructor.

GEOL 5524 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.

GEOL 5527 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.

GEOL 5528 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. Specific, evaluated graduate-level activities and/or performances are identified in the course syllabus. PREREQ: GEOL 5503 or permission of instructor.

GEOL 5529 Watershed Hydrology: 4 semester hours.

Precipitation, snowmelt, evapotranspiration, infiltration and unsaturated flow, runoff processes, stream hydraulics, water quality, and modeling. Lectures and laboratory exercises. Specific, evaluated graduate-level activities and/or performances are identified in the course syllabus.

GEOL 5530 Principles of Hydrogeology: 3 semester hours.

Surface and groundwater occurrence, principles of groundwater flow, water quality and pollution, and well construction principles. Specific, evaluated graduate-level activities and/or performances are identified in the course syllabus.

GEOL 5531 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. Specific, evaluated graduate-level activities and/or performances are identified in the course syllabus. LL at PC COREQ: GEOL 5531L. AF

GEOL 5531L Geobiology and History of Life Lab: 0 semester hours.

Assignments to apply principles from GEOL 5531. LL at PC. COREQ: GEOL 5531. AF

GEOL 5535 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 5535.

GEOL 5539 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. Specific, evaluated graduate-level activities and/or performances are identified in the course syllabus. CL at PC. Equivalent to ANTH 5539 and BIOL 5539. PREREQ: Permission of Instructor. D

GEOL 5540 Ore Deposits: 3 semester hours.

Nature, mode of occurrence, and origin of ores with each type related to a given rock association and as the product of a particular environment. Specific, evaluated graduate-level activities and/or performances are identified in the course syllabus.

GEOL 5545 Environmental and Engineering Geophysics: 4 semester hours.

Geophysical applications to environmental and geological engineering problems. Includes seismic, gravity, magnetic, electrical, and electromagnetic methods (includes lab).

GEOL 5550 Field Geology: 6 semester hours.

Five-week summer field camp, applying standard geologic field instruments and geologic concepts to a series of field problems.

GEOL 5551 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. Specific, evaluated graduate-level activities and/or performances are identified in the course syllabus. PREREQ: Permission of Instructor.

GEOL 5552 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, subsurface, and field techniques. Specific, evaluated graduate-level activities and/or

GEOL 5554 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 5554. Specific, evaluated graduate-level activities and/or performances are identified in the course syllabus.

GEOL 5555 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 5555. Specific, evaluated graduate-level activities and/or performances are identified in the course syllabus.

GEOL 5556 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. Specific, evaluated graduate-level activities and/or performances are identified in the course syllabus.

GEOL 5558 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. Specific, evaluated graduate-level activities and/or performances are identified in the course syllabus.

GEOL 5565 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. Specific, evaluated graduate-level activities and/or performances are identified in the course syllabus. CL at PC. PREREQ: GEOL 3310 or permission of instructor.

GEOL 5571 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, discussion sections. Specific, evaluated graduate-level activities and/or performances are identified in the course syllabus. Equivalent to HIST 5571 and POLS 5571.

GEOL 5575 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 5575.

GEOL 5576 Engineering Geology Project: 1 semester hour.

Team projects studying actual problems in engineering geology. Equivalent to CE 5576.

GEOL 5580 Special Topics in GIS: 1-3 semester hours.

Discussion and/or practice of topics in the geotechnologies. Specific, evaluated graduate-level activities and/or performances are identified in the course syllabus.

GEOL 5583 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 5580.

GEOL 5590 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. Specific, evaluated graduate-level activities and/or performances are identified in the course syllabus. Equivalent to BIOL 5590. PREREQ: BIOL 2209 or permission of instructor. PRE-OR-COREQ: CHEM 1111.

GEOL 5591 Seminar: 1 semester hour.

Field trip or discussion of current geologic literature and geologic problems. May be repeated for up to 3 credits. Specific, evaluated graduate-level activities and/or performances are identified in the course syllabus. Graded S/U.

GEOL 5594 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. Specific, evaluated graduate-level activities and/or performances are identified in the course syllabus. May be repeated for up to 2 credits. Graded S/U.

GEOL 5595 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 5599 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 6601 Advanced Physical Geology: 2 semester hours.

An introduction to the Geosciences department, its faculty, and an evaluation of current research topics in the Geosciences through discussion and critical evaluation of scientific literature.

GEOL 6602 Advanced Geomorphology: 3 semester hours.

Seminar in the treatment of theoretical concepts in classical and modern geomorphology.

GEOL 6603 Geologic Writing Seminar: 2 semester hours.

Review of quality geologic writing and presentation practices. Topics include databases, abstracts, stratigraphic terminology, poster and manuscript preparation, grant proposals, thesis prospecti, and use of reference library.

GEOL 6604 Watershed Modeling: 3 semester hours.

Use of geographic information systems and integrated simulation models to study the hydrologic cycle, water quality, agricultural and industrial impacts, environmental and related issues at the watershed scale.

GEOL 6607 Spatial Analysis: 4 semester hours.

This course focuses on advanced techniques for spatial data analysis covering issues in sampling, characterizing, visualizing, exploring and modeling spatial data. Techniques for point patterns, continuous data, area data, and spatial interaction data will be emphasized.

GEOL 6608 Geostatistics Spatial Data Analysis and Modeling: 3 semester hours.

This class explores core concepts of analysis and modeling of spatial data with emphasis on applications in the Geosciences. Develop proficiency with geostatistical software tools to examine geographic patterns, probabilistic modeling, and introductory machine learning.

GEOL 6609 Advanced Image Processing: 3 semester hours.

An advanced-level course in image processing techniques, such as using transforms, filters, and classifiers for data derived in the visible, infrared, and microwave. Specific topics include preprocessing, endmember analysis, classification (including spectral unmixing), and accuracy assessment. Practical application of theory for graduate student theses and dissertations.

GEOL 6611 UAS Applications for the Geosciences: 3 semester hours.

As Unmanned Aircraft Systems enter the national airspace, they are emerging as a tool for geoscientists and engineers to collect remotely sensed data. In this course, students will learn the varied applications of UAS and the workflow of data collection, processing, and analysis. Field demos and hands-on training will be part of the course objectives. Students will learn about Federal Aviation Administration (FAA) rules and regulations for UAS flights.

GEOL 6612 GIS Internship: 1-3 semester hours.

Students will work with faculty assistance to apply for and secure an off-campus GIS focused internship. The student, faculty member and employer will meet early in the internship to discuss the goals and deliverables for the internship.

GEOL 6613 Idaho Water Resources Seminar: 1 semester hour.

This course is an interactive discussion focused on water science, issues, and policy across the state. The seminar is a joint effort of Idaho's universities and multiple institutes, agencies and firms. May be repeated up to two times for credit.

GEOL 6615 Neutron Activation Analysis: 4 semester hours.

Theory and use of neutron activation methods for quantitative chemical analysis of natural and synthetic materials. Applications in geologic systems will be emphasized. Equivalent to CHEM 6615 and PHYS 6615.

GEOL 6617 Environmental Geochemistry: 3 semester hours.

Geochemistry of environmental systems. Emphasis given to low-temperature water-rock interactions, including sorption processes, retardation, reaction kinetics and reaction-mass transport modeling. Equivalent to CHEM 6617.

GEOL 6618 Applied Geophysics: 3 semester hours.

Geologic interpretation of reflection seismic, refraction seismic, gravity, magnetic, and ground penetrating radar data.

GEOL 6620 Geochronology and Thermochronology: 3 semester hours.

An overview of the geochemical methods used to date Earth materials and thus explore the history and dynamics of Earth and planetary processes. This course will cover the fundamentals of radioactive decay and growth, the diffusion of elements in minerals and heat in the Earth, the use of radioisotopes as tracers, and the applications of geochronology and thermochronology to a range of problems in the Geosciences.

GEOL 6621 Advanced Structural Geology: 3 semester hours.

Current aspects of structural geology or tectonics. May focus on regional structures, tectonic theories, orogenic mechanics, global tectonic model(s), or topics of special interest in structural geology.

GEOL 6622 Orogenic Belts: 3 semester hours.

Interdisciplinary analysis of contractional mountain belts including their infrastructure, tectonic evolution, and mechanisms of formation.

GEOL 6623 Tectonics and Sedimentation: 3 semester hours.

Sedimentary basin analysis and mechanisms of subsidence. Extensional, compressional and strikes lip tectonics as related to depositional systems, facies architecture, and provenance.

GEOL 6625 Quantitative Geochemistry Lab: 3 semester hours.

Practical application of theory involving use and operation of instrumental techniques. Equivalent to CHEM 6625.

GEOL 6628 Advanced GIS Programming: 3 semester hours.

Course focuses on advanced topics in GIS programming, particularly processing efficiency for large problems. Students will learn the fundamentals of parallel processing for spatial problem solving, including use of shared and/or distributed memory systems. PREREQ: GEOL 5503, GEOL 5528, and permission of instructor.

GEOL 6630 Advanced Hydrogeology: 3 semester hours.

Advanced topics in hydrogeology, including precipitation and stream flow, soil moisture, principles and modeling of groundwater flow, migration of wastes in both saturated and unsaturated zones, design and impact of production wells, water chemistry.

GEOL 6631 Sedimentology: 3 semester hours.

Provenance, dispersal, and environments of deposition; emphasis on various aspects of surface equilibria.

GEOL 6641 Advanced Petrology: 3 semester hours.

Selected topics in igneous and/or metamorphic petrology, regional and/or global aspects of current interest, including relationship to major advances in other areas of solid earth sciences.

GEOL 6646 The Sedimentary Record: 3 semester hours.

Earth history as revealed in sedimentary facies, provenance, chemical and isotopic excursions. Methods of analysis including sequence stratigraphy, geochronology, biogeochemistry, chemostratigraphy.

GEOL 6648 Research Problems: 1-6 semester hours.

Independent research on non-thesis subject matter, subject to approval of the staff before results receive credit. Course may be repeated until 10 credits are earned.

GEOL 6649 Pre-Thesis: 1-6 semester hours.

Preparation and development of a prospectus for a thesis or dissertation project. May be repeated. Graded S/U. Credits are not counted in the program graduation credit requirement.

GEOL 6650 Thesis: 1-9 semester hours.

Ordinarily a field problem with supporting laboratory work undertaken by the student with approval of the geology graduate faculty, and after a thesis prospectus has been accepted. May be repeated. Graded S/U.

GEOL 6684 Graduate Teaching Practicum: 1 semester hour.

Teaching techniques and tools for use in undergraduate courses. Graded S/U.

GEOL 6699 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 8850 Doctoral Dissertation: 1-16 semester hours.

Research toward and completion of the dissertation. Variable credit. May be repeated. Graded S/U.