

GEOL - Geology

Courses numbered 500 to 799 = *undergraduate/graduate*. (Individual courses may be limited to undergraduate students only.) Courses numbered 800 to 999 = *graduate*.

GEOL 522. Sedimentology and Stratigraphy (4).

3 Classroom hours; 3 Lab hours. Origin, classification, primary structures and physiochemical processes controlling deposition of sedimentary rocks. Surveys modern and ancient sedimentary depositional environments and petrographic study of sedimentary rocks in thin sections. Description, classification, methods of correlations and determination of relative ages of stratigraphic rock units; stratigraphic principles and practice, the nature of cyclic sedimentation and controls on deposition, and elements of sequence stratigraphy. May require field trips. Prerequisite: GEOL 102 (with lab) or GEOL 111.

GEOL 540. Field Map Methods (3).

6 Lab hours. Field mapping methods with special reference to use of level, compass, barometer, alidade and airphotos. Field trips required. Prerequisite: GEOL 102 (with lab) or 111 or GEOL/GEOG 201.

GEOL 544. Structural Geology (3).

2 Classroom hours; 2 Lab hours. Stress-strain theory and mechanics of rock deformation, description, and genesis of secondary structural features in crustal rocks resulting from diastrophism, elements of global tectonics, and laboratory solution of geologic problems in three dimensions and time. May require field trips and field problems. Prerequisites: MATH 112 or 123; GEOL 312; and GEOL 324 or 522. Corequisite: GEOL 544L.

GEOL 560. Geomorphology & Land Use (3).

Cross-listed as GEOL 810AG. Identification of landforms and their genesis, processes producing landforms, the influence of geomorphology in aspects of natural hazards such as landslides, floods, earthquakes and volcanic activity; soil erosion, drainage basin modification, coastal and desert environments, mineral resource exploitation, and their effects on humans; importance of these influences in environmental management and land-use planning. Prerequisite: GEOL 111 or GEOL 102 or GEOL/GEOG 201.

GEOL 564. Remote Sensing Interpretation (3).

2 Classroom hours; 2 Lab hours. Introduces interpretation techniques for most types of images acquired by remotely positioned means. Physical principles that control various remote sensing processes using the electromagnetic spectra are applied to geology, land use planning, geography, resource evaluation and environmental problems. Derivative maps generated from a variety of images. May require field trips. Prerequisite: GEOL 102 or 111 or GEOL/GEOG 201.

GEOL 570. Biogeology (3).

2 Classroom hours; 2 Lab hours. *General education math and natural sciences advanced further study course*. Systematic survey of major fossil biogeological materials, analysis of the origin and evolution of life, and paleoecological interpretation of ancient environments and climates. Includes handlens and binocular microscopic examination of major fossil biogeological materials. Includes application of analyzed fossil data to the solution of problems in biogeochronology, paleoecology, paleoclimatology and paleogeography. Cites examples from fields of invertebrate, vertebrate and micropaleontology, and palynology. May require museum and field trips. Prerequisite: GEOL 312. Corequisite: GEOL 570L.

GEOL 574. Special Studies in Paleontology (3).

2 Classroom hours; 2 Lab hours. *General education math and natural sciences advanced further study course*. A systematic study in selected areas of biogeology and paleontology. Content differs, upon demand, to

provide in-depth analysis in the fields of: (A) invertebrate paleontology, (B) vertebrate paleontology, (C) micropaleontology, (D) palynology, and (E) paleoecology. Gives appropriate laboratory instruction in the systematics, taxonomy and biogeological relationships within the selected fields listed. May require field trips. Repeatable for credit to cover all five areas listed.

GEOL 621. Geochemical Cycling (3).

Capstone course. The geochemistry of earth materials and the important geochemical processes; cycles operating on and within the atmosphere, hydrosphere and lithosphere through time; anthropogenic effects on these cycles today. Prerequisites: GEOL 102 (with lab) or GEOL 111 and CHEM 211; or instructor's consent.

GEOL 630. Field Studies in Geology (2-6).

Off-campus, systematic field study in a selected area of geological significance. Course given upon demand, repeatable for credit when locality and/or content differ. Where appropriate, travel, lodging and board costs are charged. Prerequisite: instructor's consent.

GEOL 640. Field Geology (6).

Capstone course. Field investigation of sedimentary, igneous and metamorphic rock units and their structures. Includes the application of mapping methods in solving geologic problems. Held at an off-campus field camp for five weeks (including weekends). Preparation of geologic columns, sections, maps and an accompanying report are due on campus during the sixth week. Prerequisites: GEOL 324, 522, 540, 544.

GEOL 650. Geohydrology (3).

2 Classroom hours; 2 Lab hours. Capstone course. The hydrologic cycle, physical and chemical properties of water; fluid flow through permeable media, exploration for and evaluation of groundwater, water quality and pollution, and water law. Prerequisites: GEOL 522, MATH 242 and 243; or instructor's consent. Corequisite: GEOL 650L.

GEOL 657. Earth Science Instructional Methods (3).

Practice in teaching an introductory course in the earth sciences. Developing and presenting the latest scientific laboratory techniques and evaluating their effectiveness. May be taken more than once if content and objectives differ. Prerequisite: senior standing and department chairperson's permission.

GEOL 678. Geologic Perspectives on Climatic Change (3).

Capstone course. Modern climate and climactic changes and analysis of climactic deterioration; systematic study of geologic evidence of climate change through time. Emphasizes theoretical causes, feedback mechanisms and recognition of effects on climactic perturbations in the rock record. Prerequisites: GEOL 312, 522.

GEOL 682. Petroleum Geology (3).

2 Classroom hours; 2 Lab hours. The origin, migration and accumulation of oil and gas in the earth's crust; reservoir trap types in common hydrocarbon fields, origin and types of porosity systems, and distribution of world petroleum supplies. Introduces subsurface study techniques. May require field trips. Prerequisite: GEOL 522. Corequisite: GEOL 682L.

GEOL 684. Methods of Subsurface Analysis (2).

1 Classroom hour; 2 Lab hours. Methods of remotely logging and describing the geologic occurrence of subsurface strata; characterization of subsurface strata, including laboratory analysis of recovered subsurface samples; application to petroleum geology, mineral resource evaluation and environmental geology. Prerequisites: GEOL 312, 522; or instructor's consent.

GEOL 690. Special Studies Geology (1-3).

Systematic study in selected areas of geology. Offered on demand; repeatable for credit when content differs. Requires laboratory work or field trips (instructor's option). Prerequisite: instructor's consent.

GEOL 690AJ. Computer Methods in Science (3).

1 Classroom hour; 4 Lab hours. Cross-listed as EEPS 701. Surveys computer applications commonly used by scientists, emphasizing nonstatistical applications. Includes computer-assisted instruction, data management, presentation packages, internet resources, digital image analysis, graphics and spreadsheets, reference acquisition and management, desktop publishing, and specialized applications for modeling, simulations, mapping and time-series analysis. Lectures and demonstrations involve individual hands-on activities and student projects. Prerequisite: graduate standing or instructor's consent.

GEOL 690AK. Soils (3).

Geologic analysis of soil types, their formation, occurrence and mineralogy; soil management and conservation, environmental aspects of soil occurrence including stability studies, pollution and reclamation.

GEOL 690AO. History of Geology (3).

The course examines the historical development of Earth science from prehistoric to modern times. The course analyzes the various techniques of data collection and interpretation that were used throughout history.

GEOL 690AP. Petroleum Engineering: An Introduction for Geoscientists (3).

An introduction to the theory and application of petroleum engineering to oil and gas exploration and development. Oriented to students with a geology or geoscience background.

GEOL 690AQ. Mass Extinctions (3).

Cross-listed as GEOL 430D. Mass extinctions have punctuated the geologic history of this planet. This course will compare the past extinction causation to our modern world for similarities and differences.

GEOL 698. Independent Study in Geology (1-3).

Independent study on special problems in selected areas of geology: (a) general, (b) mineralogy, (c) petrology, (d) structural, (e) paleontology, (f) economic geology, (g) sedimentation, (i) stratigraphy, (j) geophysics, and (k) petroleum. Requires a written final report. Prerequisite: consent of sponsoring faculty.

GEOL 720. Geochemistry (3).

The chemistry of natural aqueous solutions and their interaction with minerals and rocks; thermodynamics and kinetics of reactions; emphasizes application to sedimentary environments and environmental problems. Requires some laboratory work. Prerequisites: GEOL 324 and CHEM 212 or instructor's consent.

GEOL 724. Soils (3).

Geologic analysis of soil types, their formation, occurrence and mineralogy; soil management and conservation, environmental aspects of soil occurrence including stability studies, pollution and reclamation.

GEOL 726. Carbonate Sedimentology (3).

2 Classroom hours; 2 Lab hours. The origin and genetic description of carbonate particles, sediments and rocks, mineralogy and textural classifications, depositional environments in carbonate rocks and analysis of modern and ancient depositional system. May require field trips. Prerequisite: GEOL 522 or equivalent. Corequisite: GEOL 726L.

GEOL 727. Carbonate Diagenesis (3).

2 Classroom hours; 2 Lab hours. Analyzes diagenesis of carbonate sediments and rocks. Includes mineralogic stability in natural waters, meteoric, marine and deep-burial diagenesis, dolomitization processes and products, trace-elements and isotopes as diagenetic tools,

cathodoluminescence and X-ray diffraction studies of carbonates; origin and porosity. Prerequisite: GEOL 726 or instructor's consent.

GEOL 740. Basin Analysis (3).

A practical course in analysis of petroleum-bearing or other sedimentary basins; emphasizes detailed subsurface mapping to document depositional, tectonic and burial history of sedimentary basins; subsurface lithologic and geochemical sample analysis and evolution of sedimentary facies systems and hydrocarbons maturation history. Includes compilation of existing data to determine geologic evolution of basins. Prerequisites: GEOL 682, 684 or instructor's consent.

GEOL 745. Advanced Stratigraphy (3).

Analysis of stratigraphic sequences at the local to global scales in terms of sequence stratigraphic concepts and high-resolution interpretation of depositional sequences (from outcrop and subsurface data); seismic sequence stratigraphy, and significance of unconformities in sequence identification and development; local to global correlation of sequences and sea level history through time; cratonic sequences of North America. Required seven-day field trip. Prerequisites: GEOL 312, 522, 726.

GEOL 750G. History of Geology (3).

The course examines the historical development of Earth science from prehistoric to modern times. The course analyzes the various techniques of data collection and interpretation that were used throughout history.

GEOL 751. Advanced Geohydrology (3).

Integrations of practical and theoretical coverage of subsurface fluid flow as applied to shallow aquifers. Covers the mass transport in both the saturated and vadose zones as well as the occurrence and movement of nonaqueous fluids. Covers groundwater quality, sources of groundwater contamination, retardation of contaminants, retardation and attenuation of dissolved solids, and the response of inorganic and organic substances to subsurface aqueous and framework chemistries. Computer simulation models used whenever practical along with detailed analysis of case histories, including those related to environmental geoscience. Prerequisites: GEOL 650, 681, MATH 344, or instructor's consent.

GEOL 752. Climatic Evolution of Earth (3).

Basics of climatology and paleoclimatology, and recognition of paleoclimatic indicators in the rock record. Climatic changes at different scales in Earth history and possible causes, and nature of climatic records. Roles of climate change on the evolution of Earth's biosphere, hydrosphere, atmosphere and lithosphere. Field trip(s) may be required. Prerequisite: GEOL 721, graduate standing, or instructor's consent.

GEOL 760. Exploration Geophysics (3).

Introduces the theory and application of geophysical techniques for hydrocarbon, mineral and groundwater prospecting. Includes use of seismic techniques, instrumentation for acquisition on land and sea, seismic processing, structural and stratigraphic modeling, 3-D seismic exploration, and seismic refraction techniques. Prerequisites: completion of geology undergraduate math and physics requirements; MATH 344 or 555; GEOL 324, 544, instructor's consent.

GEOL 781. Advanced Numerical Geology (3).

Involves practical implementation of algorithms and computer code. Includes the analysis of multivariate techniques and the development of the computer/algorithm skills needed to handle very large databases. Covers standard statistical approaches to data analysis, treatment of applied linear algebra and matrix theory; the application of linear and nonlinear discriminate analysis, various factor analytic techniques, hard and fuzzy clustering, linear and nonlinear unmixing analysis, and other forms of data modeling. Prerequisites: GEOL 681 or equivalent,

competence in one or more high level computer languages, MATH 344 or 555, and instructor's consent.

GEOL 795. Earth and Space Physics (3).

Cross-listed as PHYS 795. An introduction to the geosciences and astrophysics of the solar system. Topics include the surface, interior and atmospheres of the planets with a comparative planetology approach, and the sun-planet system including solar physics and the effect of the sun on the earth's environment and geologic history. Prerequisites: PHYS 313-314, and MATH 242, or EEPS 721, or instructor's consent.

GEOL 800. Research In Geology (1-3).

9 Lab hours. Research in special areas of geology: (a) general, (b) mineralogy, (c) petrology, (d) structural, (e) paleontology, (f) economic geology, (g) sedimentation, (i) stratigraphy, (j) geophysics, and (k) petroleum. Requires a written final report. Prerequisite: consent of sponsoring faculty.

GEOL 810. Advanced Graduate Studies in Geology (1-6).

Systematic study in a selected topic of professional or applied geology. Course given upon demand. May require field trips. Repeatable for credit when content differs. Prerequisites: graduate standing, instructor's consent and two years of professional postgraduate practice in geology.

GEOL 810AG. Geomorphology & Land Use (3).

Cross-listed as GEOL 560. Identification of landforms and their genesis, processes producing landforms, the influence of geomorphology in aspects of natural hazards such as landslides, floods, earthquakes and volcanic activity; soil erosion, drainage basin modification, coastal and desert environments, mineral resource exploitation, and their effects on humans; importance of these influences in environmental management and land-use planning. Prerequisite: GEOL 111 or GEOL 102 or GEOL/GEOG 201.

GEOL 810AI. Issues in Marine Environments (2).

Seminar course examines geologic processes in the marine realm and current environmental issues with tropic marine environments around the world. Assignments and projects in the course give students experience in development and presentation of research, data analysis, and conflict resolution.

GEOL 810AP. Petroleum Engineering: An Introduction for Geoscientists (3).

Introduction to the theory and application of petroleum engineering to oil and gas exploration and development. Oriented to students with a geology or geoscience background.

GEOL 821. Special Studies in Geochemistry (3).

A systematic study in selected areas of geochemistry. Content differs upon demand to provide in-depth analysis in fields of (a) sedimentary carbonate and silicate geochemistry and mineralogy, (b) organic geochemistry, (c) high pressure and temperature thermodynamics of earth materials, (d) exploration geochemical geochemistry, (e) exogenic geochemical cycling, (f) stable isotope geochemistry. May require some laboratory work. Repeated for credit to cover all six areas listed. Prerequisite: GEOL 720 or instructor's consent.

GEOL 830. Field Studies in Geology (2-6).

Off-campus, systematic field study in a selected area or region of geologic significance. Course given upon demand. Where appropriate, travel, lodging and board costs are charged. Repeatable for credit when locality and content differ. Prerequisites: summer field geology (or equivalent) and instructor's consent.