

# Geology Courses

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## Courses

### **GEOL 5101. Graduate Seminar.**

Graduate Seminar (1-0) Required of all graduate students. Discussion of various geological topics by the faculty, graduate students, and speakers from industry and other institutions. Prerequisite: Graduate standing.

**Department:** Geology

**1 Credit Hour**

**1 Total Contact Hour**

0 Lab Hour

1 Lecture Hour

0 Other Hour

### **GEOL 5115. Selected Topics in Geol Scien.**

Selected Topics in the Geological Sciences (1-0) Study of advanced topics in such fields as structural geology, economic geology, paleontology, petrology, and geochemistry. May be repeated for credit when the topic varies. Prerequisite: Department approval.

**Department:** Geology

**1 Credit Hour**

**1 Total Contact Hour**

0 Lab Hour

1 Lecture Hour

0 Other Hour

### **GEOL 5162. Directed Study in Geology.**

Directed Study in Geology (0-0-1) Prerequisites: Graduate standing and department approval.

**Department:** Geology

**1 Credit Hour**

**1 Total Contact Hour**

0 Lab Hour

0 Lecture Hour

1 Other Hour

### **GEOL 5215. Selected Topics in Geol Scien.**

Selected Topics in Geological Sciences (2-0) Study of advanced topics in such fields as structural geology, economic geology, paleontology, petrology, and geochemistry. May be repeated for credit when the topics vary. Prerequisite: Department approval.

**Department:** Geology

**2 Credit Hours**

**2 Total Contact Hours**

0 Lab Hours

2 Lecture Hours

0 Other Hours

### **GEOL 5262. Directed Study in Geology.**

Directed Study in Geology (0-0-2) Prerequisites: Graduate standing and department approval.

**Department:** Geology

**2 Credit Hours**

**2 Total Contact Hours**

0 Lab Hours

0 Lecture Hours

2 Other Hours

### **GEOL 5289. Graduate Research in Geol Sci.**

Graduate Research in Geological Science (0-0-2) Prerequisite: Graduate standing or department approval.

**Department:** Geology

**2 Credit Hours**

**2 Total Contact Hours**

0 Lab Hours

0 Lecture Hours

2 Other Hours

**GEOL 5303. Computer Appl in Earth Sci.**

Computer Applications in the Earth Sciences (3-0) Principles and applications of software to earth science data analysis and modeling. Topics will include uses of Geographic Information Systems, remote sensing data types and analysis, and uses of other common PC-based applications for earth science data analysis. Prerequisites: GEOL 5401 with a grade of "C" or better and department approval.

**Department:** Geology

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (GEOL 5401 w/C or better)

**GEOL 5304. Earth Structure.**

Earth Structure (3-0) Fundamentals of the origin and evolution of earth structure at all scales. Topics include, geographical and geophysical methods of determining the structure of the earth, processes of rock deformation including folding and fracturing, plate tectonics, and the influence of large-scale plate tectonic processes on local earth structure. Prerequisites: GEOL 5401 with a grade of "C" or better and department approval.

**Department:** Geology

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (GEOL 5401 w/C or better)

**GEOL 5305. Earth Materials.**

Earth Materials (2-3) Study of the minerals and rocks that comprise the crust of the earth, utilizing hand specimens and thin sections of common minerals, igneous, metamorphic, and sedimentary rocks. Materials common in the southwestern part of the U.S. will be given some emphasis.

Prerequisites: GEOL 5401 with a grade of "C" or better and department approval.

**Department:** Geology

**3 Credit Hours**

**5 Total Contact Hours**

3 Lab Hours

2 Lecture Hours

0 Other Hours

**Prerequisite(s):** (GEOL 5401 w/C or better)

**GEOL 5308. Planetary Geology.**

Planetary Geology (3-0) A survey of the composition, evolution, and geologic features of planetary bodies and the potential for life in the solar system. Topics include origin of the solar system, planetary atmospheres, comparative planetology of terrestrial and Jovian planets, small bodies such as moons, comets and asteroids. Prerequisites: GEOL 5401 with a grade of "C" or better and department approval.

**Department:** Geology

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (GEOL 5401 w/C or better)

**GEOL 5309. Mineral Resrcs, Econ & Environ.**

Mineral Resources, Economics, and the Environment (3-0) Geological characteristics and classification of metallic, non-metallic, and fuel resources. Environmental consequences of mineral extraction and issues of public policy. Prerequisites: GEOL 5401 with a grade of "C" or better and department approval.

**Department:** Geology

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (GEOL 5401 w/C or better)

**GEOL 5310. Intro Entrepreneurial Geosci.**

Entrepreneurial activities in the geosciences focus on discovery and development in the energy and mineral exploration industries. This course will consist of a survey of all aspects of such activities, including but not limited to: 1) money sources, 2) the technical challenges of geology, extraction and metallurgy, and the environment mainly water, 3) social issues and ethics. Weekly discussions of current entrepreneurial events are required. Selections from the 150 professional development web courses in EduMin will enhance student learning. Written and oral products are required.

**Department:** Geology

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**GEOL 5315. Selected Topics-Geological Sci.**

Selected Topics in the Geological Sciences (3-0) Study of advanced topics in such fields as structural geology, economic geology, paleontology, petrology, and geochemistry. May be repeated for credit when topic varies. Prerequisite: Department approval.

**Department:** Geology

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**GEOL 5317. Hydrogeology.**

Hydrogeology (3-0) Consideration of hydrologic cycle, groundwater flow, recharge and discharge of groundwater, types and properties of aquifers, principles of flow, groundwater models and groundwater flow to wells. Additional topics include aqueous geochemistry, isotope hydrogeology, and 1-d contaminant transport.

**Department:** Geology

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**GEOL 5318. Petroleum Geology.**

Petroleum Geology (3-0) study of the mature, origin, migration, and accumulation of petroleum, including consideration of porosity/permeability in reservoir systems, behavior of reservoir fluids, and of trap systems. Relationships between plate tectonics and petroleum provinces will be examined.

**Department:** Geology

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**GEOL 5320. Environmental Tracers in Water.**

Introduction to the use of environmental isotope tracers in studying water-related problems. Topics will cover the fundamentals of stable isotope geochemistry, the geochemical processes causing natural variations of isotope ratios in water, and the applications of isotopic techniques in determining ground water residence times and recharge conditions.

**Department:** Geology

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**GEOL 5321. Introduction to GIST.**

Introduction to the principals and applications of Geographic Information Systems (GIS). Topics include the importance of validated databases, GIS design, data structures, producing map products, and spatial analysis. The laboratory will focus on the application of a common GIS software package to science and engineering projects.

**Department:** Geology

**3 Credit Hours**

**5 Total Contact Hours**

3 Lab Hours

2 Lecture Hours

0 Other Hours

**GEOL 5322. Advanced GIST.**

Advanced principals of Geographic Information Systems and Technology (GIST), with a focus on spatial analysis. Topics include combining data, map algebra, terrain modeling, spatial interaction modeling, along with basic remote sensing and digital image processing functions. The laboratory will focus on the application of a common GIS software package to science and engineering projects.

**Department:** Geology

**3 Credit Hours**

**5 Total Contact Hours**

3 Lab Hours

2 Lecture Hours

0 Other Hours

**GEOL 5323. Spat Analysis Earth/Env Sci.**

This course focuses on advanced spatial analysis in geographic information systems applicable to the environmental, geological, and hydrological sciences. Students will be introduced to analytical tools such as spatial data interpolation techniques, point pattern, and density analysis, as well as emerging techniques in the research literature.

**Department:** Geology

**3 Credit Hours**

**5 Total Contact Hours**

3 Lab Hours

2 Lecture Hours

0 Other Hours

**GEOL 5324. Geocomputation.**

This course focuses on advanced spatial simulation, computation and analytics using GIS alone or in conjunction with other analysis and modeling software packages. Students will be introduced to fundamentals of computer programming using Python, will use Python to develop custom programs in ArcGIS and/or QGIS, and will learn how to link GIS with other programs. Advanced spatial modeling will include agent-based models and cellular automata. In the last portion of the class students will be introduced to emerging topics in "big data" relevant to geospatial analysis and modeling, such as spatial data mining and geovisual analytics.

**Department:** Geology

**3 Credit Hours**

**5 Total Contact Hours**

3 Lab Hours

2 Lecture Hours

0 Other Hours

**GEOL 5343. Isotope Geology.**

Isotope Geology (3-0) Study of the systematics and geochemistry of radiogenic and stable isotopes. The course includes both geochronology and the use of isotopes as tracers in igneous, sedimentary, and metamorphic processes. Restricted to majors: GEOL and GEOP. Prerequisite: Graduate standing. Course fee required.

**Department:** Geology

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**GEOL 5344. Advanced Petrology.**

Advanced Petrology (2-3) Study of magmas and magma genesis in light of field, theoretical, and experimental considerations. The course includes interpretation of isotopic and trace element data. Laboratory studies focus on field trips and petrographic description of thin sections. Course fee required.

**Department:** Geology

**3 Credit Hours**

**5 Total Contact Hours**

3 Lab Hours

2 Lecture Hours

0 Other Hours

**Prerequisite(s):** (GEOL 3315 w/D or better ) OR (GEOL 3115 w/D or better AND GEOL 3215 w/D or better)

**GEOL 5362. Directed Study in Geology.**

Directed Study in Geology (0-0-3) Prerequisites: Graduate standing and department approval.

**Department:** Geology

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

0 Lecture Hours

3 Other Hours

**GEOL 5363. Sandstone Petrography.**

The interpretation of mineralogy, provenance, diagenesis and porosity of sandstones using petrographic microscopic techniques.

**Department:** Geology

**3 Credit Hours**

**4 Total Contact Hours**

2 Lab Hours

2 Lecture Hours

0 Other Hours

**GEOL 5364. Sedimentary Depositional Envir.**

Sedimentary Depositional Environments (3-0) Reconstruction of ancient depositional environments in the surface and subsurface using facies analysis. Field trips are included. The class will focus on analysis of field examples. Prerequisites: GEOL 3425 with a grade of "C" or better, or instructor approval.

**Department:** Geology

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (GEOL 3425 w/C or better ) OR (GEOL 3126 w/C or better AND GEOL 3326 w/C or better)

**GEOL 5365. Basin Analysis.**

Basin Analysis (3-0) The study of evolution of sedimentary basins and the influences of tectonic eustasy and other factors to create a stratigraphic framework. The course includes basin analysis techniques such as backstripping, paleotemperature calculations, and sequence stratigraphy. Field trips included. Prerequisite: GEOL 3425 with a grade of "C" or better or instructor approval.

**Department:** Geology

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (GEOL 3425 w/C or better ) OR (GEOL 3126 w/C or better AND GEOL 3326 w/C or better)

**GEOL 5375. Quantitative Geological Sci.**

Quantitative Techniques in the Geological Sciences (2-3) Introduction to techniques for quantitative analysis of geologic data. Emphasis on the extraction of maximum information from large data matrices. Specific applications to petroleum and mineral exploration. Course fee required.

**Department:** Geology

**3 Credit Hours**

**5 Total Contact Hours**

3 Lab Hours

2 Lecture Hours

0 Other Hours

**GEOL 5376. Low Temperature Geochemistry.**

Low Temperature Geochemistry (2-0) Chemical reactions at the earth's surface and their interpretation by thermodynamic and kinetic principles. Precipitation and dissolution, the solid-solution interface, oxidation and reduction, the distribution and circulation of elements and compounds. Course fee required.

**Department:** Geology

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (CHEM 1306 w/D or better)

**GEOL 5378. Global Biochemical Cycles.**

Introduction to the water and energy balance, and the global elemental cycles. This course will discuss Earth surface processes, different water reservoirs, environmental hot topics, and natural/anthropogenic cycles of C, P, S and other elements.

**Department:** Geology

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**GEOL 5381. Paleoclimatology.**

Investigation of scientific principles, methods and data sources used to reconstruct and interpret Earth's climate system and related paleoenvironmental factors through geological time. Emphasis is placed on the sedimentary record (marine sediments, lacustrine sediments, ice cores) of the Cenozoic Era. Actual data, scientific literature and core samples are used to describe and interpret paleoclimates through case studies.

**Department:** Geology

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**GEOL 5389. Graduate Research in Geol Sci.**

Graduate Research in Geological Science (0-0-3) Prerequisite: Graduate standing.

**Department:** Geology

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

0 Lecture Hours

3 Other Hours

**GEOL 5397. Geol/Mineral Resources Mexico.**

Geology and Mineral Resources of Mexico (3-0) Strategraphic and structural framework of the republic of Mexico with particular reference to the distribution of mineral resources. Field excursion required. Prerequisite: Graduate standing.

**Department:** Geology

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**GEOL 5398. Thesis.**

Thesis (0-0-3)

**Department:** Geology

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

0 Lecture Hours

3 Other Hours

**GEOL 5399. Thesis.**

Thesis (0-0-3) Prerequisite: GEOL 5398.

**Department:** Geology

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

0 Lecture Hours

3 Other Hours

**Prerequisite(s):** (GEOL 5398 w/P or better)

**GEOL 5401. Fundamentals of Earth Science.**

Fundamentals of Earth Science (3-3) Overview of earth science principles and processes and their relationship to environmental issues. Topics will include fundamentals of physical geology and their applications to geo hazards, engineering geology, surface and ground water, erosion, and environmental geochemistry. Atmospheric and climate topics will include global change issues. Labs will feature hands-on experience with earth materials, maps, analytical techniques, and environmental problem solving. Prerequisite: Department approval.

**Department:** Geology

**4 Credit Hours**

**6 Total Contact Hours**

3 Lab Hours

3 Lecture Hours

0 Other Hours

**GEOL 5402. Fundmtls/Fld Meth in Earth Sci.**

Fundamentals of Field Methods in Earth Science (3-3) Field-oriented, problem-solving studies emphasizing field identification of rocks; study of landforms and processes that create them and the use of maps, aerial photographs, and satellite imagery. Emphasis on developing observational and analytical skills and the use of multiple working hypotheses. Prerequisites: GEOL 5401 with a grade of "C" or better and department approval.

**Department:** Geology

**4 Credit Hours**

**6 Total Contact Hours**

3 Lab Hours

3 Lecture Hours

0 Other Hours

**Prerequisite(s):** (GEOL 5401 w/C or better)

**GEOL 6105. Directed Study in Geology.**

Directed Study in Geology (0-0-1) Restricted to major: GEOL. Prerequisites: Doctoral graduate standing and department approval.

**Department:** Geology

**1 Credit Hour**

**1 Total Contact Hour**

0 Lab Hour

0 Lecture Hour

1 Other Hour

**GEOL 6115. Adv Topics in Geological Scien.**

Advanced Topics in the Geological Sciences (1-0) Advanced topics in paleontology and stratigraphy, mineralogy, petrology, geochemistry, structural geology and geomorphology, economic geology, and subsurface correlation. May be repeated when the topic varies. Prerequisites: Doctoral graduate standing and department approval.

**Department:** Geology

**1 Credit Hour**

**1 Total Contact Hour**

0 Lab Hour

1 Lecture Hour

0 Other Hour

**GEOL 6205. Directed Study in Geology.**

Directed Study in Geology (0-0-2) Restricted to major: GEOL. Prerequisites: Doctoral graduate standing and department approval.

**Department:** Geology

**2 Credit Hours**

**2 Total Contact Hours**

0 Lab Hours

0 Lecture Hours

2 Other Hours

**GEOL 6296. Doctoral Research in Geol Sci.**

Doctoral Research in Geological Sciences (0-0-2) Prerequisite: Doctoral standing or department approval.

**Department:** Geology

**2 Credit Hours**

**2 Total Contact Hours**

0 Lab Hours

0 Lecture Hours

2 Other Hours

**GEOL 6305. Directed Study in Geology.**

Directed Study in Geology (0-0-3) Prerequisites: Doctoral standing and department approval.

**Department:** Geology

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

0 Lecture Hours

3 Other Hours

**GEOL 6315. Adv Topics in Geological Scien.**

Advanced Topics in the Geological Sciences (3-0) Advanced topics in paleontology and stratigraphy, mineralogy, petrology, geochemistry, structural geology and geomorphology, economic geology, and subsurface correlation. May be repeated when the topic varies. Prerequisites: Doctoral standing and department approval.

**Department:** Geology

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**GEOL 6320. Dissertation.**

Dissertation (0-0-3)

**Department:** Geology

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

0 Lecture Hours

3 Other Hours

**GEOL 6321. Dissertation.**

Dissertation (0-0-3) Prerequisite: GEOL 6320.

**Department:** Geology

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

0 Lecture Hours

3 Other Hours

**Prerequisite(s):** (GEOL 6320 w/P or better)

**GEOL 6330. Sandstone Petrography.**

The interpretation of mineralogy, provenance, diagenesis and porosity of sandstones using petrographic microscopic techniques. Students will be expected to conduct independent research as an element of this course.

**Department:** Geology

**3 Credit Hours**

**4 Total Contact Hours**

2 Lab Hours

2 Lecture Hours

0 Other Hours

**GEOL 6332. Carbonate Petrogrph & Dep. Env.**

Petrographic techniques and recognition & depositional interpretation of components of carbonate rocks. Interpretation of carbonate depositional environments from the rock record. Field trips are included. The class will focus on analysis of field examples.

**Department:** Geology

**3 Credit Hours**

**5 Total Contact Hours**

3 Lab Hours

2 Lecture Hours

0 Other Hours



**GEOL 6334. Sedimentary Depositional Env.**

Reconstruction of ancient depositional environments in the surface and subsurface using facies analysis. Field trips are included. The class will focus on analysis of field examples.

**Department:** Geology

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**GEOL 6336. Sequence Stratigraphy.**

Learning the supporting concepts of the sequence stratigraphic approach and utilizing practical example exercises in lab to support the understanding of these still evolving concepts. Field trips are included. The class will focus on analysis of field examples.

**Department:** Geology

**3 Credit Hours**

**4 Total Contact Hours**

2 Lab Hours

2 Lecture Hours

0 Other Hours

**GEOL 6340. Hydrogeology.**

Basic principles of hydrologic cycles and groundwater flow. Flow in confined and unconfined aquifers, pump test design and analysis, the transport of contaminants and the use of computer models to simulate saturated groundwater flow. Simple experiments will be performed to better understand the concepts of groundwater flows and pump tests. Case studies for groundwater contamination and remediation will be also discussed.

**Department:** Geology

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**GEOL 6342. Environmental Tracers in Water.**

This course discusses the principles of stable, radiogenic, and radioactive isotope chemistry of natural waters, as well as the geochemical processes affecting isotopic compositions of surface waters, soil waters, and groundwater. The course will also discuss the applications of isotopic techniques in determining groundwater residence times, flow paths and recharge conditions.

**Department:** Geology

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

3 Lecture Hours

0 Other Hours

**GEOL 6396. Doctoral Research in Geol Sci.**

Doctoral Research in Geological Sciences (0-0-3) Prerequisite: Doctoral standing.

**Department:** Geology

**3 Credit Hours**

**3 Total Contact Hours**

0 Lab Hours

0 Lecture Hours

3 Other Hours