Geology Courses

Courses

GEOL 1101. Laboratory for Geology 1301.
Laboratory for Geology 1301 (0-2) (Common Course Number GEOL 1103) Concurrent enrollment in GEOL 1301 suggested. Laboratory fee required.
Department: Geology
1 Credit Hour
2 Total Contact Hours
2 Lab Hours
0 Lecture Hours
0 Other Hours

GEOL 1102. Laboratory for Geology 1302.
Laboratory for Geology 1302 (0-3) (Common Course Number GEOL 1103) Concurrent enrollment in GEOL 1302 suggested. Prerequisite: GEOL 1101.
Laboratory fee required.
Department: Geology
1 Credit Hour
2 Total Contact Hours
2 Lab Hours
0 Lecture Hours
0 Other Hours

GEOL 1103. Lab for GEOL 1313.
Laboratory for Geology 1313: [TCCN GEOL1103] Concurrent enrollment in GEOL 1313 suggested. Course fee required.
Department: Geology
1 Credit Hour
2 Total Contact Hours
2 Lab Hours
0 Lecture Hours
0 Other Hours

GEOL 1104. Lab for GEOL 1314.
Laboratory for Geology 1314: [TCCN GEOL1104] Concurrent enrollment in GEOL 1314 Course fee required.
Department: Geology
1 Credit Hour
2 Total Contact Hours
2 Lab Hours
0 Lecture Hours
0 Other Hours

Laboratory for Geology 1211. [TCCN GEOL 1101] Course fee required.
Department: Geology
1 Credit Hour
2 Total Contact Hours
2 Lab Hours
0 Lecture Hours
0 Other Hours

Corequisite(s): GEOL 1211

GEOL 1112. Laboratory for Geology 1212.
Laboratory for Geology 1212. [TCCN GEOL 1102] Course fee required.
Department: Geology
1 Credit Hour
2 Total Contact Hours
2 Lab Hours
0 Lecture Hours
0 Other Hours
Prerequisite(s): (GEOL 1211 w/C or better)
Corequisite(s): GEOL 1212
This course serves as an introduction to the topics of earth materials, plate tectonics, earthquakes, volcanoes, earth's atmosphere and climate.
Corequisite: GEOL 1111.
Department: Geology
2 Credit Hours
2 Total Contact Hours
0 Lab Hours
2 Lecture Hours
0 Other Hours
Corequisite(s): GEOL 1111

Study of the earth as a planet. A survey of earth history as interpreted from and exhibited by plants, animals, rocks, and minerals; a study of the earth in space; a survey of the physical processes operating in the hydrosphere. Includes an introduction to historical geology, astronomy, physiography, and oceanography. Prerequisite: GEOL 1211 with a grade of "C" or better, may be taken concurrently. Corequisite: GEOL 1112.
Department: Geology
2 Credit Hours
2 Total Contact Hours
0 Lab Hours
2 Lecture Hours
0 Other Hours
Prerequisite(s): (GEOL 1211 w/C or better)
Corequisite(s): GEOL 1112

GEOL 1230. The Blue Planet.
An introduction to the topics of earth system science, exploring interactions within solid earth, water, atmosphere, and life, as well as impact of Earth systems on human society and vice versa. May not be counted toward Geology or Environmental Science Major.
Department: Geology
2 Credit Hours
2 Total Contact Hours
0 Lab Hours
2 Lecture Hours
0 Other Hours

GEOL 1231. Natural Hazards.
Geologic events that affect everyday life, including global warming, earthquakes, volcanism, desertification, river and coastline flooding and erosion, groundwater, mineral resources, and plate tectonics. May not be counted toward a Geology or Environmental Science Major.
Department: Geology
2 Credit Hours
2 Total Contact Hours
0 Lab Hours
2 Lecture Hours
0 Other Hours

GEOL 1301. Intro to Physical Geology.
Introduction to Physical Geology (3-0) (Common Course Number GEOL 1303) An introductory study of the earth's composition, structure, and internal and external processes. Concurrent enrollment in laboratory (GEOL 1101) suggested but not required. A study may not receive credit for both GEOL 1301 and GEOL 1303.
Department: Geology
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours
GEOL 1302. Intro to Historical Geology.
Introduction to Historical Geology (3-0) (Common Course Number GEOL 1304) An integrated study of the geologic history of the earth with a consideration of the history of life as documented by the fossil record. Concurrent enrollment in laboratory (GEOL 1102) suggested but not required. A student may not receive credit for both GEOL 1302 and GEOL 1304. Prerequisite: GEOL 1301.

Department: Geology
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

GEOL 1303. Principles-Earth Sciences (C).
Principles of Earth Sciences (2-2) Study of the earth as a planet. A survey of the physical processes operating in the atmosphere, lithosphere, and biosphere. Includes an introduction to meteorology, physical geology, soils, and vegetation. Laboratory is required. A student may not receive credit for both GEOL 1303 and GEOL 1301. Laboratory fee is required.

Department: Geology
3 Credit Hours
4 Total Contact Hours
2 Lab Hours
2 Lecture Hours
0 Other Hours

GEOL 1304. Principles-Earth Science (C).
Principles of Earth Sciences (2-2) Study of the earth as a planet. A survey of earth history as interpreted from and exhibited by plants, animals, rocks and minerals; a study of the earth in space; a survey of the physical processes operating in the hydrosphere. Includes an introduction to historical geology, astronomy, physiography, and oceanography. Laboratory is required. A student may not receive credit for GEOL 1304 and GEOL 1302. Prerequisite: GEOL 1303. Laboratory fee required.

Department: Geology
3 Credit Hours
4 Total Contact Hours
2 Lab Hours
2 Lecture Hours
0 Other Hours

Principles of Earth Sciences (2-2) (C) Study of the earth as a planet. A survey of the physical processes operating in the atmosphere, lithosphere, and biosphere. Includes an introduction to meteorology, physical geology, soils, and vegetation. Concurrent laboratory enrollment is required. A student may not receive credit for both GEOL 1311 and GEOL 1313. Laboratory fee required.

Department: Geology
3 Credit Hours
4 Total Contact Hours
2 Lab Hours
2 Lecture Hours
0 Other Hours

GEOL 1312. Prin. of Earth Sciences (C).
Principles of Earth Sciences (2-2) (C) Study of the earth as a planet. A survey of earth history as interpreted from and exhibited by plants, animals, rocks, and minerals; a study of the earth in space; a survey of the physical processes operating in the hydrosphere. Includes an introduction to historical geology, astronomy, physiography, and oceanography. Concurrent laboratory enrollment is required. A student may not receive credit for both GEOL 1311 and GEOL 1314. Prerequisite: GEOL 1303 with a grade of "C" or better or GEOL 1311 with a grade of "C" or better. Laboratory fee required.

Department: Geology
3 Credit Hours
4 Total Contact Hours
2 Lab Hours
2 Lecture Hours
0 Other Hours
**GEOL 1313. Intro to Physical Geology.**
Introduction to Physical Geology (3-0) (C) An introductory study of the earth’s composition, structure, and internal and external processes. Concurrent enrollment in laboratory (GEOL 1103) suggested but not required. A student may not receive credit for both GEOL 1313 and GEOL 1311 or GEOL 1211.

**Department:** Geology

**3 Credit Hours**
**3 Total Contact Hours**
- 0 Lab Hours
- 3 Lecture Hours
- 0 Other Hours

**GEOL 1314. Intro to Historical Geol.**
Introduction to Historical Geology: [TCCN GEOL 1304] An integrated study of the geologic history of the earth with a consideration of the history of life as documented by the fossil record. Concurrent enrollment in laboratory (GEOL 1104) suggested but not required. A student may not receive credit for both GEOL 1312 and GEOL 1314.

**Department:** Geology

**3 Credit Hours**
**3 Total Contact Hours**
- 0 Lab Hours
- 3 Lecture Hours
- 0 Other Hours

**Prerequisite(s):** (GEOL 1313 w/C or better)

**GEOL 2109. Mineralogy & Petrology Lab.**
Principles of crystal chemistry, phase equilibrium, and crystallography of common rock-forming minerals. Mineral and rock examination in hand samples and field trips, and problem solving. Prerequisite: CHEM 1305 with a grade of "C" or better. Corequisite: GEOL 2309. Course fee required.

**Department:** Geology

**1 Credit Hour**
**3 Total Contact Hours**
- 3 Lab Hours
- 0 Lecture Hours
- 0 Other Hours

**Prerequisite(s):** (CHEM 1305 w/C or better)

**Corequisite(s):** GEOL 2309

**GEOL 2309. Mineralogy & Petrology.**
Principles of crystal chemistry, phase equilibrium, and crystallography of common rock-forming minerals. Mineral and rock examination in hand samples and field trips, and problem solving. Prerequisite: CHEM 1305 with a grade of "C" or better. Corequisite: GEOL 2109.

**Department:** Geology

**3 Credit Hours**
**3 Total Contact Hours**
- 0 Lab Hours
- 3 Lecture Hours
- 0 Other Hours

**Prerequisite(s):** (CHEM 1305 w/C or better)

**Corequisite(s):** GEOL 2109

**GEOL 2314. Geological Microscopy.**
Geological Microscopy (2-3) Study of the rock-forming minerals and crystals with the petrographic microscope. Prerequisite: GEOL 2411. Laboratory fee required.

**Department:** Geology

**3 Credit Hours**
**5 Total Contact Hours**
- 3 Lab Hours
- 2 Lecture Hours
- 0 Other Hours
GEOL 2411. Mineralogy and Petrology.
Mineralogy and Petrology (3-3) (Common Course Number GEOL 2409) Principles of crystal chemistry, phase equilibrium, and crystallography of common rock forming minerals. Hand sample and thin section investigation. Field trips. Prerequisite: CHEM 1305 with a grade of "C" or better. Laboratory fee required.
Department: Geology
4 Credit Hours
6 Total Contact Hours
3 Lab Hours
3 Lecture Hours
0 Other Hours

GEOL 2412. Geoscience Processes.
Geoscience Processes (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 observation and analytical skills and the use of multiple working hypotheses. Prerequisites: GEOL 1301 and GEOL 1101; and GEOL 1302 and GEOL 1102; or GEOL 1303 and GEOL 1304.
Department: Geology
4 Credit Hours
6 Total Contact Hours
3 Lab Hours
3 Lecture Hours
0 Other Hours

GEOL 3112. Geoscience Processes Lab.
Survey and synthesis of principals of physical and historical geology, including tectonic, geophysical, structural, stratigraphic, and petrologic concepts and processes. Emphasis on field-oriented, problem-solving studies, including: analysis of outcrops and the development of multiple working hypotheses; construction of geologic maps and other skills used in geologic field work; study of landforms and the processes that create them. Prerequisites: GEOL 1313/1103 or GEOL 1311 or GEOL 1211/1111 GEOL 1314/1104 or GEOL 1312 or GEOL 1212/1112; Concurrent enrollment in GEOL 2309/2109 is recommended. Corequisite: GEOL 3312.
Department: Geology
1 Credit Hour
1 Total Contact Hour
1 Lab Hour
0 Lecture Hours
0 Other Hours
Prerequisite(s): (GEOL 1103 w/C or better AND GEOL 1313 w/C or better ) OR (GEOL 1111 w/C or better AND GEOL 1211 w/C or better ) AND (GEOL 1104 w/C or better AND GEOL 1314 w/C or better ) OR (GEOL 1112 w/C or better AND GEOL 1212 w/C or better)

Corequisite(s): GEOL 3312

GEOL 3115. Igneous/Metamorphic Petr. Lab.
Petrogenesis of Igneous and metamorphic rocks as studies by the petrology of samples in thin sections, by field work, and by computer-based exercises. Prerequisites: GEOL 2309/2109 or GEOL 2411; and CHEM 1305. Corequisite: GEOL 3215. Course fee required.
Department: Geology
1 Credit Hour
3 Total Contact Hours
3 Lab Hours
0 Lecture Hours
0 Other Hours
Prerequisite(s): (GEOL 2309 w/D or better ) OR (GEOL 2109 w/D or better ) OR (CHEM 1305 w/D or better)

Corequisite(s): GEOL 3215
GEOL 3123. Structural Geology Lab.
A field and laboratory class applying principals learned in GEOL 3323, Structural Geology, to real world problems. Introduction to recognition of geologic structure on geologic maps, geologic mapping, and cross-section construction; use of stereographic projection for solving geometric problems; introduction to GIS for geologic mapping and techniques for 3D structural analysis. Course fee req. Prerequisites: GEOL 3312 or GEOL 3412; GEOL 1313 or 1311 or GEOL 1211/1111; and GEOL 1314 or 1312 or GEOL 1212/1112. Corequisite: GEOL 3323.

Department: Geology
1 Credit Hour
1 Total Contact Hour
1 Lab Hour
0 Lecture Hours
0 Other Hours
Prerequisite(s): (GEOL 2309 w/D or better ) OR (GEOL 2109 w/D or better ) OR (GEOL 3312 w/C or better ) OR (GEOL 3112 w/C or better)

Corequisite(s): GEOL 3323

GEOL 3126. Lab for Sedim & Stratigraphy.
Study of sedimentary processes, environments, and deposits, including fundamental concepts of stratigraphy and sequence stratigraphy. Ancient deposits and modern analogs are examined in the field. Laboratory will be divided between field trips and in-lab activity to introduce techniques for the study of sediments and sedimentary rock sequences. Transportation fee required. Prerequisites: GEOL 2411 or GEOL 2309/2109; and and GEOL 3412 or GEOL 3312/3112. Corequisite: GEOL 3326.

Department: Geology
1 Credit Hour
3 Total Contact Hours
3 Lab Hours
0 Lecture Hours
0 Other Hours
Prerequisite(s): (GEOL 2109 w/C or better AND GEOL 2309 w/C or better ) AND (GEOL 3112 w/C or better AND GEOL 3312 w/C or better ) OR (GEOL 3412 w/C or better)

Corequisite(s): GEOL 3326

GEOL 3215. Igneous/Metamorphic Petrology.
Petrogenesis of Igneous and metamorphic rocks, including the thermodynamics and physical properties of minerals and melts. Prerequisites: GEOL 2309/2109 or GEOL 2411; and CHEM 1305. Corequisite: GEOL 3115.

Department: Geology
2 Credit Hours
2 Total Contact Hours
0 Lab Hours
2 Lecture Hours
0 Other Hours
Prerequisite(s): (GEOL 2109 w/C or better AND GEOL 2309 w/C or better ) AND (GEOL 3112 w/C or better AND GEOL 3312 w/C or better)

Corequisite(s): GEOL 3115

GEOL 3305. Rocks & Minerals.
Rocks and Minerals (2-3) Hand specimen study of the common rock-forming minerals, gem and ore minerals, and of igneous, metamorphic, and sedimentary rocks. Prerequisite: GEOL 1301 and GEOL 1101, or GEOL 1303, or department approval.

Department: Geology
3 Credit Hours
5 Total Contact Hours
3 Lab Hours
2 Lecture Hours
0 Other Hours
Geology of El Paso (2-3) An introduction to the stratigraphy, tectonic history, paleontology, and geomorphology of the El Paso area. Lectures will stress use of basic geologic principles to develop understanding of the geologic processes which have shaped the area. Lab will consist of a series of field trips during the semester. Students whose degree plans required GEOL 4665 may use this course for elective credit only. Prerequisites: (1) GEOL 1311 and 1312; or (2) GEOL 1313 and GEOL 1314. Laboratory fee required.

Department: Geology
3 Credit Hours
5 Total Contact Hours
3 Lab Hours
2 Lecture Hours
0 Other Hours

GEOL 3312. Geoscience Processes.
Survey and synthesis of principals of physical and historical geology, including tectonic, geophysical, structural, stratigraphic, and petrologic concepts and processes. Emphasis on field-oriented, problem-solving studies, including: analysis of outcrops and the development of multiple working hypotheses; construction of geologic maps and other skills used in geologic field work; study of landforms and the processes that create them. Prerequisite: GEOL 1313/1103 or GEOL 1311 or GEOL 1211/1111; GEOL 1314/1104 or GEOL 1312 or GEOL 1212/1112. Concurrent enrollment in GEOL 2309/2109 recommended. Corequisite: GEOL 3112.

Department: Geology
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

Prerequisite(s): (GEOL 1313 w/C or better ) OR (GEOL 1211 w/C or better ) AND (GEOL 1314 w/C or better ) OR (GEOL 1212 w/C or better)

Corequisite(s): GEOL 3112

GEOL 3315. Igneous/Metamorphic Petrology.
Igneous and Metamorphic Petrology (2-3) Petrogenesis of igneous and metamorphic rocks, including the thermodynamics and physical properties of minerals and melts and the petrography of samples in thin-section. Prerequisites: Junior standing, GEOL 2411, and CHEM 1305. MATH 1411 is recommended. Laboratory fee required.

Department: Geology
3 Credit Hours
5 Total Contact Hours
3 Lab Hours
2 Lecture Hours
0 Other Hours

GEOL 3321. Geology for Engineers.
Geology for Engineers (2-3) The principles of physical geology and their practical applications to civil engineering. This course may not count toward a major or minor in geology. Prerequisite: Junior standing in engineering or department approval.

Department: Geology
3 Credit Hours
5 Total Contact Hours
3 Lab Hours
2 Lecture Hours
0 Other Hours

GEOL 3323. Structural Geology.
An introduction to the recognition, description and analysis of deformed rocks, spanning the spectrum from microscopic structures to mountain belts and plate tectonics. Geometric and stereographic analysis of map-scale structures. Introduction to stress, strain and constitutive laws for rocks. Processes of rock deformation including folding, fracturing and grain-scale processes. Correlation of structural styles with tectonic environments. Prerequisites: GEOL 3312/3112 or GEOL 3412; GEOL 1311 or 1313 or 1211/1111; and GEOL 1312 or 1212/1112 or 1314. Corequisite: GEOL 3123.

Department: Geology
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

Prerequisite(s): (GEOL 2109 w/C or better AND GEOL 2309 w/C or better ) AND (GEOL 3112 w/C or better AND GEOL 3312 w/C or better)

Corequisite(s): GEOL 3123
GEOL 3325. Sedimentology.
Sedimentology (2-3) An introduction to sedimentary processes, environments, and deposits. Ancient deposits and modern analogs are examined in the field. Laboratory work will introduce techniques of hand-specimen study and classification of sediments and sedimentary rocks. Prerequisites: Junior standing and GEOL 2411 or department approval. Laboratory fee required.

Department: Geology
3 Credit Hours
5 Total Contact Hours
3 Lab Hours
2 Lecture Hours
0 Other Hours

GEOL 3326. Sedimentology & Stratigraphy.
Study of sedimentary processes, environments, and deposits, including fundamental concepts of stratigraphy and sequence stratigraphy. Ancient deposits and modern analogs are examined in the field. Prerequisites: GEOL 2411 or GEOL 2309/2109; and GEOL 3412 or GEOL 3312/3112; or instructor approval. Corequisite: GEOL 3126.

Department: Geology
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours
Prerequisite(s): (GEOL 2109 w/C or better AND GEOL 2309 w/C or better) AND (GEOL 3112 w/C or better AND GEOL 3312 w/C or better)
Corequisite(s): GEOL 3126

GEOL 3330. Applied Geomorphology.
Applied Geomorphology (2-3) An introduction to the genesis of landforms and the processes that shape the earth's surface. Geomorphic data are applied to solving environmental problems. Topics include earth surface processes, internal forces, climate and climate change, weathering, mass movement and erosion, channels and stream channel evolution, drainage basins, fluvial landforms, coastal landforms, arid landforms, and glacial landforms. Prerequisite: Junior standing and GEOL 2314, with a grade of "C" or better.

Department: Geology
3 Credit Hours
5 Total Contact Hours
3 Lab Hours
2 Lecture Hours
0 Other Hours

GEOL 3340. Vulcanology.
Vulcanology (3-0) A study of the origin, eruption patterns and products of volcanoes. Discussion of thermal energy resources. Students whose degree plans require GEOL 4665 may use this course for elective credit only. Prerequisite: Junior standing and either GEOL 1301, GEOL 1303, or GEOL 3321.

Department: Geology
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

GEOL 3345. Planetary Geology.
Planetary Geology (3-0) A survey of the composition, evolution, and geologic features of planetary bodies in the solar system. Heavy use is made of resources on the internet. Prerequisites: Junior standing and either (GEOL 1301 and GEOL 1101) or (GEOL 1303 or GEOL 3405).

Department: Geology
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours
GEOL 3350. Oceanography.
Oceanography (3-0) Introduction to submarine geology, physical and chemical oceanography, marine organisms. Marine resources, shore processes, and methods of marine technology. Students whose degree plans require GEOL 4665 may use this course for elective credit only. Prerequisite: Junior standing and either GEOL 1304 or GEOL 1312 or GEOL 1303 or GEOL 1313, or GEOL 3321.
Department: Geology
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

GEOL 3355. Structure of the Earth.
Structure of the Earth (2-3) An introduction to geological and geophysical methods employed to study the structure of the earth. Structures at all scales will be studied. Emphasis will be on how plate tectonics operates to form surface and deep structures. Students whose degree plan requires GEOL 4665 may use this course for elective credit only. Prerequisites: Junior standing and either GEOL 1301, or GEOL 1303, or GEOL 3321. Laboratory fee required.
Department: Geology
3 Credit Hours
5 Total Contact Hours
3 Lab Hours
2 Lecture Hours
0 Other Hours

GEOL 3359. Minerals, Econ - Environments.
Minerals, Economics and the Environment (3-0) Geological characteristics and classification of metallic, non-metallic and fuel resources. Economic factors and problems related to development. Students whose degree plans require GEOL 4665 may use this course for elective credit only. Prerequisites: Junior standing and either GEOL 1301, or GEOL 1303, GEOL 3405, or GEOL 3321.
Department: Geology
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

GEOL 3360. Geology and the Environment.
Geology and the Environment (3-0) A study of the application of the science of geology to the problems of urban development and environmental control. Prerequisites: Junior standing and GEOL 1301 or GEOL 1303 or GEOL 3321 or department approval. For non-majors.
Department: Geology
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

GEOL 3405. Rocks & Minerals.
Rocks and Minerals (2-6) Hand specimen, microscopic, and field study of the common rock-forming minerals and of igneous, metamorphic, and sedimentary rocks. Prerequisite: GEOL 1301 and GEOL 1101, or GEOL 1303, or department approval and junior standing.
Department: Geology
4 Credit Hours
8 Total Contact Hours
6 Lab Hours
2 Lecture Hours
0 Other Hours

GEOL 3412. Geoscience Processes.
Geoscience Processes (3-3) Field-oriented, problem-solving studies emphasizing field identification of rocks; study of landforms and processes that create them; use of maps, aerial photographs, and satellite imagery. Emphasis on developing observational and analytical skills and use of multiple working hypotheses. Prerequisites: Junior standing in Geology or permission of instructor. Lab fee required.
Department: Geology
4 Credit Hours
6 Total Contact Hours
3 Lab Hours
3 Lecture Hours
0 Other Hours
GEOL 3420. Invertebrate Paleontology.
Invertebrate Paleontology (3-3) A survey of the classification, paleoecology, and stratigraphic distribution of fossil invertebrates. Prerequisite: (1) GEOL 1314 and GEOL 1104, or (2) GEOL 1312 or (3) instructor approval. Course fee required.
Department: Geology
4 Credit Hours
6 Total Contact Hours
3 Lab Hours
3 Lecture Hours
0 Other Hours

GEOL 3423. Structural Geology.
Structural Geology (3-6) An introduction to the recognition, description and analysis of deformed rocks, spanning the spectrum from microscopic structures to mountain belts and plate tectonics. Geometric and stereographic analysis of map-scale structures. Introduction to stress, strain and constitutive laws for rocks. Processes of rock deformation including folding, fracturing and grain-scale processes. Correlation of structural styles with tectonic environments. Prerequisites: GEOL 1313-1103; and GEOL 1314-1104; and GEOL 3412 or (2) GEOL 1311 and GEOL 1312, and GEOL 3412, or (3) instructor approval. PHYS 2420 is recommended. Fees required.
Department: Geology
4 Credit Hours
9 Total Contact Hours
6 Lab Hours
3 Lecture Hours
0 Other Hours

GEOL 3425. Sedimentology and Stratigraphy.
Sedimentology and Stratigraphy (3-3) Study of sedimentary processes, environments, and deposits, including fundamental concepts of stratigraphy and sequence stratigraphy. Ancient deposits and modern analogs are examined in the field. Laboratory will be divided between field trips and in-lab activity to introduce techniques for the study of sediments and sedimentary rock sequences. Prerequisites: GEOL 2411 and 3412, or instructor approval. Transportation fee required.
Department: Geology
4 Credit Hours
6 Total Contact Hours
3 Lab Hours
3 Lecture Hours
0 Other Hours

GEOL 4125. Sedimentary Petrography.
Sedimentary Petrography (1-2) Introduction to the petrographic study of siliciclastic, carbonate and volcanioclastic sediments and sedimentary rocks. Prerequisite: GEOL 2314 and junior standing.
Department: Geology
1 Credit Hour
3 Total Contact Hours
2 Lab Hours
1 Lecture Hour
0 Other Hours

Classification Restrictions:
Restricted to class of JR,SR

GEOL 4155. Vertebrate Paleontology Techs.
Vertebrate Paleontology Techniques (0-3) Collection, preservation, identification, and curation of vertebrate fossils. Co-requisite: GEOL 4354. Prerequisite: Junior standing. Laboratory fee required.
Department: Geology
1 Credit Hour
3 Total Contact Hours
3 Lab Hours
0 Lecture Hours
0 Other Hours
Corequisite(s): GEOL 4354
### GEOL 4157. Adv Vertebrate Paleontol Tech.
Advanced Vertebrate Paleontology Techniques (0-3) Collection, preservation, identification and curation of vertebrate fossils. Co-requisite: GEOL 4356. Prerequisite: Junior standing. Laboratory fee required.

**Department:** Geology
**1 Credit Hour**
**3 Total Contact Hours**
- 3 Lab Hours
- 0 Lecture Hours
- 0 Other Hours
**Corequisite(s):** GEOL 4356

### GEOL 4166. Directed Study, Geology.
Directed Study, Geology (0-0-1) Directed study problems in geology; hours and subjects to be arranged with each student; for undergraduate students who wish to do work on a special problem. No student may receive credit for more than six hours of directed study work. Application of a directed study towards required upper-division elective hours in the major is subject to prior approval by the departmental undergraduate studies committee. Prerequisites: Junior standing and department approval.

**Department:** Geology
**1 Credit Hour**
**1 Total Contact Hour**
- 0 Lab Hours
- 0 Lecture Hours
- 1 Other Hour

### GEOL 4189. Research in Geological Science.
Research in Geological Sciences (0-0-1) This course provides undergraduates with a research experience working with a faculty mentor. It cannot be used to satisfy minimum degree requirements. Grade of Pass/Fail. Prerequisite: Juniors standing.

**Department:** Geology
**1 Credit Hour**
**1 Total Contact Hour**
- 0 Lab Hours
- 0 Lecture Hours
- 1 Other Hour

### GEOL 4266. Directed Study, Geology.
Directed Study, Geology (0-0-2) Directed study problems in geology; hours and subjects to be arranged with each student; for undergraduate students who wish to do work on a special problem. No student may receive credit for more than six hours of directed study work. Application of a directed study towards required upper-division elective hours in the major is subject to prior approval by the departmental undergraduate studies committee. Prerequisite: Department approval and junior standing.

**Department:** Geology
**2 Credit Hours**
**2 Total Contact Hours**
- 0 Lab Hours
- 0 Lecture Hours
- 2 Other Hours

### GEOL 4289. Research in Geological Science.
Research in Geological Sciences (0-0-2) This course provides undergraduates with a research experience working with a faculty member. It cannot be used to satisfy minimum degree requirements. Grade of Pass/Fail.

**Department:** Geology
**2 Credit Hours**
**2 Total Contact Hours**
- 0 Lab Hours
- 0 Lecture Hours
- 2 Other Hours
GEOL 4308. Paleoclimatology.
Investigation of methods and data sources used to reconstruct Earth's climate history 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
Prerequisite(s): (GEOL 3326 w/C or better ) OR (GEOL 3308 w/C or better)

GEOL 4315. Topics in Geological Sciences.
Topics in Geological Sciences (3-0) Study of topics in fields such as structural geology, environmental geosciences, economic geology, paleontology, petrology, and geochemistry. May be repeated when topics vary. Prerequisites: Junior standing.
Department: Geology
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

GEOL 4316. Geochemistry.
Geochemistry (3-0) Low-temperature aqueous geochemistry emphasizing the chemistry and chemical processes in ground and surface water and in aqueous solutions. Emphasis on surface and ground water important as water supplies or supporting important ecosystems, rock- and soil-fluid interactions important in determining water chemistry, and waste-rock-fluid system chemistry and processes. Prerequisites: CHEM 1305, CHEM 1306 and junior standing.
Department: Geology
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours
Prerequisite(s): (CHEM 1305 w/C or better ) AND (CHEM 1306 w/C or better)

GEOL 4335. Soil Properties & Genesis.
This course centers on the overlap of soil science and geology. Our goal is to explain the fundamental principles in soil sciences, introduce the concept of critical zone, where water, rock, biology, and atmosphere interact as a system, understand: (1) how the interactions of landform, topography, climate, and biota result in patterns of soil development and the distribution of soils that we observe within the landscape; (2) how physical, chemical and biological properties of soils affect water and nutrient availability to plants.
Department: Geology
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours
Prerequisite(s): (CHEM 1305 w/C or better ) AND (GEOL 1313 w/C or better ) OR (GEOL 1212 w/C or better)

GEOL 4354. Paleozoic Mesozoic Vert Paleont.
Paleozoic and Mesozoic Vertebrate Paleontology (3-0) Study of evolution, biologic history, biostratigraphy, and classification of Paleozoic and Mesozoic vertebrates with emphasis on the lower vertebrates with an introduction to early Mammalian development. Prerequisites: (1) GEOL 1314 and GEOL 1104 or GEOL 1312; or (2) ZOOL 2406, or BIOL 1306 and BIOL 1108, or (3) department approval; GEOL 4155. GEOL 4155 may be taken concurrently with GEOL 4354.
Department: Geology
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours
GEOL 4356. Cenozoic Vert Paleontology.
Cenozoic Vertebrate Paleontology (3-0) Study of the evolution, biologic history, biostratigraphy and classification of the Cenozoic vertebrates with major emphasis on the mammals. Co-requisite: GEOL 4157. Prerequisites: BIOL 1305, BIOL 1107 and ZOOL 2406, or GEOL 1302, GEOL 1102 or GEOL 1304, or department approval and junior standing.
Department: Geology
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours
Corequisite(s): GEOL 4157

GEOL 4362. Stratigraphy.
Stratigraphy (2-3) A study of the fundamental principles of stratigraphy with special emphasis on the stratigraphy of the Southwestern United States and Northern Mexico. Prerequisites: GEOL 3425 and GEOL 3420 or instructor approval and junior standing. Laboratory fee required.
Department: Geology
3 Credit Hours
5 Total Contact Hours
3 Lab Hours
2 Lecture Hours
0 Other Hours

GEOL 4366. Directed Study, Geology.
Directed Study, Geology (0-0-3) Directed study problems in geology; hours and subjects to be arranged with each student; for undergraduate students who wish to do work on a special problem. No student may receive credit for more than six hours of directed study work. Application of a directed study towards required upper-division elective hours in the major is subject to prior approval by the departmental undergraduate studies committee. Prerequisites: Department approval and junior standing.
Department: Geology
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
0 Lecture Hours
3 Other Hours

GEOL 4373. Groundwater Contamination and Reclamation.
Groundwater Contamination and Reclamation (3-0) Contamination fate and transport in the groundwater. Includes the application of remediation methods for various types of contaminants and the discussion of reclamation methods.
Department: Geology
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

GEOL 4375. Field Geology I.
Field Geology I (0-0-16) A three-week course in Field Geology, emphasizing geologic mapping methods and techniques; preparation of stratigraphic sections, geologic maps, and geologic cross-sections. Weekly written reports, in professional style, will be required. Restricted to majors: GEOL or GEOP. Prerequisites: GEOL 3315, GEOL 3423 and GEOL 3425. Transportation fee required.
Department: Geology
3 Credit Hours
16 Total Contact Hours
0 Lab Hours
0 Lecture Hours
16 Other Hours
Prerequisite(s): (GEOL 3125 w/C or better AND GEOL 3325 w/C or better ) OR (GEOL 3425 w/C or better ) AND (GEOL 3123 w/C or better AND GEOL 3323 w/C or better ) OR (GEOL 3423 w/C or better)
GEOL 4376. Field Geology II.
Field Geology II (0-0-16) A three-week course in advanced Field Geology utilizing GIS tools, computer-aided mapping, and use of air photos in geologically complex projects. Weekly written reports, in professional style, will be required of all students. Restricted to majors: Geology or Geophysics. Prerequisite: GEOL 4375 with a grade of "C" or better. Transportation fee required.
Department: Geology
3 Credit Hours
16 Total Contact Hours
0 Lab Hours
0 Lecture Hours
16 Other Hours
Prerequisite(s): (GEOL 4375 w/C or better)

GEOL 4380. Environmental Geol & Geophys.
Environmental Geology and Geophysics (2-4) Geology and geophysics applied to environmental studies with emphasis on site characterization. Subjects include surficial processes, tectonic processes, general hydrology, and soils data collection and analysis. Prerequisites: GEOL 3423 or GEOL 3321 or department approval and junior standing. Course fee required.
Department: Geology
3 Credit Hours
6 Total Contact Hours
4 Lab Hours
2 Lecture Hours
0 Other Hours

GEOL 4383. General Hydrogeology.
The overall objective of this course is to provide an introduction to the basic principles of hydrologic cycles and groundwater flow. The course will emphasize flow in confined and unconfined aquifer, pump test design and analysis, the transport of contaminants and the use of computer models to simulate saturated groundwater flow. We will also perform simple experiments 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
Prerequisite(s): (GEOL 3321 w/C or better ) OR (GEOL 2109 w/C or better ) AND (GEOL 2309 w/C or better ) OR (ESCI 3306 w/C or better ) AND (MATH 2326 w/C or better)

Nuclear Fuel Cycle (3-0) Examination of the problems involved in the control of nuclear waste. Characterization, treatment, shipping and permanent disposal of the nuclear waste will be discussed. The problems of decontamination, decommissioning, and site restoration, as well as quality assurance and control of nuclear waste, will be examined. Prerequisite: Upper-division standing in the College of Science or the College of Engineering, or department approval.
Department: Geology
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

GEOL 4385. Introduction to GIS.
Introduction to GIS (2-3) Introduction to the principals and applications of Geographic Information Systems (GIS). Topics include the importance of validated data bases, 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. Prerequisites: GEOL 1313-1103 or GEOL 1311 or GEOG 1306-1106.
Department: Geology
3 Credit Hours
5 Total Contact Hours
3 Lab Hours
2 Lecture Hours
0 Other Hours
Prerequisite(s): (GEOL 1103 w/C or better AND GEOL 1313 w/C or better ) OR (GEOG 1106 w/C or better AND GEOG 1306 w/C or better ) OR (GEOL 1111 w/C or better AND GEOL 1211 w/C or better)
Research in Geological Sciences (0-0-3) This course provides undergraduates with a research experience working with a faculty mentor. It cannot be used to satisfy minimum degree requirements. Grade of pass/fail. Prerequisite: Junior standing.
Department: Geology
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
0 Lecture Hours
3 Other Hours

GEOL 4390. Internship Geological Sciences.
Internship in Geological Science (0-0-3) Practical on-the-job experience in federal, state, city/county governmental and/or private agencies or industries. Restricted to majors: GEOL, GEOP. Prerequisites: GEOL 3412 with a grade of "C" or better and department approval.
Department: Geology
3 Credit Hours
6 Total Contact Hours
0 Lab Hours
0 Lecture Hours
6 Other Hours
Prerequisite(s): (GEOL 3112 w/C or better AND GEOL 3312 w/C or better)

GEOL 4399. Senior's Thesis.
Senior's Thesis (0-0-3) Guided program of research culminating in the writing of a senior thesis. Prerequisite: Junior standing.
Department: Geology
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
0 Lecture Hours
3 Other Hours

GEOL 4665. Field Geology (Summer Field).
Field Geology (Summer Field Course) (0-0-32) A six-week summer course in field geology. The work will include preparation of topographic and geologic maps, cross-sections, columnar sections, and detailed structural studies of areas embracing both sedimentary and igneous rocks; planetable and aerial photo mapping techniques will be used. A report will be required of each student. Five hours of lecture and thirty-two hours of field work per week. Prerequisites: GEOL 3315, and GEOL 3423. Transportation fee required.
Department: Geology
6 Credit Hours
32 Total Contact Hours
0 Lab Hours
0 Lecture Hours
32 Other Hours