GEOLOGICAL SCIENCES

Undergraduate Program Information

Students may follow one of three courses of study in geology. The first track is a BS in Geology with the option in Geological Sciences. This is a traditional geology curriculum, in which students take geology classes, augmented with calculus, physics, and chemistry. The second track is a BS in Geology with the option in Earth and Environmental Systems. Students take geology classes, augmented with a variety of environmental, economic, and political classes. The third track is a BS in Geology with the option in Earth Science Education. Students take geology and education classes, and are certified to teach science at New Mexico middle and high schools after completing the BS and one year of graduate work in the College of Education.

Students earning the BS in Geology, any option, may also earn the Undergraduate Research Certificate in the Department of Geological Sciences. Completion of the Undergraduate Research Certificate includes completion of an undergraduate research project, participation in the department’s undergraduate research meetings and one of the following:

1. a senior thesis;
2. a manuscript submitted for a publication; or
3. an oral or poster presentation at a national or regional meeting.

Undergraduate Research Certificates are presented at the department’s annual awards ceremony.

The Department of Geological Sciences also cooperates with the Department of Physics in offering a BS degree in physics with a concentration in geophysics. Requirements are listed in the Department of Physics (http://catalogs.nmsu.edu/nmsu/arts-sciences/physics) section of this catalog.

Graduate Program Information

The Department of Geological Sciences offers graduate study leading to the Master of Science degree in geology. Admission to the program is in accord with the general regulations of the Graduate School. The Graduate Record Examination (verbal, quantitative, and analytical writing only) is required.

Degrees for the Department

Geology - Bachelor of Science (http://catalogs.nmsu.edu/nmsu/arts-sciences/geological-sciences/geology-bachelor-science)

Geology - Master of Science (http://catalogs.nmsu.edu/nmsu/arts-sciences/geological-sciences/geology-master-science)

Minors for the Department

Geology - Undergraduate Minor (http://catalogs.nmsu.edu/nmsu/arts-sciences/geological-sciences/geology-undergraduate-minor)

Professor, Nancy J. McMillan, Department Head

Professors Amato, McMillan; Associate Professor Ramos; Assistant Professors Burgette, Hampton, Johnson; Adjunct Professors Davis, Witcher; Emeritus Faculty Giordano, Lawton, Mack


Geology

GEOI 111G. Introductory to Geology
4 Credits (3+3P)
Covers the fundamental principles of physical geology, including the origin of minerals and rocks, geologic time, rock deformation, and plate tectonics. May be repeated up to 4 credits.

GEOI 212G. The Dynamic Earth
4 Credits (3+3P)
Introduction to earth systems. Geology and the solid earth, geologic time and earth history, water and the world oceans, atmosphere and weather, the solar system. Community Colleges only.

GEOI 220. Special Topics
1-3 Credits
Specific subjects to be announced in the Schedule of Classes. Community Colleges only. May be repeated for a maximum of 12 credits. May be repeated up to 12 credits.

GEOI 295. Environmental Geology
3 Credits
Earth processes that affect humans and their works, properties of rocks and soils, use and application of environmental geologic data.

GEOI 305V. Fossils and the Evolution of Life
3 Credits
Examination of the fossil record within the context of geologic time. Special emphasis on critical evaluation of possible terrestrial and extra-terrestrial causes for the evolution of plants and animals and for periods of mass extinction.

GEOI 310. Mineralogy
3 Credits (2+3P)
Crystallography and the physical and chemical aspects of minerals. Prerequisite(s): GEOI 111G and CHEM 111G.

GEOI 312. Optical Mineralogy
3 Credits (2+3P)
Principles of optical mineralogy as applied to the identification and characterization of rock-forming minerals. Prerequisite or Corequisite: GEOI 310.

GEOI 320. Special Topics
1-3 Credits
Specific subjects to be announced in the Schedule of Classes. May be repeated for a maximum of 12 credits.

GEOI 335V. Earthquakes, Volcanoes, Hurricanes, and Floods: The Role of Natural Hazards in Civ Past and Present
3 Credits
This class will provide an introduction to geologic hazards and natural disasters, their effects on society and the attempts at preparation and mitigation for these events. Hazards to be covered include earthquakes, volcanic eruptions, floods, landslides, hurricanes, tsunamis and others.

GEOI 353. Geomorphology
3 Credits
Same as GEOG 353.
**GEOL 360. General Geochemistry**  
3 Credits  
The chemistry of the earth and its parts, with emphasis on geochemical systems and cycles, distribution of the elements, and mineral equilibria. Crosslisted with: CHEM 360  
**Prerequisite(s):** CHEM 111G or CHEM 110G.

**GEOL 399. Igneous and Metamorphic Petrology**  
3 Credits (2+3P)  
Mineralogical composition, classification, and genesis of igneous and metamorphic rocks.  
**Prerequisite(s):** GEOL 312 for geology majors, GEOL 310 for majors other than geology.

**GEOL 401. Geology Colloquium**  
1 Credit  
Presentations by visiting speakers and students. May be repeated up to 6 credits.

**GEOL 420. Stratigraphy and Sedimentology**  
3 Credits (2+3P)  
Identification and interpretation of sedimentary rocks with emphasis on classification, deposition, and stratigraphic sequence.  
**Prerequisite:** GEOL 310.

**GEOL 424. Soil Chemistry**  
3 Credits  
Same as SOIL 424, CHEM 424.

**GEOL 434. Tectonics of Sedimentary Basins**  
3 Credits  
Origin of sedimentary basins with emphasis on subsidence mechanisms, geometry of basin fill, depositional systems and tectonic setting. Course includes two off-campus field trips. Crosslisted with: GEOL 534.  
**Prerequisite(s):** GEOL 420.

**GEOL 441. Tutorial Geology**  
2 Credits (1+3P)  
Participation in teaching lower-division laboratories and conducting tutorial sessions. May be repeated for a total of 4 credits.  
**Prerequisite:** junior or above standing and nomination by faculty.

**GEOL 444. GIS for Geology**  
3 Credits  
**Prerequisite(s):** GEOL 470.

**GEOL 449. The Geological Profession**  
1 Credit  
Investigation of graduate school and employment opportunities, writing the resume, conduct of interviews, and ethics of the profession. Also includes assessment and exit exams. For graduating seniors only.

**GEOL 452. Geohydrology**  
4 Credits (3+2P)  
Origin, occurrence, and movement of fluids in porous media assessment of aquifer characteristics. Development and conservation of ground water resources, design of well fields. Crosslisted with: C E 452 and E S 452.  
**Prerequisite(s):** Junior or senior.

**GEOL 455. Undergraduate Research**  
1-3 Credits  
Geological research and field projects for the advanced student. May be repeated for a total of 6 credits. May be repeated up to 6 credits. Consent of instructor required.  
**Prerequisite(s):** Consent of instructor.

**GEOL 465. Isotope Geochemistry**  
3 Credits  
Geochemistry of stable and radiogenic isotopes and its application to a wide range of problems in the earth and planetary sciences.  
**Prerequisite(s):** CHEM 112G, GEOL 360, GEOL 399.

**GEOL 470. Structural Geology**  
3 Credits (2+3P)  
Deformation of rocks of the earth. Prerequisite: GEOL 310

**GEOL 471. Volcanology**  
3 Credits  
Identification and interpretation of volcanic deposits (including ash fall, ash flow tuffs, surges, lava flows), with focus on how the characteristics of these deposits can reveal eruption styles and eruption dynamics. Other topics covered include: magma migration and storage, volcanic hazards, volcano monitoring and volcanoes and climate. Crosslisted with: GEOL 571.  
**Prerequisite(s):** GEOL 399.

**GEOL 475. Geology of Mineral Resources**  
3 Credits (2+3P)  
Introduction to ore deposits and industrial rocks and minerals; genesis, mining methods, estimation of reserves, exploration, and economic aspects of selected commodities.  
**Prerequisite:** GEOL 399.

**GEOL 477. Special Problems**  
1-3 Credits  
Selected advanced topics of current interest or importance. May be repeated for a total of 6 credits.  
**Prerequisite:** consent of instructor.

**GEOL 478. Petroleum Systems and Stratigraphy**  
3 Credits (2+3P)  
Sedimentation, stratigraphy, depositional environments, and tectonics in relation to the occurrences and exploration of hydrocarbons. Course includes two off-campus field trips. May be repeated up to 3 credits.  
**Prerequisite(s):** GEOL 420.

**GEOL 479. Environmental Soil Chemistry**  
3 Credits  
Same as SOIL 479.

**GEOL 480. Seminar**  
1-3 Credits  
Supervised study of a subject not covered by regular courses. For organized group meetings treating selected advanced topics. May be repeated for a maximum of 6 credits.  
**Prerequisite:** consent of instructor.

**GEOL 482. Zuhl Collection Internship**  
1-3 Credits (1-3)  
Applied experience working with the Zuhl Collection of rocks, minerals, fossils, and petrified wood, supervised by the Director of the Zuhl Collection. Activities include tours, display development, research on aspects of the collection, and other work in the museum. May be repeated up to 6 credits. Consent of Instructor required. Restricted to: GEOL majors.
GEOL 490. Field Geology
3 Credits
Mapping, instrumentation, and interpretation of geology in the field.
Prerequisites: either GEOL 420 and GEOL 470.

GEOL 491. Tectonic Evolution of North America
3 Credits
Current ideas regarding the plate-tectonic evolution of North America from Archean through Holocene time, emphasizing the use of regional stratigraphy and structural geology to interpret mountain building, magmatism, and basin development.
Prerequisites: GEOL 111G, GEOL 399, GEOL 420 and GEOL 470.

GEOL 495. Geology Field Camp
4 Credits
Three week intensive summer course. Geologic mapping in a site-based setting, emphasizing spatial relations, cross-section construction, and preparation of geologic reports. Prerequisite: GEOL 490

GEOL 499. Senior Thesis
1-3 Credits
Writing a formal paper describing original geologic research conducted under supervision of a faculty advisor. Restricted to majors.
Prerequisite: consent of instructor.

GEOL 501. Geology Colloquium
1 Credit
Presentations by visiting speakers and graduate students.

GEOL 520. Selected Topics
1-3 Credits
Selected topics in geology. May be repeated for unlimited credit.
Prerequisites: graduate standing and consent of instructor.

GEOL 534. Tectonics of Sedimentary Basins
3 Credits
Origin of sedimentary basins with emphasis on subsidence mechanisms, geometry of basin fill, depositional systems and tectonic setting. Course includes two off-campus field trips. Restricted to: GEOL majors.
Prerequisites: GEOL 420 or equivalent or consent of instructor.

GEOL 544. GIS FOR GEOLOGY
3 Credits
Prerequisite(s): GEOL 470 or equivalent.

GEOL 553. Applied Geomorphology
3 Credits (2+3P)
Same as GEOG 553.

GEOL 562. Analytical Geochemistry
3 Credits
Techniques used to determine the major element, trace element and isotopic composition of rocks and minerals and the determination of mineral structure.

GEOL 565. Isotope Geochemistry
3 Credits
Trace element partitioning and isotope systematics applied to problems in petrology and ore genesis.

GEOL 567. Global Geochemical Systems
3 Credits
Generation of major element, trace element, and isotopic signatures of igneous rocks in different tectonic settings and propagation or destruction of those signatures by sedimentary and metamorphic processes.

GEOL 571. Volcanology
3 Credits
Identification and interpretation of volcanic deposits (including air fall, ash flow tuffs, surges, lava flows), with focus on how the characteristics of these deposits can reveal eruption styles and eruptions dynamics. Other topics covered include: magma migration and storage, volcanic hazards, volcano monitoring and volcanoes and climate. Crosslisted with: GEOL 471.
Prerequisite(s): GEOL 399 or equivalent.

GEOL 578. Petroleum Systems and Stratigraphy
3 Credits (2+3P)
Sedimentation, stratigraphy, depositional environments and tectonics in relation to the occurrences and exploration of hydrocarbons. Course includes two off-campus field trips.
Prerequisite(s): GEOL 420.

GEOL 582. Plate Tectonics
3 Credits
Plate tectonics as a fundamental model for geological activity on a dynamic earth. Focuses on plate tectonic theory development and mechanisms, plus modern analogs of ancient processes.

GEOL 585. Geochronology
3 Credits
The principles, analytical methods, and interpretation of the most common geochronologic methods.

GEOL 588. Special Research Programs
1-3 Credits
Investigations into contemporary geological problems. May be repeated for unlimited credit.
Prerequisites: graduate standing and consent of instructor.

GEOL 599. Master's Thesis
15 Credits
Thesis research.

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