

# GEOLOGY (GEOLOGY)

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## ***GEOLOGY 5000 Special Problems*** (IND 0.0-6.0)

Problems or readings on specific subjects or projects in the department. Consent of instructor required.

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## ***GEOLOGY 5001 Special Topics*** (LAB 0.0 and LEC 0.0)

This course is designed to give the department an opportunity to test a new course. Variable title.

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## ***GEOLOGY 5010 Seminar*** (LEC 0.50)

Discussion of current topics.

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## ***GEOLOGY 5040 Oral Examination*** (IND 0.0)

After completion of all other program requirements, oral examinations for on-campus M.S./Ph.D. students may be processed during intersession. Off-campus M.S. students must be enrolled in oral examination and must have paid an oral examination fee at the time of the defense/comprehensive examination (oral/ written). All other students must enroll for credit commensurate with uses made of facilities and/or faculties. In no case shall this be for less than three (3) semester hours for resident students.

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## ***GEOLOGY 5085 Internship*** (IND 3.0)

Students will select, with their committee's advice, problems for investigation and preparation of a graduate research proposal. Problems must provide higher level experiential learning consistent with a graduate degree in geology. Assessment is based upon the quality of written and oral presentations and supervisor's evaluation. Repeatable for credit. Prerequisite: Graduate Standing.

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## ***GEOLOGY 5099 Research*** (IND 0.0-15)

Investigations of an advanced nature leading to the preparation of a thesis or dissertation.

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## ***GEOLOGY 5100 Professional Geoscience Skills*** (LEC 3.0)

Development and communication of complex topics in the geosciences is required for successful post-MS career advancement. Best practices for developing these skills in the geosciences will be critiqued weekly, culminating with poster and oral presentations. Assessment by peer-review and self-evaluation. Topics selected from geosciences careers. Prerequisites: Graduate Standing.

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## ***GEOLOGY 5111 Advanced Physical Geology*** (LEC 3.0)

Examination of topics concerned with the physical properties of earth materials, processes affecting change of the surface and interior of the earth, and the driving forces causing these changes. Weekly critical assessment of literature, and an oral presentation and term paper required. Prerequisite: Consent of instructor.

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## ***GEOLOGY 5121 Advanced Historical Geology*** (LAB 1.0 and LEC 2.0)

Study of the physical and biological history of the Earth beginning with the origin of the solar system up to the present. Emphasis will be placed on processes that shaped the Earth and its ecosystems. Prerequisite: Entrance requirements for the MST program in Earth Science.

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## ***GEOLOGY 5311 Depositional Systems*** (LEC 3.0)

Development of three dimensional depositional models using Walther's Law, Walther's Warning and seismic stratigraphy. Emphasis on overall geometries and internal porosity and permeability characteristics of aquifers and hydrocarbon reservoirs. Includes 3-D models for clastic, carbonate and evaporate sequences. Prerequisites: Geology 1110 or Geo Eng 1150; accompanied or preceded by both Geology 3310 and Geology 3620.

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## ***GEOLOGY 5510 Organic Geochemistry*** (LEC 3.0)

This course explores the carbon cycle, the history and inventory of organic matter on Earth, the transport of organic matter in aqueous systems, the burial of organic matter, the maturation of organic matter to become petroleum, and organic contaminants in the environment. Prerequisites: Graduate standing or consent of instructor.

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## ***GEOLOGY 5511 Applied Petroleum Geology*** (LAB 2.0 and LEC 1.0)

The principles of petroleum geology are applied in solving hydrocarbon exploration and developmental problems. Geological and economic techniques for evaluating hydrocarbonbearing reservoirs are presented, with methods for decisionmaking under conditions of extreme uncertainty. Prerequisite: Consent of instructor.

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## ***GEOLOGY 5513 Petroleum Geology*** (LAB 1.0 and LEC 2.0)

Principles of origin, migration, and accumulation of oil and gas. The laboratory introduces the procedures used for exploration, and development of hydrocarbon resources. Prerequisites: Geology 1110 or Geo Eng 1150; accompanied or preceded by both Geology 3310 and Geology 3620.

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## ***GEOLOGY 5521 Coal Petrology*** (LEC 3.0)

Formation, composition, and properties of coals. Discussion of the geology of selected coal deposits, the analysis of coal, and the optical identification of coal minerals. Prerequisite: Permission of instructor.

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## ***GEOLOGY 5611 Granites And Rhyolites*** (LAB 1.0 and LEC 3.0)

Processes governing the generation and crystallization of felsic magma will be covered, with specific reference to: 1) crust vs mantle sources, 2) melt migration and emplacement, 3) magma chamber dynamics, 4) the volcanic-plutonic connection, and 5) the relationship to tectonic setting. A field trip at the student's expense is required. Prerequisite: Geology 2620.

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**GEOLOGY 5631 Carbonate Petrology** (LAB 1.0 and LEC 2.0)

Petrology, chemistry and sedimentology of carbonates and other associated chemical sedimentary rocks. Prerequisites: GEOLOGY 2620, 3620 and CHEM 1320 or equivalent; GEOLOGY 3410 recommended.

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**GEOLOGY 5641 Advanced Igneous Petrology** (LAB 1.0 and LEC 2.0)

The genesis of eruptive rocks as evidenced by the physico-chemical conditions of formation of their constituent minerals. A critical examination of various magmatic processes. Use of advanced petrographic techniques. Prerequisites: GEOLOGY 4631.

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**GEOLOGY 5661 Advanced Stratigraphy and Basin Evolution** (LEC 3.0)

Advanced topics in sedimentary geology including: tectonic controls on sedimentary basin development, global sequence stratigraphy, regional facies and diagenetic patterns, basin hydrogeology, thermal evolution of basins and distribution of economic resources. This course should be preceded or accompanied by Geology 3410. Prerequisites: Geology 3620 and Geology 3310.

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**GEOLOGY 5671 Clay Mineralogy** (LAB 1.0 and LEC 2.0)

Mineral structure, geochemical properties, occurrence, environment, and uses of clays. Determination of physical properties, optics, x-ray diffraction, and thermal features of clays. Field trip fee required. Prerequisites: Geology 2610 and 3410, or Chem 2310, or Civ Eng 5715, or Geo Eng 5172.

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**GEOLOGY 5679 Field and Laboratory Studies in Earth Science** (LAB 3.0)

Hands-on laboratory and field experiences in the Earth Sciences. This course is designed to be taught in an intensive three week session during the summer on the S&T campus. Prerequisites: GEOLOGY 2096 or 5121 or equivalents.

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**GEOLOGY 5681 Lidar Principles and Application** (LEC 3.0)

Provides a comprehensive understanding of light detection and ranging (lidar) technology as it has been developed for commercial use; various methods of deploying technology for collection of data for mapping, engineering and science, and application of the data using specialized software for editing and processing point cloud data. Assumes GIS experience. Prerequisite: Senior or graduate standing.

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**GEOLOGY 5741 Micropaleontology** (LAB 1.0 and LEC 2.0)

This course studies the fossil and soft-body characteristics of bacteria, protists, microinvertebrates and organic-walled microfossils (palynomorphs). Focused discussions on systematics, evolutionary histories, paleoecology, and geologic applications of the microfossil groups. Extraction of foraminifera and palynomorphs from rocks in lab. Prerequisite: Geology 4630.

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**GEOLOGY 6000 Special Problems** (IND 0.0-6.0)

Problems or readings on specific subjects or projects in the department. Consent of instructor required.

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**GEOLOGY 6001 Special Topics** (LAB 0.0 and LEC 0.0)

This course is designed to give the department an opportunity to test a new course. Variable title.

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**GEOLOGY 6010 Seminar** (IND 0.0-6.0)

Discussion of current topics.

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**GEOLOGY 6040 Oral Examination** (IND 0.0)

After completion of all other program requirements, oral examinations for on-campus M.S./Ph.D. students may be processed during intersession. Off-campus M.S. students must be enrolled in oral examination and must have paid an oral examination fee at the time of the defense/comprehensive examination (oral/ written). All other students must enroll for credit commensurate with uses made of facilities and/or faculties. In no case shall this be for less than three (3) semester hours for resident students.

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**GEOLOGY 6050 Continuous Registration** (IND 1.0)

Doctoral candidates who have completed all requirements for the degree except the dissertation, and are away from the campus must continue to enroll for at least one hour of credit each registration period until the degree is completed. Failure to do so may invalidate the candidacy. Billing will be automatic as will registration upon payment.

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**GEOLOGY 6085 Internship** (IND 3.0)

Students will select, with their committee's advice, problems for investigation and preparation of a graduate research proposal. Problems must provide higher level experiential learning consistent with a graduate degree in geology. Assessment is based upon the quality of written and oral presentations and supervisor's evaluation. Repeatable for credit. Prerequisite: Graduate standing.

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**GEOLOGY 6097 Advanced Geologic Field Methods** (LEC 3.0)

Advanced instruction in planning and implementation of geologic field campaigns, development of an appropriate scientific plan, including logistics, safety, and supervision of field personnel in a manner consistent with professional practices. Emphasis placed upon reflection on projects outcomes supervised with faculty oversight. Field Trip fee required.

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**GEOLOGY 6098 Advanced Geologic Field Methods** (LEC 3.0)

Adv. instruction in theory and practice of qualitative/quantitative description of spatial relationships of rock types in areas exhibiting complex deformation. Emphasis on expl. learning where students plan, implement, and reflect on outcomes for sev. scientific field campaigns in a manner consistent with prof. scientific practices. Field trip fee required.

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**GEOLOGY 6099 Research** (IND 0.0-15)

Investigations of an advanced nature leading to the preparation of a thesis or dissertation.

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**GEOLOGY 6100 Advanced Professional Geoscience Skills** (LEC 3.0)

Communication of complex research topics in the geosciences is required for successful post-doctoral career advancement in both academic and non-academic career paths. Best practices for developing and proposing scientific ideas in the geosciences will be critiqued weekly. Assessment of research proposals presentations includes peer-and self-evaluation. Prerequisites: Doctoral Graduate Standing. (Co-listed with Pet Eng 6100).

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**GEOLOGY 6211 Geodynamics** (LEC 3.0)

The applications of continuum physics to geological and petroleum engineering problems. Topics include plate tectonics, stress and strain in solids, elasticity and flexure, heat transfer, gravity, fluid mechanics, rock rheology, faulting, and flow in porous media. Prerequisites: Math 2222 and Geology 3310. (Co-listed with Pet Eng 6711).

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**GEOLOGY 6311 Advanced Structural Geology** (LAB 1.0 and LEC 2.0)

The course provides theoretical background, analytical techniques, and hands-on experience for analyzing geologic structures at a variety of scales hand sample to global. Prerequisites: Geology 3310, Geophys 4096.

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**GEOLOGY 6321 Analytical Structural Geology** (LAB 1.0 and LEC 2.0)

The course provides theoretical background, analytical techniques, and hands-on experience, for quantifying processes that lead to the formation and evolution of rocks and structures produced as a result of deformation at a variety of scales - hand sample to global. Poster - and oral - presentations, and a research paper required. Prerequisites: Geology 3310, Geophys 4096.

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**GEOLOGY 6331 Geotectonics** (LEC 3.0)

A critical study of the origin, and differentiation of the earth, evolution of the crust, and plate tectonics. Geology of the continents and ocean basins. Regional tectonic analysis of precambrian shields, platforms, orogenic belts, and a review of internal energy sources. Emphasis is on North America. Prerequisite: Geology 3310.

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**GEOLOGY 6341 Advanced Remote Sensing And Image Processing** (LAB 1.0 and LEC 2.0)

Quantitative methods of utilizing remote sensing technology for terrain analysis. Digital image processing of landsat and/or aircraft scanner data for mineral resource studies and geological engineering applications. Prerequisite: Geo Eng 5146. (Co-listed with Geo Eng 6146).

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**GEOLOGY 6351 Advanced Geochemistry** (LEC 3.0)

A study of the absolute and relative abundance of elements and isotopes in the Earth, principles of element transport, formation of the Earth's crust, mineral deposits, and soils. Field trip fee required. Prerequisite: Geology 3410.

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**GEOLOGY 6411 Advanced Isotope Geochemistry** (LAB 1.0 and LEC 2.0)

The use of radiogenic and stable isotopes in geology in the study of the evolution of Earth, crust, mantle, and the Solar System as well as applications to geothermometry, ore petrogenesis, paleontology, and the global climate system. Prerequisites: Geology 2620, 3620, 3410.

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**GEOLOGY 6421 Environmental Geology** (LEC 3.0)

Overview of environmental problems facing humans. Emphasis will be placed on surface and groundwater pollution, geological hazards, and pressures on Earth's ecosystems and natural resources by urbanization and population growth. Prerequisites: GEOLOGY 1110 or 1120 or equivalents.

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**GEOLOGY 6511 Advanced Petroleum Geology** (LAB 2.0 and LEC 1.0)

The principles of petroleum geology are applied in solving hydrocarbon exploration and developmental problems. Various types of oil and gas accumulations are reviewed in detail. Study of criteria useful in evaluating the petroleum potential of undrilled areas. Special investigation assignment is required. Prerequisite: Geology 3310, Geology 5513, Geology 5661, or Geology 6811.

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**GEOLOGY 6521 Advanced Ore Microscopy** (LAB 2.0 and LEC 1.0)

A study of ore suites utilizing various advanced, quantitative ore microscopy techniques including hardness, spectral reflectance, indentation, color, rotation property measurements, fluid inclusion geothermometry, and salinity measurements. Laboratory study includes demonstration and operation of the luminoscope and other microbeam techniques. Prerequisite: Geology 4521.

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**GEOLOGY 6531 Applied Ore Microscopy** (LAB 2.0 and LEC 1.0)

Application of ore microscopic and petrographic techniques to problems in ore beneficiation, pelleting, sintering, smelting, refining, refractories, cement, mining, and exploration. Discussions and laboratories are based upon industrial case histories. Prerequisite: Geology 4521.

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**GEOLOGY 6541 Geology of Natural Resources** (LEC 3.0)

The origin and distribution of economically important natural resources including soils, water resources, metals, non-metals, building materials, petroleum, and other energy resources. Prerequisites: GEOLOGY 1110 or 1120 or equivalents.

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***GEOLOGY 6551 Global Tectonics and Metallogeny*** (LAB 1.0 and LEC 2.0)

An advanced study of metallic ore deposits. Theories of ore genesis in different tectonic regimes and the effects on exploration. Discussions based on maps, logs, exploration datasets and samples from the world's typical mineral deposits. Prerequisites: Geology 3511 and preceded or accompanied by Geology 4521.

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***GEOLOGY 6611 Advanced Palynology*** (LAB 2.0 and LEC 1.0)

Study of organic-walled microfossils, and the processes of sporopollenin preservation, sedimentation and palynofacies. Chronicle of Phanerozoic palynology in lectures. Major emphasis on independent palynostratigraphic research and applications, such as biostratigraphy, paleoclimatology and paleoenvironments. Prerequisite: Geology 4630 or Geology 5741.

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***GEOLOGY 6621 Clastic Sedimentary Petrology*** (LAB 1.0 and LEC 2.0)

Petrology and petrography of clastic sedimentary rocks. Emphasis on origin, diagenesis and description of clastic, sedimentary rocks. Prerequisite: Geology 3620.

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***GEOLOGY 6651 Granite and Rhyolite Petrogenesis*** (LAB 1.0 and LEC 3.0)

The origin of granites and rhyolites with respect to extreme fractionation, crustal anatexis, magma mixing, and tectonic setting will be explored through critical reading of the literature and examination of hand samples and thin sections from classic geologic terranes. A research paper is required as well as a field trip at the student's expense. Prerequisite: Geology 2620.

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***GEOLOGY 6711 Advanced Paleoclimatology and Paleocology*** (LEC 3.0)

Advanced study of paleoclimatic and paleoecologic processes since the Archean, and the interpretation of Holocene climate changes, including human impacts. Extensive presentations and discussions of current ideas and techniques in paleoclimatic studies. Prerequisite: Geology 3620.

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***GEOLOGY 6811 Sedimentary Basin Analysis*** (LEC 3.0)

An advanced study of stratigraphic, diagenetic and tectonic processes in sedimentary basins. Prerequisites: Geology 3310, 3620, 3410 or 4441 or 4451.

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