

GEOLOGY (GEO)

Geology (GEO) Courses

GEO 5033. Geographical Information Systems. (2-2) 3 Credit Hours.

Application of the computer to environmental planning and management problems through a Geographical Information System (GIS). Using the computer as a mapping device for query, analysis, creation and display of spatially related data. Additional topics include using the Global Positioning System (GPS) for data acquisition. (Same as CE 5293. Credit cannot be earned for both CE 5293 and GEO 5033.) Course Fees: GS01 \$90; IUE1 \$15; LRS1 \$15; STSI \$15.

GEO 5063. Applied Statistics for Geoinformatics. (3-0) 3 Credit Hours.

Prerequisites: CS 1063, MAT 1073, and STA 1053, or consent of instructor. This course will cover both the basic statistics and in depth coverage of analytical methods used in the analysis of geospatial data. Descriptive clustering methods for spatial data and in depth coverage of linear models used in the analysis of geospatial data will also be covered. Variogram models and kriging techniques will also be covered. All course materials will be taught using the programming language R. Course Fees: GS01 \$90; IUE1 \$15; LRS1 \$15; STSI \$15.

GEO 5103. Current Topics in the Geosciences. (3-0) 3 Credit Hours.

Prerequisite: Graduate standing in geology or consent of instructor. Evaluation of current research trends and methodology in the geosciences. Course Fees: GS01 \$90; LRS1 \$15; STSI \$15.

GEO 5113. Research Design in the Geosciences. (3-0) 3 Credit Hours.

Prerequisite: GEO 5103 or consent of instructor. Development of research projects, including literature review, methodology, and data analysis. Elements of project management will also be covered. Course Fees: GS01 \$90; LRS1 \$15; STSI \$15.

GEO 5223. Advanced Environmental Geology. (3-0) 3 Credit Hours.

Prerequisites: GEO 4063 and ES 5213, or consent of instructor. Study of the geology of the environment, with emphasis on the physical and social effects of catastrophic geologic processes. Course Fees: GS01 \$90; LRS1 \$15; STSI \$15.

GEO 5303. Petroleum Geology. (3-0) 3 Credit Hours.

Prerequisites: GEO 3103 and GEO 3123, or consent of instructor. Integrated study of the generation, migration, and entrapment of petroleum. Survey of surface and subsurface geological and geophysical techniques for exploration and production. Case studies of petroleum systems including economic aspects of the petroleum industry. Course Fees: GS01 \$90; LRS1 \$15; STSI \$15.

GEO 5413. River Science. (3-0) 3 Credit Hours.

Prerequisite: Graduate standing in biology, environmental science, geology, or civil engineering, or consent of instructor. An in-depth examination of river sediment transport principles. Topics include water and sediment supply, sediment dynamics, river morphology, and channel instability. Field trips may be required. (Formerly GEO 5414. Same as CE 5323. Credit can be earned for only one of the following: CE 5323, CE 5653, GEO 5414, or GEO 5413.) Course Fees: GS01 \$90; LRS1 \$15; STSI \$15.

GEO 5434. Fluvial Processes and Deposits. (3-3) 4 Credit Hours.

Prerequisite: GEO 4113 or GRG 3723, or consent of instructor. An in-depth examination of the interface between fluvial geomorphology and sedimentology. Key topics include sediment transport principles, bedform development, facies models, and architectural analysis. Field trips may be required. Course Fees: GS01 \$120; LRS1 \$20; STSI \$20.

GEO 5454. Advanced Paleontology. (3-3) 4 Credit Hours.

Prerequisite: GEO 3063 or consent of instructor. In-depth paleontological analyses. Current literature and scientific deliberations will be emphasized. Topic 1: Focused Paleontology. Detailed study of one to three taxonomic groups. Topic 2: Vertebrate Paleontology. The evolutionary history of the Vertebrata. Topic 3: Earth Systems Paleontology. Survey of past interactions between the biosphere, lithosphere, and atmosphere. May be repeated for credit when topics vary. Field trips may be required. Course Fees: GS01 \$120; LRS1 \$20; STSI \$20.

GEO 5483. Environmental Hydrogeology. (3-0) 3 Credit Hours.

Focuses on the physical and chemical processes that control natural variation in the chemical and isotopic composition of groundwater, fate and transport of groundwater contaminants, and modeling of groundwater quality using publicly available computer programs. Field trips may be required. Course Fees: GS01 \$90; LRS1 \$15; STSI \$15.

GEO 5504. Advanced Stratigraphy. (3-3) 4 Credit Hours.

Prerequisites: GEO 3123 and GEO 3131, or consent of instructor. Chronologic study of stratigraphic systems, physical properties and facies, depositional and paleogeographic implications, correlation, nomenclature, and biostratigraphy. Sequence stratigraphy and seismic and log analyses are studied. Field trips may be required. Course Fees: GS01 \$120; LRS1 \$20; STSI \$20.

GEO 5603. Physical Hydrogeology. (3-0) 3 Credit Hours.

Prerequisite: GEO 4623 with a grade of "C-" or better, or consent of instructor. Geologic principles governing the flow of subsurface water with an emphasis on physical hydrogeology, interaction of surface and groundwater, hydrogeologic properties and their measurement, flow in the unsaturated zone, mass transport, evolution of aquifer systems, and an introduction to groundwater modeling. Field trips may be required. Course Fees: GS01 \$90; LRS1 \$15; STSI \$15.

GEO 5713. Groundwater Modeling. (3-0) 3 Credit Hours.

Prerequisite: GEO 5603 or consent of instructor. Focus is on using MODFLOW code to model the occurrence and movement of groundwater. Course will discuss hydrogeologic data for modeling, modeling protocol, and MODFLOW packages. Multiple graphics-rich user model interfaces commonly used in groundwater science will be learned. Other computer programs for simulating flow of subsurface fluids may be included. Course Fees: GS01 \$90; LRS1 \$15; STSI \$15.

GEO 5894. Advanced Structural Geology. (3-3) 4 Credit Hours.

Prerequisites: GEO 3103 and GEO 3111, or consent of instructor. In-depth study of the various aspects of structural geology: stress and strain, behavior of materials, failure criteria, fault analysis, rheological properties of geologic materials, fold analysis, and subsurface analysis. Field trips may be required. Course Fees: GS01 \$120; LRS1 \$20; STSI \$20.

GEO 5904. Carbonate Petrology. (3-3) 4 Credit Hours.

Prerequisites: GEO 3043, GEO 3051, GEO 3123, and GEO 3131, or consent of instructor. Thin-section analysis and hand-specimen study of carbonate sediment and rocks, carbonate classifications, carbonate facies, models, and carbonate diagenesis. Field trips required. Course Fees: GS01 \$120; LRS1 \$20; STSI \$20.

GEO 5954. Sandstone Petrology. (3-3) 4 Credit Hours.

Prerequisites: GEO 3043, GEO 3051, GEO 3123, and GEO 3131, or consent of instructor. Thin-section analysis and hand-specimen study of clastic rocks, classifications, interpretation of provenance, clastic sedimentary facies, and clastic diagenesis. Field trips may be required. Course Fees: GS01 \$120; LRS1 \$20; STSI \$20.

GEO 5971. Directed Research. (0-0) 1 Credit Hour.

Prerequisites: Graduate standing and permission in writing (form available) of the instructor and the student's Graduate Advisor of Record. The directed research course may involve a laboratory, field-based, or theoretical problem. May be repeated for credit, but not more than 3 hours, regardless of discipline, will apply to the Master's degree. Course Fees: GS01 \$30; LRS1 \$5; STSI \$5.

GEO 5972. Directed Research. (0-0) 2 Credit Hours.

Prerequisites: Graduate standing and permission in writing (form available) of the instructor and the student's Graduate Advisor of Record. The directed research course may involve a laboratory, field-based, or theoretical problem. May be repeated for credit, but not more than 3 hours, regardless of discipline, will apply to the Master's degree. Course Fees: GS01 \$60; LRS1 \$10; STSI \$10.

GEO 5973. Directed Research. (0-0) 3 Credit Hours.

Prerequisites: Graduate standing and permission in writing (form available) of the instructor and the student's Graduate Advisor of Record. The directed research course may involve a laboratory, field-based, or theoretical problem. May be repeated for credit, but not more than 3 hours, regardless of discipline, will apply to the Master's degree. Course Fees: GS01 \$90; LRS1 \$15; STSI \$15.

GEO 5991. Graduate Seminar in Geology. (1-0) 1 Credit Hour.

Prerequisite: Graduate standing in geology or consent of the Graduate Advisor of Record. Topical issues chosen by faculty and current research seminars presented by faculty, visiting lecturers, and Master's degree candidates. May be repeated for credit but only 2 hours may be applied toward the Master's degree. The grade report for the course is either "CR" (satisfactory performance) or "NC" (unsatisfactory performance). Course Fees: GS01 \$30; LRS1 \$5; STSI \$5.

GEO 6011. Seminar in Geospatial Science and Applications. (1-0) 1 Credit Hour.

Seminar will focus on literature review of cutting-edge research in remote sensing, GIS, geoinformatics, and their applications to water resources, surface hydrology and cryosphere. Course Fees: GS01 \$30; LRS1 \$5; STSI \$5.

GEO 6043. Global Change. (3-0) 3 Credit Hours.

Prerequisite: Graduate standing in the program or consent of instructor. Changes in the global distribution of plants and animals and the causes of the changes will be examined. Factors that are apparently coupled to changes in the atmosphere and environmental temperature will be examined. (Same as CE 6113 and ES 5043. Formerly GEO 5043. Credit can be earned for only one of the following: CE 6113, ES 5043, GEO 5043, or GEO 6043.) Course Fees: GS01 \$90; LRS1 \$15; STSI \$15.

GEO 6053. Remote Sensing. (2-2) 3 Credit Hours.

Prerequisites: MAT 1073, and PHY 1603 or PHY 1943. Fundamental remote sensing theory and technology will be introduced and emphasized as well as remote sensing applications to land surface, ocean, and atmosphere. Emphasis will be on the interaction of electromagnetic energy with the Earth's surface and different types of remote sensing for data collection. (Formerly GEO 5053. Credit cannot be earned for both GEO 5053 and GEO 6053.) Course Fees: GS01 \$90; IUE1 \$15; LRS1 \$15; STSI \$15.

GEO 6063. Ocean Remote Sensing. (3-0) 3 Credit Hours.

Prerequisites: MAT 1073 or equivalent, and PHY 1603 or PHY 1943 or equivalent. This course provides an overview of applications of satellite remote sensing to the study of the physics and biology of the oceans. The physical principles behind each type of ocean observing satellite system is presented as well as the various possible satellite orbits and sampling patterns. Course Fees: GS01 \$90; LRS1 \$15; STSI \$15.

GEO 6083. Remote Sensing Image Processing and Analysis. (2-2) 3 Credit Hours.

Prerequisite: GEO 4093 or GEO 6053, or consent of instructor. Fundamentals, algorithms, and techniques of remote sensing image processing, information extraction and analysis, including radiometric and geometric corrections, image enhancement, image sharpening, principal components analysis, image classification, spectral analysis, vectorization, integration with GIS, etc. (Formerly GEO 5083. Credit cannot be earned for both GEO 5083 and GEO 6083.) Course Fees: GS01 \$90; LRS1 \$15; STSI \$15.

GEO 6093. Remote Sensing in Hydrology. (2-2) 3 Credit Hours.

Prerequisite: GEO 4093 or GEO 6053, or consent of instructor. Apply remote sensing to derive parameters of surface hydrology and hydrometeorology such as precipitation, land surface temperature and emissivity, heat flux, evaporation, evapotranspiration, soil moisture, surface water, water quality, snow and ice, and soil erosion. The contents will also include radar hydrology, microwave techniques and mapping of soil moisture and precipitation, and remote sensing in hydrologic modeling. (Formerly GEO 5093. Credit cannot be earned for GEO 5093 and GEO 6093.) Course Fees: GS01 \$90; LRS1 \$15; STSI \$15.

GEO 6183. Basin Analysis and Sedimentary Geology. (3-0) 3 Credit Hours.

An interdisciplinary integration of geodynamics, mathematical and physical modeling, and sedimentary geology. Emphasizes basin formation, nature and maturation of the basin fill, and timing of events. Case histories of various basins illustrate approaches. Field trips may be required. Course Fees: GS01 \$90; LRS1 \$15; STSI \$15.

GEO 6243. Paleoecology and Paleoclimatology. (3-0) 3 Credit Hours.

Prerequisite: GEO 3063 or consent of instructor. Study of fossil organisms in relation to their past environments, and their interactions in extinct ecological communities. Use of fossils to interpret past environmental conditions, and the temporal contribution fossil communities provide to research of environmental change. Topic 1: Methods of Paleoecology. Survey of paleoecological theory and methods. Topic 2: Paleoclimatology. Review of the modern climate system and proxies for understanding major climate changes through geologic time. May be repeated for credit when topics vary. Field trips may be required. Course Fees: GS01 \$90; LRS1 \$15; STSI \$15.

GEO 6304. Isotope Geochemistry. (3-2) 4 Credit Hours.

Prerequisite: GEO 3374. The course will cover an introduction to isotope theory, and its utility in geological science and related fields. Focus will be on methods, data acquisition, data corrections, and interpretation. Laboratory methods for isotope sample preparation and hands-on experience with isotope ratio-mass spectrometry (IRMS) and peripherals. Course Fees: GS01 \$120; LRS1 \$20; STSI \$20.

GEO 6344. Micropaleontology. (3-3) 4 Credit Hours.

Prerequisite: GEO 3063 or consent of instructor. A study of microscopic fossil organisms that commonly produced a fossil record. Emphasis on taxonomy, evolution, and processing methods for biostratigraphically and paleoecologically important groups. Field trips may be required. Course Fees: GS01 \$120; IUE1 \$15; LRS1 \$20; STSI \$20.

GEO 6403. Advanced Geophysics. (3-0) 3 Credit Hours.

Prerequisite: GEO 3383 or consent of instructor. Application of fundamentals of geophysical properties of the earth, specifically the propagation of seismic energy and electromagnetic (EM) fields in earth materials, toward an advanced analysis of seismic, EM prospection techniques, and well-logging methods. Techniques addressed will be specifically relevant to the petroleum and mineral extraction industries. Course Fees: GS01 \$90; LRS1 \$15; STSI \$15.

GEO 6513. Advanced GIS. (2-2) 3 Credit Hours.

Prerequisite: CE 5293 or GEO 5033, or consent of instructor. Geographic Information Systems (GIS) is an excellent tool for modeling, analyzing, and managing environmental systems. This course teaches advanced concepts and applications of industry standard GIS software, including spatial analysis, spatial statistics, geostatistical analysis, 3-D analysis, and geoprocessing. The emphasis of this course is on understanding the underlying principles of those tools and on how to apply them to solve real-world problems. Course Fees: GS01 \$90; LRS1 \$15; STSI \$15.

GEO 6523. GIS for Water Resources. (3-0) 3 Credit Hours.

Prerequisites: GEO 4623 and GEO 6513, or consent of instructor. Current approaches for using GIS to acquire, process and analyze spatial data for surface water and groundwater systems. Course will introduce watershed delineation techniques, spatial interpolation methods for analysis of precipitation and groundwater data, and GIS-based modeling of hydrologic mass-balance in watersheds. Course Fees: GS01 \$90; LRS1 \$15; STSI \$15.

GEO 6533. Programming for Geospatial Application. (2-2) 3 Credit Hours.

Prerequisite: CE 5293 or GEO 5033, or consent of instructor. This course teaches one or more programming languages with high-level toolkits suitable for GIS (Geographic Information System) application and development in a variety of open source environments. The course introduces key GIS concepts such as location, distance, units, projections, datum, and GIS data formats, examines a number of libraries of programming languages (e.g., Python or others), and explores how to combine these with geo-spatial data to accomplish a variety of tasks. Course Fees: GS01 \$90; LRS1 \$15; STSI \$15.

GEO 6813. Water Resources. (3-0) 3 Credit Hours.

Application of management principles to the efficient use of water resources by people and their public and private institutions. Water is examined in terms of its value, use, and changing role in the context of economics, history, politics, and technology. Course Fees: GS01 \$90; LRS1 \$15; STSI \$15.

GEO 6951. Independent Study. (0-0) 1 Credit Hour.

Prerequisites: Graduate standing and permission in writing (form available) of the instructor and the student's Graduate Advisor of Record. Independent reading, research, discussion, and/or writing under the direction of a faculty member. For students needing specialized work not normally or not often available as part of the regular course offerings. May be repeated for credit, but not more than 6 hours, regardless of discipline, will apply to the Master's degree. Course Fees: GS01 \$30; LRS1 \$5; STSI \$5.

GEO 6952. Independent Study. (0-0) 2 Credit Hours.

Prerequisites: Graduate standing and permission in writing (form available) of the instructor and the student's Graduate Advisor of Record. Independent reading, research, discussion, and/or writing under the direction of a faculty member. For students needing specialized work not normally or not often available as part of the regular course offerings. May be repeated for credit, but not more than 6 hours, regardless of discipline, will apply to the Master's degree. Course Fees: GS01 \$60; LRS1 \$10; STSI \$10.

GEO 6953. Independent Study. (0-0) 3 Credit Hours.

Prerequisites: Graduate standing and permission in writing (form available) of the instructor and the student's Graduate Advisor of Record. Independent reading, research, discussion, and/or writing under the direction of a faculty member. For students needing specialized work not normally or not often available as part of the regular course offerings. May be repeated for credit, but not more than 6 hours, regardless of discipline, will apply to the Master's degree. Course Fees: GS01 \$90; LRS1 \$15; STSI \$15.

GEO 6961. Comprehensive Examination. (0-0) 1 Credit Hour.

Prerequisite: Approval of the appropriate Graduate Program Committee to take the Comprehensive Examination. Independent study course for the purpose of taking the Comprehensive Examination. May be repeated as many times as approved by the Graduate Program Committee. Enrollment is required each term in which the Comprehensive Examination is taken if no other courses are being taken that term. The grade report for the course is either "CR" (satisfactory performance on the Comprehensive Examination) or "NC" (unsatisfactory performance on the Comprehensive Examination). Course Fees: GS01 \$30; LRS1 \$5; STSI \$5.

GEO 6973. Special Problems. (3-0) 3 Credit Hours.

Prerequisite: Consent of instructor. An organized course offering the opportunity for specialized study not normally or not often available as part of the regular course offerings. Special Problems courses may be repeated for credit when the topics vary, but not more than 6 hours, regardless of discipline, will apply to a Master's degree. Field trips may be required. Course Fees: GS01 \$90; LRS1 \$15; STSI \$15.

GEO 6981. Master's Thesis. (0-0) 1 Credit Hour.

Prerequisites: Permission of the Graduate Advisor of Record and thesis director. Thesis research preparation. May be repeated for credit, but not more than 6 hours will apply to the Master's degree. Credit will be awarded upon completion of the thesis. Enrollment is required each term in which the thesis is in progress. Course Fees: GS01 \$30; LRS1 \$5; STSI \$5.

GEO 6982. Master's Thesis. (0-0) 2 Credit Hours.

Prerequisites: Permission of the Graduate Advisor of Record and thesis director. Thesis research preparation. May be repeated for credit, but not more than 6 hours will apply to the Master's degree. Credit will be awarded upon completion of the thesis. Enrollment is required each term in which the thesis is in progress. Course Fees: GS01 \$60; LRS1 \$10; STSI \$10.

GEO 6983. Master's Thesis. (0-0) 3 Credit Hours.

Prerequisites: Permission of the Graduate Advisor of Record and thesis director. Thesis research preparation. May be repeated for credit, but not more than 6 hours will apply to the Master's degree. Credit will be awarded upon completion of the thesis. Enrollment is required each term in which the thesis is in progress. Course Fees: GS01 \$90; LRS1 \$15; STSI \$15.