Geology (GEO)

NOTE: All prerequisites required for Geology (GEO) courses or courses counted toward major or minor requirements in geology must be completed with a grade of "C-" or better.

Geology (GEO) Courses

GEO 1013. The Third Planet. (3-0) 3 Credit Hours. (TCCN = GEOL 1301)
Evolution of ideas concerning the earth's origin, structure, and age; social impact of recognizing the antiquity of the planet and humankind's brief presence; examination of how the distribution of planetary resources influenced the rise and clash of civilizations. May not be applied to a major in geology. May apply toward the Core Curriculum requirement in Life and Physical Sciences.

GEO 1103. Physical Geology. (3-0) 3 Credit Hours. (TCCN = GEOL 1303)
Prerequisites: Completion of or concurrent enrollment in CHE 1103, CHE 1121, and MAT 1093 or higher, or satisfactory performance on placement exam. Completion of or concurrent enrollment in GEO 1111 required. The earth as a dynamic planet; relation of the earth's present processes to its resources, structure, and internal composition. Nature of minerals and rocks, the hydrosphere, tectonics, earthquakes, volcanism, and surface features of the earth. (Formerly titled "Introduction to Earth Systems.").

GEO 1111. Physical Geology Laboratory. (1-3) 1 Credit Hour. (TCCN = GEO 1103)
Prerequisite: Completion of or concurrent enrollment in GEO 1103. Relation of the earth's present processes to its resources, structure, and internal composition. Field and laboratory study of minerals, rocks, maps, and aerial and satellite photos. Field trips may be required. (Formerly titled "Introduction to Earth Systems Laboratory.").

GEO 1123. Life Through Time. (3-0) 3 Credit Hours. (TCCN = GEOL 1304)
Concurrent enrollment in GEO 1131 recommended. The origin of Earth and the interaction of plate tectonics, mountain building, evolution of the oceans and climate, and the history and development of life from the Archean to the present. May apply toward the Core Curriculum requirement in Life and Physical Sciences. (Formerly titled "Earth History.").

GEO 1131. Life Through Time Laboratory. (1-3) 1 Credit Hour. (TCCN = GEOL 1104)
Prerequisite: Completion of or concurrent enrollment in GEO 1123. Field and laboratory study of fossils and rock sequences; interpretation of earth history. Field trips may be required. (Formerly titled "Earth History Laboratory.").

GEO 2003. Mineralogy. (3-0) 3 Credit Hours.
Prerequisites: CHE 1103, CHE 1121, GEO 1103, GEO 1111, MAT 1093 or higher, or satisfactory performance on placement exam. Completion of or concurrent enrollment in GEO 2011. Crystallography, crystal chemistry, and the physical and optical properties of minerals. Principles of optical mineralogy and the microscopic determination of nonopaque minerals. Field trips may be required.

GEO 2011. Mineralogy Laboratory. (1-4) 1 Credit Hour.
Corequisite: GEO 2003. Laboratory study of crystal models, crystals, and minerals. Use of the petrographic microscope for mineral identification. Field trips may be required. (Formerly GEO 2012. Credit cannot be earned for both GEO 2011 and GEO 2012.).

GEO 2113. Fundamentals of Geographic Information Systems (GIS). (2-2) 3 Credit Hours.
Prerequisite: CS 1173 or equivalent. This course will serve as a basic introduction to the concepts and techniques of utilizing a Geographic Information System (GIS) to study and model environmental issues. In lecture and laboratory, students will study methods of querying, analyzing, creating and displaying GIS data utilizing industry standard software. Students will also be introduced to using the Global Positioning System (GPS) as a means for creating GIS data. (Same as ES 2113. Formerly ES 4043. Credit cannot be earned for more than one of the following: GEO 2113, ES 2113, or ES 4043.).

GEO 3004. Rocks, Fossils, and Global Tectonics. (2-4) 4 Credit Hours.
Prerequisites: GEO 1103 and GEO 1111. An investigation of the major rock forming minerals, petrogenesis of the major rock types, and their plate tectonic context. Study of major trends in fauna and flora through time and their application to interpreting plate tectonics, paleoenvironments, and paleoclimate. Credit may not be applied to a B.S. or B.A. major in Geology.

GEO 3043. Petrology. (3-0) 3 Credit Hours.
Prerequisites: GEO 2003, GEO 2011, MAT 1214, and completion of or concurrent enrollment in GEO 3051. Description, classification, occurrence, and origin of igneous and metamorphic rocks. Field trips may be required.

GEO 3051. Petrology Laboratory. (1-4) 1 Credit Hour.
Prerequisites: GEO 2003, GEO 2011, and completion of or concurrent enrollment in GEO 3043. Laboratory study of igneous and metamorphic rocks in hand specimen and thin section. Field trips may be required. (Formerly GEO 3052. Credit cannot be earned for both GEO 3051 and GEO 3052.).

GEO 3063. Paleontology. (3-0) 3 Credit Hours.
Prerequisites: GEO 1103, GEO 1111, GEO 1123, GEO 1131, GEO 3123, GEO 3131, or consent of instructor, and concurrent enrollment in GEO 3071. Study of fossil animals and plants. Emphasis on invertebrate animals. Systematics, biostratigraphy, paleoecology, and evolution of fossil organisms. Field trips may be required.

GEO 3071. Paleontology Laboratory. (1-3) 1 Credit Hour.
Prerequisites: GEO 1103, GEO 1111, GEO 1123, GEO 1131, GEO 3123, GEO 3131, and concurrent enrollment in GEO 3063. Study of fossil specimens, collections, and preparation techniques. Field trips may be required.

GEO 3103. Structural Geology. (3-0) 3 Credit Hours.
Prerequisites: GEO 3043, GEO 3051, and completion of or concurrent enrollment in GEO 3111. Response of earth materials to natural stresses. Description and origin of geologic structures. Field trips may be required.

GEO 3111. Structural Geology Laboratory. (1-3) 1 Credit Hour.
Prerequisite: Completion of or concurrent enrollment in GEO 3103. Laboratory study of geologic structures using maps, cross-sections, photographs, and descriptive geometric and stereographic methods. Field trips may be required.
GEO 3112. Geologic Field Investigations. (1-4) 2 Credit Hours.  
Prerequisites: GEO 1103, GEO 1111, GEO 1123, GEO 1131, GEO 2003, GEO 2011, and WRC 1023, or consent of instructor. Introduction to techniques for studying geologic features and processes in the field, including rock identification, construction of geological maps, orientation analysis, and report writing. Concurrent enrollment in GEO 4933 or GEO 4943 is not permitted. Some half-day and Saturday field trips may be required. (Formerly GEO 3113. Credit cannot be earned for both GEO 3112 and GEO 3113.).

GEO 3123. Sedimentation and Stratigraphy. (3-0) 3 Credit Hours.  
Prerequisites: GEO 1123, GEO 1131, GEO 2003, GEO 2011, GEO 3112, and completion of or concurrent enrollment in GEO 3131. Processes of erosion, transportation, and deposition that form bodies of sedimentary rock. Depositional systems and modeling are a significant area of study. Stratigraphic principles and temporal and spatial facies relationships at various scales. Field trips may be required. (Formerly titled “Sedimentary Geology.”).

GEO 3131. Sedimentation and Stratigraphy Laboratory. (1-3) 1 Credit Hour.  
Prerequisites: GEO 2003, GEO 2011, and completion of or concurrent enrollment in GEO 3123. Laboratory studies of sedimentary processes and their products. Hand specimens, thin sections, sedimentary structures, and interpretation of depositional environments. Stratigraphic case studies, including surface, subsurface, and sequence stratigraphic analysis. Field trips may be required. (Formerly titled “Sedimentary Geology Laboratory.”).

GEO 3143. Economic Geology. (3-0) 3 Credit Hours.  
Prerequisites: GEO 2003, GEO 2011, and completion of or concurrent enrollment in GEO 3151. Origin and occurrence of economic natural resources including metallic ore deposits, industrial minerals, and fossil fuels. Field trips may be required.

GEO 3151. Economic Geology Laboratory. (1-3) 1 Credit Hour.  
Prerequisites: GEO 2003, GEO 2011, and completion of or concurrent enrollment in GEO 3143. Laboratory study of ore specimens and industrial minerals from important ore localities. Field trips may be required.

GEO 3163. Oceanography. (3-0) 3 Credit Hours.  
General oceanography, with emphasis on marine geology and especially the continental margins. An optional field trip may be offered.

GEO 3173. Polar Regions and Climate Change. (3-0) 3 Credit Hours.  
This course covers properties, areal distribution, seasonal change and climatic change of the major constituents of the Polar Regions: the large ice sheets of Greenland and Antarctica; seasonal snow cover in the high and mid latitudes; sea ice covers in the Arctic, Southern Ocean and other seas; mountain glaciers from the tropics to the polar regions; and permafrost in the high latitude land areas of the Northern Hemisphere. How to examine these constituents will be presented with illustrative examples of monitoring of climate-induced changes in the Polar Regions using remote sensing and field investigations of processes and properties. Applications discussed will include: snow and ice covers as agents of geological change; snow and ice impacts as water resources in Asia and western North America, and global environmental impact through for example, effects on the earth’s radiation budget, and contributions to sea level change. Human impacts covered will include effects of ice covers of rivers and sea ice such as on petroleum extraction, transportation and navigation, frost and freezing damage to crops, and hazards of blizzards and avalanches.

GEO 3374. Geochemistry. (2-4) 4 Credit Hours.  
Prerequisites: GEO 1103, GEO 1111, CHE 1103, CHE 1121, and MAT 1093. A survey of geochemical processes and the distribution of elements in the earth. Application of geochemical methods and data to the solution of geologic problems. Includes geochemical laboratory experiments and use of analytical equipment. Incorporates use of standard computer software for analysis of geochemical data and graphing of results.

GEO 3383. General Geophysics. (3-0) 3 Credit Hours.  
Prerequisites: Completion of or concurrent enrollment in MAT 1224 and PHY 1623 or PHY 1963. This course examines the interrelated geology and physics of the Earth’s interior as deduced from earthquake seismology, gravity and magnetic fields, and the application of geophysical methods to the exploration of near-surface cultural and natural resources. Topics in archeological, environmental, and engineering geophysics will be explored through the methods of refraction seismology, electrical resistivity, electromagnetic induction, microgravity, and ground penetrating radar. Field trips may be required.

GEO 3393. Introduction to Isotope Geochemistry. (3-0) 3 Credit Hours.  
Prerequisites: GEO 1103, GEO 1111, CHE 1103, CHE 1121, and MAT 1093. The course includes a review of theories of nuclear structure, stability of nucleus, nucleosynthesis and origin of elements, and introduces both radiogenic and stable isotope geochemistry. Topics include radioactive decay schemes for tritium-helium, U-Pb, Rb-Sr, Sm-Nd, K-Ar, and U-Th-Pb-He systems; isotopic fractionations of stable isotopes of C, H, O, N, and S; and application of radiogenic and stable isotopes to petrology, evolution of the crust and mantle, geochronology, geothermometry, archaeology, ecology, hydrology, and paleoclimatic interpretation.

GEO 4013. Volcanology. (3-0) 3 Credit Hours.  
Prerequisite: GEO 3043 or consent of instructor. A survey of volcanoes and volcanic processes, including historically important volcanic eruptions and the prediction and mitigation of volcanic hazards. Field trips may be required.

GEO 4023. Engineering Geology. (3-0) 3 Credit Hours.  
Prerequisites: PHY 1963 (engineering majors only) or PHY 1943, and MAT 1214; or consent of instructor. Geologic factors in construction. Geotechnical properties of minerals, rocks, and soils. Case studies. Field trips may be required. (Formerly GEO 3023. Credit cannot be earned for both GEO 4023 and GEO 3023.).

GEO 4063. Environmental Geology. (3-0) 3 Credit Hours.  
Prerequisites: GEO 1103 and GEO 1111. An analysis of human interaction with geologic systems; the risks and effects of natural geologic hazards such as volcanic eruptions, earthquakes, and floods. Topics will include the effects of human activity on natural systems such as groundwater quality and recharge, river systems, and coasts. The meaning of “geologic repository” for human waste disposal and how the concept is applied will also be addressed.

GEO 4093. Principles of Remote Sensing. (2-2) 3 Credit Hours.  
Prerequisites: MAT 1073 or higher and PHY 1603 or PHY 1943. This course will provide a thorough introduction to remote sensing theory, technology, and application. The emphasis in this course is on understanding the underlying principles of acquiring, interpreting, and applying data from imaging systems covering the electromagnetic spectrum from the ultraviolet through the microwave. (Formerly ES 4093. Credit cannot be earned for both GEO 4093 and ES 4093.).
GEO 4113. Geomorphology. (3-0) 3 Credit Hours.
Prerequisites: GEO 1103 or GRG 2613, or consent of instructor, and junior or senior standing, and concurrent enrollment in GEO 4121.
Examination of landforms on the Earth’s surface and landscape-forming processes. Field trips may be required.

GEO 4121. Geomorphology Laboratory. (1-3) 1 Credit Hour.
Prerequisites: GEO 1103 or GRG 2613, or consent of instructor, and junior or senior standing, and concurrent enrollment in GEO 4113.
Interpretation of landforms and their formative processes from maps, aerial photographs, and calculations. Field trips may be required.

GEO 4623. Groundwater Hydrogeology. (3-0) 3 Credit Hours.
Prerequisites: GEO 1103, GEO 1111, PHY 1603 or PHY 1943, and MAT 1214. Hydrologic cycle and the occurrence and movement of groundwater. Recharge and discharge of aquifers; water quality; exploration and development of ground-water supplies. Field trips may be required.

GEO 4911. Independent Study. (0-0) 1 Credit Hour.
Prerequisites: Permission in writing (form available) of the instructor, the student’s advisor, the Department Chair, and the Dean of the College in which the course is offered. Independent reading, research, discussion, and/or writing under the direction of a faculty member. May be repeated for credit, but not more than 6 semester credit hours, regardless of discipline, will apply to a bachelor’s degree in geology.

GEO 4912. Independent Study. (0-0) 2 Credit Hours.
Prerequisites: Permission in writing (form available) of the instructor, the student’s advisor, the Department Chair, and the Dean of the College in which the course is offered. Independent reading, research, discussion, and/or writing under the direction of a faculty member. May be repeated for credit, but not more than 6 semester credit hours, regardless of discipline, will apply to a bachelor’s degree in geology.

GEO 4913. Independent Study. (0-0) 3 Credit Hours.
Prerequisites: Permission in writing (form available) of the instructor, the student’s advisor, the Department Chair, and the Dean of the College in which the course is offered. Independent reading, research, discussion, and/or writing under the direction of a faculty member. May be repeated for credit, but not more than 6 semester credit hours, regardless of discipline, will apply to a bachelor’s degree in geology.

GEO 4933. Field Geology Part I. (1-6) 3 Credit Hours.
Prerequisites: GEO 3103 and GEO 3111, or consent of instructor. Part I: Field mapping and measurements. Field trips are required. (Formerly GEO 4946. Credit cannot be earned for both GEO 4933 and GEO 4946.)

GEO 4943. Field Geology Part II. (1-6) 3 Credit Hours.
Prerequisite: GEO 4933 or consent of instructor. Part II: Field mapping and measurements. Field trips are required. (Formerly GEO 4946. Credit cannot be earned for both GEO 4943 and GEO 4946.)

GEO 4951. Special Studies in Geology. (1-0) 1 Credit Hour.
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 Studies may be repeated for credit when the topics vary, but not more than 6 semester credit hours, regardless of discipline, will apply to a bachelor’s degree.

GEO 4952. Special Studies in Geology. (2-0) 2 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 Studies may be repeated for credit when the topics vary, but not more than 6 semester credit hours, regardless of discipline, will apply to a bachelor’s degree.

GEO 4953. Special Studies in Geology. (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 Studies may be repeated for credit when the topics vary, but not more than 6 semester credit hours, regardless of discipline, will apply to a bachelor’s degree.

GEO 4961. Special Studies in Geology Laboratory. (1-3) 1 Credit Hour.
Prerequisite: Consent of instructor. An organized laboratory course offering the opportunity for specialized study not normally or not often available as part of the regular course offerings. Special Studies may be repeated for credit when the topics vary, but not more than 6 semester credit hours, regardless of discipline, will apply to a bachelor’s degree.

GEO 4993. Honors Research. (0-0) 3 Credit Hours.
Prerequisites: Enrollment limited to candidates for College Honors during their last two semesters; approval by the College Honors Committee. Supervised research and preparation of an honors thesis. May be repeated only once with approval.