GEOLOGY (GEOL)

See the Financial Information (https://catalog.wheaton.edu/financial-information) section of this catalog for course fees.

GEOL 201. Exploring the Dynamic Earth - Field. (4 Credits)
Introduction to geoscience in the field, focus on geological history of the SD Black Hills through on-site study of rocks, minerals, fossils, and earth processes as seen in rock strata, folds, faults, mountains, mines and other human impacts on the environment. Emphasis on field excursions and data collection procedures (topographic and geologic maps, sample collection, and feature interpretations). "Indoor" lab work supports the fieldwork. Field trip ($50 field trip fee). Offered only at the Science Station. Su.
Tags: SP

GEOL 211. Exploring the Dynamic Earth. (4 Credits)
Introduction to the physical properties and processes of the Earth with special emphases on the current practice of geology and its significant contributions to humans and the environment. Topics are presented in the plate tectonic framework to include minerals and rocks, igneous activity, earthquakes, rivers, ground water, glaciers, and energy and mineral resources. Field trip fee.
Tags: SP

GEOL 212. Introduction to Environmental Studies. (4 Credits)
See ENVR 221.

GEOL 306. Earth Resources and Environment. (2 Credits)
The application of geologic principles and knowledge to the development of natural resources (minerals and rocks, fossil and renewable fuels, air, water, and soil) and to the problems created by human occupancy and exploitation of the physical environment (solid and hazardous waste disposal, air and water pollution, land use management). Three hours lecture.

GEOL 307. Water: the Essential Natural Resource. (4 Credits)
An overview of our most important natural resource - water. Topics include occurrence, chemistry, physiological requirement for water, effects upon past and present civilizations, surface and groundwater flow, global water supply, water pollution, water exploration and extraction. Lab fee.
Tags: SIP

GEOL 308. Energy & Climate Change. (4 Credits)
Human use of energy and its predicted impact upon climate change. Review of the past and present use of global fossil fuel consumption as a possible cause of climate change. Study of past climate change since the ice age, present climate, basic meteorology, and future predictions of climate change forced by energy use and the resulting impact upon civilization. Arguments for and against global warming are evaluated with analysis through the science of climate change. Concludes with consideration of alternate energy sources to mitigate any effects of climate change. Lab fee.
Tags: SIP

GEOL 311. Geology of National Parks. (2 Credits)
Overview of geography, geology, and natural history of selected US National Parks. Examination of featured natural attractions, processes, and history, including stratigraphy, fossils, canyons, caves, glaciers, volcanoes, and mountains. Reflection on Christian environmental stewardship, philosophy and ethics of preserving wilderness areas and the role of National Parks in American culture. Three hours lecture. No prerequisite.

GEOL 321. Earth History and Stratigraphy. (4 Credits)
Basic principles of interpreting Earth history: geologic time, stratigraphic analysis, reconstructing past environments. Actualism, catastrophism and engagement with Christian theology in the historical development of geology. Overview of Earth history including origin of Earth-Moon, history of life, stratigraphic record and tectonic activity. Field trip fee and lab fee.
Tags: SIP

GEOL 332. Studies In Regional Geology. (1 or 2 Credits)
Geologic study in the field of a selected region during an excursion over spring vacation or in May following commencement. Learning emphasis is on structural and stratigraphic framework, interpretation of geologic history, and natural resources of the region. Assignments include background readings, participation in discussions in the field, and preparation of field notes. (Field trip fee varies by destination.) Prerequisite: GEOL 201, 211, or consent of instructor. (1 or 2, repeatable for a max. of 4)

GEOL 336. Process Geomorphology. (4 Credits)
The study of earth surface processes and the landforms they produce in the context of engineering and environmental applications. Topics include processes and landforms associated with: weathering, mass wasting, rivers, karst, neotectonics, glaciers, shorelines, and wind. Individual project and laboratory assignments required, including qualitative descriptions and quantitative measurements from topographic and geologic maps, and aerial photographs. Three hours lecture, three hours lab. Field trip fee and lab fee. Prerequisite: GEOL 201, 211, or consent of instructor. Alternate years.

GEOL 341. Quantitative Methods for Environmental Analysis and Problem Solving. (4 Credits)
See ENVR 341.
Tags: AAQR

GEOL 342. Fundamentals of Geochemistry. (2 Credits)
Principles and applications of Earth's chemical systems. Topics include low (aqueous) and higher temperature phenomena, crystal chemistry, trace-element distribution, isotopic and applied geochemical methods. Three hours lecture and three hours lab per week. Prerequisites: one introductory geology class (such as GEOL 201 or 211) and one semester of a chemistry lab class is recommended.

GEOL 343. Fundamentals of Mineral Science. (2 Credits)
A brief survey of theory and applications in mineralogy. Emphasis is on chemical classification, modes of occurrence, modern techniques of mineral identification, and utility. Three hours lecture and three hours lab per week. Prerequisites: GEOL 201, or 211. Alternate years.

GEOL 344. Genera. (4 Credits)
The study of igneous, and metamorphic rocks. Lecture sessions present petrogenesis and classification through topics such as lithification/diagenesis, magmatic phenomena, the role of temperature, pressure, and fluids, and plate tectonic settings. Laboratory projects include the identification of rock types and their variation, the significance of rock fabrics as observed in hand specimen and thin section, and the study of petrographic suites from classic localities. Three hours lecture, three hours lab. Field trip fee and lab fee. Prerequisite: GEOL 201, or 211. Suggested: GEOL 343. Alternate years.

GEOL 355. Introduction to Soil Science. (2 Credits)
Basic survey including the origin and properties of soils, their classification and applications to agriculture, third world development, engineering, environmental issues. Laboratory and field experiences will provide opportunities to observe soil profiles and measure physical properties. Three hours lecture and two hours lab. Field trip fee and lab fee. Alternate years.

GEOL 365. Physics of the Earth. (2 Credits)
Principles and applications of geophysics related to the study of the Earth's deep interior and geophysical prospecting. Topics include earthquake seismology, Earth's gravity, shape, magnetism, paleomagnetism, heat flow, temperature, and geodynamics. Also applied methods of seismic reflection and refraction, gravimetry, magnetism, electromagnetism, and resistivity. Three hours lecture plus two hours lab. Prerequisite: one four-hour physics laboratory course or permission of instructor. Alternate years. Lab fee.

GEOL 371. Introduction to Geographic Information Systems. (2 Credits)
The hardware and software technology of GIS programs. Basic concepts of spatial data collection, storage, processing, and interpretation, combined with remote sensing. Uses the popular GIS software ArcGIS. Three hours lecture, two hours lab. Lab fee.

GEOL 372. GIS Practicum. (2 Credits)
Application of GIS methods to student-designed projects. Hardware and software expertise derived from GEOL 371 (prerequisite). Two hours directed research, one hour discussion per week.

GEOL 375. Biogeology. (4 Credits)
Survey of paleontology and the history of life as interpreted from the fossil record. Topics include description and classification of fossil groups, functional morphology, evolution, biostratigraphy, and paleoecology. Field trips to study ancient life in the field and exhibits at the Field Museum, Chicago. Three hours lecture, three hours lab. Field trip ($35 field trip fee). Prerequisite: GEOL 201, 211, or 212, or BIOL 201 or 242.

GEOL 385. Topics in Earth Science. (2 or 4 Credits)
Selected topics from the following: economic geology, appropriate technologies, tectonics, and regional studies. Lectures or lecture/laboratory. Prerequisite: GEOL 201, or 211.

GEOL 388. Appropriate Technology, Development, and the Environment. (2 Credits)
Seminar course exploring the relationship of science with sustainable development practices, both domestic and in an international context. Course foundations are theological and philosophical with regard to cost/benefit analyses and project planning. Study/discussion topics are partly student chosen and may include water resources, agriculture, energy systems, mineral-resource extraction, coastal development, housing, waste and sanitation, and sustainable land-use practices. Lecture and discussion. No prerequisite. Does not fulfill a general education requirement.

GEOL 391. Environmental Modeling. (4 Credits)
See ENVR 391.

GEOL 412. Field Geology. (6 Credits)
The comprehensive exercise of geological field techniques and interpretation in the context of western South Dakota and the Rockies. Projects involve the preparation of maps and reports from diverse areas and of varying complexity. Offered only at the Science Station. Field trip fee and lab fee. Prerequisite: GEOL 443 or consent of instructor. Corequisite: must be taken with GEOL 413. Alternate years. Su

GEOL 413. Rocky Mountain Geology. (2 Credits)
Field geological study in the northern Rocky Mountains of South Dakota, Montana, and Wyoming. Observation of rock, strata, and structures in classic localities, including Black Hills, Devil's Tower, Big Horn and Bear Tooth Mountains, and Yellowstone and Grand Teton National Parks. Field trip fee. Corequisite: must be taken with GEOL 412. Alternate years. Su

GEOL 437. Hydrogeology. (4 Credits)
Basic processes and measurement of the hydrologic cycle, including: precipitation, evaporation, surface runoff, stream flow, soil moisture, and groundwater. Emphasis placed on groundwater, including: geology of occurrence, principles of flow, conceptual models of regional flow, chemistry and quality, well hydraulics, aquifer characteristics, resource development, detection of pollutants, and contaminant transport. Three hours lecture, three hours lab. Field trip fee and lab fee. Prerequisite: GEOL 201, 211, or consent of instructor. Alternate years.

GEOL 443. Structural Geology. (4 Credits)
Architecture of the dynamic earth. Earth movement and deformation in the context of plate tectonics. Laboratory simulation of stress and strain, study of deformed rocks, and interpretation of geologic maps; measurements and computations. Three hours lecture, three hours lab. Field trip fee and lab fee. Pre/Corequisite: GEOL 201 or 211. Alternate years.

GEOL 494. Senior Capstone Seminar for Geology Majors. (2 Credits)
Integration seminar for seniors or for juniors who have completed most geology requirements. Reading and discussion of history and philosophy of geological science and critical reflection of student's experience in Christian liberal arts education, understanding of vocation and ethical considerations of practice. Prerequisite: Completion of 16 credit hrs of GEOL courses.

GEOL 495. Problems In Geology. (1 to 4 Credits)
Independent study or research. Prerequisites: consent of instructor and department chairman.

GEOL 496. Internship. (1 to 4 Credits)
Supervised off-campus experience with departmental approval. Graded pass/fail. Prerequisite: junior or senior standing with Geology or Environmental Studies major. (credit variable)

Note: GEOL 306, GEOL 307, GEOL 308, GEOL 311 credit not applicable for Geology majors.