

# GEOLOGY (GEOL)

## GEOL 103 Our Dynamic Planet 3 Hours

Introduction to Earth's dynamic systems and processes and how their spatial dimensions affect people and the environment. This includes the atmosphere, hydrosphere, and lithosphere, and the interconnectedness of Earth's systems. Students are encouraged to think about the interdisciplinary nature of geoscience from examples emphasized throughout the course. **Colonnade/Statewide General Education Code E-NS | NS**

**Equivalent(s):** GEOG 103

*Recent Term(s) Offered: spring 2022; fall 2022; spring 2023; summer 2023; spring 2024; fall 2024*

## GEOL 106 Geology and Cinema 1.5 Hour

Examines how Hollywood depicts geology and geologists in movies. Addresses facts and fallacies in selected movies and in so doing explores basic geological processes and Earth materials. No credit for the Geology major or minor.

*Recent Term(s) Offered: None*

## GEOL 107 Backyard Geology 1.5 Hour

Applies basic geologic principles to local surroundings. Explains how geologic processes create local rock forms and structures. Field trips required. No credit for the Geology major or minor.

*Recent Term(s) Offered: None*

## GEOL 111 The Earth 3 Hours

The study of Earth including rocks, mineral resources, energy, soils, surface geologic processes, earthquakes and Earth's interior, global tectonics, hydrology, and environmental geology. Students electing to meet their general education laboratory requirement through GEOL 113 must simultaneously enroll in the GEOL 111 lecture course. Laboratory is required for Geology majors and some prospective science teachers, but is optional for most others. **Colonnade/Statewide General Education Code E-NS | NS**

*Recent Term(s) Offered: spring 2022; summer 2022; fall 2022; winter 2023; spring 2023; summer 2023; fall 2023; winter 2024; spring 2024; summer 2024; fall 2024*

## GEOL 112 Earth's Past and Future 3 Hours

Deep time study of Earth, life, and climate to understand how the planet - our only home - has changed in the past and what this means for the future of human species. Students electing to meet their general education laboratory requirement through GEOL 114 must simultaneously enroll in GEOL 112. Laboratory (GEOL 114) is required for Geology majors and some prospective science teachers, but is optional for most others. **Colonnade/Statewide General Education Code E-NS | NS**

*Recent Term(s) Offered: spring 2022; fall 2022; spring 2023; summer 2023; fall 2023; spring 2024; fall 2024*

## GEOL 113 The Earth Laboratory 1 Hour

Laboratory work designed to accompany GEOL 111. Minerals, rocks, topographic maps, geologic maps, streams, and groundwater are studied. This laboratory is required for Geology majors and some prospective science teachers, but is optional for most others. **Colonnade/Statewide General Education Code E-SL | SL**

**Prerequisite(s):** (GEOL 111 (may be taken concurrently) or GEOG 103 (may be taken concurrently) or GEOL 103 (may be taken concurrently))  
*Recent Term(s) Offered: spring 2022; summer 2022; fall 2022; winter 2023; spring 2023; summer 2023; fall 2023; winter 2024; spring 2024; summer 2024; fall 2024*

## GEOL 114 Earth's Past and Future Lab 1 Hour

Laboratory to accompany GEOL 112, which is a deep time study of Earth, life, and climate. This laboratory is required for Geology majors and some prospective science teachers, but is optional for most other students. **Colonnade/Statewide General Education Code E-SL | SL**

**Prerequisite(s):** GEOL 112 (may be taken concurrently)  
*Recent Term(s) Offered: spring 2022; fall 2022; spring 2023; fall 2023; spring 2024; fall 2024*

## GEOL 250 Environmental Geology 3 Hours

Survey of the geologic principles in relation to environmental problems arising from human actions. Topical environmental issues controlled by whole Earth processes, and the use of geologic knowledge in their remediation will be investigated. **Colonnade/Statewide General Education Code E-NS, E-SL | NS, SL**

*Recent Term(s) Offered: spring 2022; summer 2022; fall 2022; spring 2023; summer 2023; fall 2023; spring 2024; summer 2024; fall 2024*

## GEOL 270 Analytical Techniques in Geology 3 Hours

Basic analytical techniques used to examine and analyze Earth materials. Topics include precision and accuracy, sample preparation, contamination, calibration techniques, analysis of data sets. Note: Permission of instructor may be required.

**Prerequisite(s):** GEOL 111 and GEOL 112

*Recent Term(s) Offered: None*

## GEOL 301 Earth's Climate in Time 3 Hours

This paleoclimate course is a survey of Earth's past climate changes, the present state, and what these mean for the future of our planet – our only home. Factors and processes that influence Earth's climate over a variety of timescales are examined. Connections between climate and life are emphasized. **Colonnade/Statewide General Education Code K-SY**

**Prerequisite(s):** 21 hours of Foundations and Explorations Courses, or junior status

*Recent Term(s) Offered: fall 2022; fall 2023; fall 2024*

## GEOL 305 Earth System Science for Teachers 3 Hours

Engages students in Earth System Science (ESS) as an integrating method for teaching about the Earth. Primarily designed for undergraduate students who plan to become K-12 teachers, students use real-world examples in lessons they can adapt for their own future classroom use. Applicable towards a major in Geology only for those students seeking teacher certification.

**Prerequisite(s):** (GEOL 111 and GEOL 113) or (GEOL 112 and GEOL 114)

*Recent Term(s) Offered: spring 2023*

**GEOL 310 Global Hydrology 3 Hours**

An introduction to descriptive and quantitative hydrology. The hydrologic cycle, precipitation, evaporation, and transpiration will be covered under descriptive hydrology. Hydrographs, runoff relations, ground water, and storage routing will be covered under quantitative hydrology. Consideration is given to use and management of water as a resource.

**Prerequisite(s):** (GEOL 111 or GEOG 103 or GEOL 103)

**Equivalent(s):** GEOG 310

*Recent Term(s) Offered: spring 2023*

**GEOL 311 General Oceanography 3 Hours**

A course in basic fundamentals pertaining to the geological, chemical, physical and biological aspects of the marine environment. Topics for discussion include the topography, structure and history of the ocean basins and their margins, ocean waters and oceanic circulation, tides and waves, marine geochemistry, ocean sediments and sedimentation, near-shore geologic processes and the ocean as a biogeochemical system. The resources of the ocean and the influence of humans are also considered. Note: Permission of instructor may be required.

**Prerequisite(s):** GEOL 111 and GEOL 113

*Recent Term(s) Offered: spring 2024*

**GEOL 315 Energy, Climate and Carbon 3 Hours**

Energy, Climate and Carbon investigates our current reliance upon carbon-based sources of energy, the effect of fossil-fuel emissions on the environment and climate at local-to-global scales, and current efforts to limit fossil-fuel emissions and global climate change. The course is particularly focused on carbon-capture technologies, geological carbon sequestration and renewable energy resources. **Colonnade/Statewide General Education Code K-SY**

**Prerequisite(s):** (GEOL 111 or GEOL 112 or GEOL 103 or GEOG 103) and 21 hours of Foundations and Explorations Courses, or junior status

*Recent Term(s) Offered: None*

**GEOL 325 Introduction to Minerals and Crystalline Rocks 3 Hours**

The sight identification of minerals and crystalline rocks is stressed. The description, origin and classification, economic uses, and occurrences of the major mineral and crystalline rock groups are discussed. Appropriate rock and mineral specimens are examined in the laboratory.

**Prerequisite(s):** (GEOG 103 or GEOL 103 or GEOL 111) and GEOL 113

*Recent Term(s) Offered: None*

**GEOL 330 Mineralogy 4 Hours** (repeatable max of 4 hrs)

The systematic study of minerals. Includes crystallography, crystal chemistry, mineral stability, the classification of minerals, and the origin, characteristics and occurrences of the major mineral groups. Laboratory work includes crystal symmetry, mineral identification, and an introduction to the optical microscope. A field trip may be required. Note: One semester of college chemistry or permission of instructor required.

**Prerequisite(s):** GEOL 111 and GEOL 113

*Recent Term(s) Offered: None*

**GEOL 350 Mineralogy and Petrology 4 Hours** (repeatable max of 4 hrs)

The study of the origin, characteristics, formative processes, and classification of minerals, and igneous and metamorphic rocks. Their occurrence in relation to plate tectonics is stressed. Laboratory work includes mineral identification, and petrographic study of igneous and metamorphic rocks in hand specimen and in thin section. A field trip may be required.

**Prerequisite(s):** GEOL 111 and GEOL 113

*Recent Term(s) Offered: spring 2022; spring 2023*

**GEOL 360 Sedimentology and Stratigraphy 4 Hours**

Introduces sedimentary processes, including sediment origins, erosion, transportation, deposition, and diagenesis. Sedimentation patterns and stratigraphic architecture are studied in the context of depositional and tectonic settings.

**Prerequisite(s):** GEOL 112 and GEOL 114

*Recent Term(s) Offered: spring 2022; spring 2024*

**GEOL 380 Introductory Field Techniques 3 Hours**

Techniques of geological field work. Topics include sampling, rock identification and description, field notes, and the transition from field to laboratory analysis. Field work is required.

**Prerequisite(s):** GEOL 111 and GEOL 113

*Recent Term(s) Offered: spring 2022; fall 2023*

**GEOL 399 Research Problems in Geology 1-3 Hours** (repeatable max of 3 hrs)

Individual research projects are conducted under faculty supervision.

May be repeated with a change of content, but only 3 hours will be counted toward the major. A written report is required. Note: Permission of research project director.

*Recent Term(s) Offered: spring 2022; fall 2022; spring 2023; fall 2023; spring 2024; fall 2024*

**GEOL 405 Paleontology 4 Hours** (repeatable max of 4 hrs)

A basic course in paleobiology including the nature of the fossil record, preservation, basic factors and theories relating to the origin and development of living systems and the process of evolution, the species concept, systematics, and paleoecology. Major invertebrate taxa with a significant fossil record are also studied. Laboratory work includes the examination, description, and classification of fossil specimens. Note: Permission of instructor may be required.

**Prerequisite(s):** GEOL 112 and GEOL 114

*Recent Term(s) Offered: None*

**GEOL 408 Structural Geology 4 Hours** (repeatable max of 4 hrs)

This course introduces the mechanics, characteristics, occurrences, and resultant structures associated with the major processes of deformation of the earth's crust. Major structural regions of North America are discussed. The laboratory emphasizes graphical and mathematical solutions of structural problems. Field trip required.

**Prerequisite(s):** GEOL 111 and GEOL 113

*Recent Term(s) Offered: fall 2022; spring 2024; fall 2024*

**GEOL 415 Applied Environmental Geology 3 Hours**

The interrelationships of geologic processes, earth materials, and human activities. Assessment of geologic factors with respect to site selection, energy production, land use, waste disposal, planning, water resources, engineering practices, and the recognition and control of geologic hazards. Class exercises stress the application of geologic knowledge to specific environmental situations. Note: Permission of instructor may be required.

**Prerequisite(s):** GEOL 111 and GEOL 113

*Recent Term(s) Offered: fall 2022; fall 2024*

**GEOL 420 Geomorphology 3 Hours** (repeatable max of 3 hrs)

Systematic study of the processes that shape and modify Earth's landforms and landscapes in a variety of spatial and temporal scales. Coupling between climatic, biologic, tectonic, and human influences on landscape changes is examined.

**Prerequisite(s):** (GEOL 111 or GEOG 103 or GEOL 103)

**Equivalent(s):** GEOG 420

*Recent Term(s) Offered: spring 2023*

**GEOL 430 Optical Mineralogy 3 Hours**

A study of the optical constants and phenomena exhibited by and characteristic of crystalline mineral materials. Topics covered include the behavior of light in crystalline solids, the origin and nature of interference colors, refractive index, birefringence, optical character, and optical identification of minerals. Laboratory work concerns techniques employed with the petrographic microscope and the use of the microscope in mineral identification.

**Prerequisite(s):** GEOL 111 and GEOL 113

*Recent Term(s) Offered: None*

**GEOL 432 Diffraction and Spectroscopy 4 Hours**

Theory and experimental practices of modern analytical techniques for the analysis of crystal structures. Focuses on the study of crystallography, crystal chemistry, and their physical and chemical properties. Laboratory fee required.

**Prerequisite(s):** GEOL 111 and GEOL 113

*Recent Term(s) Offered: None*

**GEOL 440 Hydrogeology 3 Hours**

Origin, occurrence, and movement of ground water; water wells and aquifer evaluations; exploratory investigations; quality of ground water supplies; legal aspects.

**Prerequisite(s):** GEOL 111 or GEOL 103 or GEOG 103

*Recent Term(s) Offered: fall 2024*

**GEOL 445 Aqueous Geochemistry 3 Hours**

An introduction to geochemical processes of surface and ground water including concentrations of ions and organic compounds, chemical equilibria, and analytical techniques. Carbonate and clay minerals will be studied in detail.

**Prerequisite(s):** CHEM 120 and CHEM 121

*Recent Term(s) Offered: None*

**GEOL 455 Field Geology 1-6 Hours (repeatable max of 6 hrs)**

Geological field experiences in a variety of settings and locations, designed to teach the hands-on methods of fieldwork and data collection, and the preparation of geologic maps, cross sections and reports.

**Prerequisite(s):** (GEOL 111 and GEOL 113) or (GEOL 112 and GEOL 114) or permission of instructor

*Recent Term(s) Offered: None*

**GEOL 465 Geophysics 3 Hours**

The fundamentals of general and exploration geophysics. Topics include the origin of the earth and solar system, the earth's interior, geochronology, gravity and isostasy, seismology, the earth's heat, geomagnetism, upper atmosphere, continents and ocean basins, ridges and island arcs, and plate tectonics. The theory and applications of exploration geophysics are also covered, especially gravity, magnetic, and seismic methods. Note: One year of college physics or permission of instructor required.

**Prerequisite(s):** GEOL 111

**Equivalent(s):** PHYS 465

*Recent Term(s) Offered: spring 2024*

**GEOL 470 Tectonics 3 Hours**

A survey of recent and past global tectonic activities and environments, including mantle plumes and processes, rifted continental margins, oceanic ridges, subduction and transform zones, mountain building and landforms, tectonic geomorphology, and interplay between climate and tectonics. Tectonic implications of environmental changes, natural hazards, and natural resources are discussed.

**Prerequisite(s):** GEOL 111 or GEOL 103 or GEOG 103

*Recent Term(s) Offered: spring 2024*

**GEOL 475 Special Topics in Geology 1-3 Hours (repeatable max of 12 hrs)**

A lecture-discussion or supervised research course in which advanced or special topics in geology are considered in detail. Special topics courses may not replace required courses in the geology major/minor but may be applied as elective credit. Note: Permission of instructor required.

*Recent Term(s) Offered: spring 2022; spring 2023; fall 2023; summer 2024*

**GEOL 485 Geology of Fossil Fuels 3 Hours**

Formation of coal, petroleum, and natural gas including depositional setting, source materials, and processes of thermal maturation. Stratigraphic and structural relations, modes of occurrence, exploration techniques, and resource evaluation are emphasized. Field trip required. Note: Permission of instructor may be required.

**Prerequisite(s):** GEOL 111 or GEOL 112

*Recent Term(s) Offered: None*

**GEOL 490 Petroleum Geology 3 Hours**

Concepts of oil formation, source-rock evaluation, thermal maturation, and petroleum migration are reviewed. Emphasis is placed on characterization of petroleum reservoirs and traps and on the techniques employed by geologists in exploration for oil and gas accumulations. Field trip required.

**Prerequisite(s):** GEOL 111 or GEOL 112

*Recent Term(s) Offered: None*

**GEOL 499 Professional Preparation in Geology 2 Hours**

Professional career preparation in geology including senior assessment, resume writing, college-to-career transition, professional ethics, and selected seminar topics. Outside speakers from industry and academia will be included.

**Restriction(s):** Students with a semester level of Academy Junior, Academy Senior, Freshman, Junior or Sophomore may **not** enroll.

*Recent Term(s) Offered: fall 2022; fall 2023; fall 2024*