

# GEOLOGY (GEOL)

## GEOL 1500 Environmental Geology 4 s.h.

An introductory course that examines interactions between human society and our changing planet, the affects of natural/geologic hazards on humans, and anthropogenic (human-caused) impacts on nature, geology, and society. Three hours of lecture and two hours lab per week.

**Gen Ed:** Environ Sustain, Natural Science, Social and Personal Awareness.

## GEOL 1503 Rock Studio: Understanding Geology Through Lapidary Experiences 4 s.h.

A discussion and studio-based course designed to develop an understanding and appreciation of earth history, earth physical processes and the formation of rocks and minerals through combined class discussions and creative studio-based discovery experiences. Students learn fundamentals of geology and reinforce their understanding by creating interesting objects and artistic pieces from rocks, minerals and earth materials using a variety of cutting, polishing and basic lapidary equipment. Approximately 3 hrs lecture and 2 hours lab weekly over the course of the term.

**Gen Ed:** Natural Science.

## GEOL 1504 The Dynamic Earth 3 s.h.

An examination of earth as consisting of interrelated geologic systems which are dynamic and constantly changing. Includes study of surface, lithologic and tectonic systems.

**Gen Ed:** Natural Science.

## GEOL 1505 Physical Geology 4 s.h.

A study of the various physical and chemical processes acting on and within the earth, and their products within the context of plate tectonics and their relevance to humans and modern society. The laboratory component includes identification of minerals and rocks, and the interpretation of topographic and geologic maps. Three hours of lecture, two hours of lab per week.

**Gen Ed:** Natural Science.

## GEOL 1505H Honors Physical Geology 4 s.h.

Concepts of the earth as a dynamic planet, investigated through a variety of lectures, text and journal readings, and independent library-research assignments.

**Prereq.:** Eligibility for the Honors Program or consent of instructor.

**Gen Ed:** Natural Science.

## GEOL 1505L Physical Geology Laboratory 0 s.h.

Physical Geology Laboratory.

## GEOL 1508 Geology of Gemstones and Allied Minerals 3 s.h.

Formation, occurrence, and distribution of gem materials. Properties and identification of gem stones; factors affecting their value. Introduction to synthetic/artificial gem materials. Not applicable toward the geology major.

## GEOL 2600 Geology in the Field 1 s.h.

An experiential field-based course designed to expose students to a variety of geological sites and development projects. Two full day field trips with class room preparation are required.

**Prereq.:** GEOL 1505 or GEOL 1505H.

## GEOL 2602 Introduction to Oceanography 3 s.h.

Survey of geological, physical, chemical, and biological oceanography; description and distribution of properties and their relationship to circulation, shorelines, ocean features, sediments, organisms, and environments.

**Gen Ed:** Natural Science.

## GEOL 2605 Historical Geology 4 s.h.

An in depth study of the origin and evolution of the Earth and its systems and life forms throughout geologic time. The course is designed to develop student critical thinking skills through analysis of concepts and issues, and the integration of maps, lithologic information, and fossil information. Three hours lecture and two hours lab per week. Field trips are an integral part of the course.

**Prereq.:** GEOL 1505 and GEOL 1505L.

## GEOL 2611 Geology for Engineers 3 s.h.

Study of geologic principles, processes, and materials; focus on recognition of geologic factors as they apply to engineering operations and projects. Laboratory work includes examination of minerals, rocks, maps, and case histories. Two hours lecture, two hours laboratory per week.

**Gen Ed:** Natural Science.

## GEOL 2620 Intro to Natural Gas and Water Resources 3 s.h.

A survey of the history, science and technology of oil and gas exploration and production and water resource related issues with an emphasis on non-conventional production in the Appalachian Basin.

**Prereq.:** MATH 1513, CHEM 1516 and CHEM 1516L.

## GEOL 3700 Mineralogy 4 s.h.

The occurrence, composition, and crystallography of common and economically important minerals. Identification of minerals using physical, chemical, optical and x-ray properties. The theory and use of the polarizing microscope and its application to the study of crystalline material, including asbestos materials. Two hours lecture, four hours of lab per week.

**Prereq.:** CHEM 1515 (may be concurrent) and GEOL 2605.

## GEOL 3701 Geomorphology 3 s.h.

A study of landforms and the processes which create them, using aerial photographs, geologic maps, and topographic maps. The laboratory work emphasizes recognition and interpretation of landforms. Two hours lecture, two hours laboratory per week.

**Prereq.:** GEOL 2605.

## GEOL 3702 Glacial Geology 3 s.h.

A study of glacier types: their origin, movement, erosional/depositional contributions, and their relationship to various non-glacial features. Emphasis is on the Pleistocene glacial succession in North America. Field trips are an integral part of the course.

**Prereq.:** GEOL 2605.

## GEOL 3703 Geological Field Methods 2 s.h.

An experiential lecture and field-based course designed to expose students to sites of geological significance and to learn basic field geology methods including data collection, field notebooks, geological feature measurements, and precision surveying methods. The course requires two different two-day field trips with scheduled class meetings to prepare students for the field experiences.

**Prereq.:** GEOL 2605.

## GEOL 3704 Structural Geology 2 s.h.

Description and interpretation of geologic structures, mechanical properties; stress-strain relationships, regional structure of North America, and major tectonic theories. Geology majors must take GEOL 3704L concurrently with GEOL 3704.

**Prereq.:** GEOL 3701 and GEOL 3718.

## GEOL 3704L Structural Geology Laboratory 1 s.h.

Structural geology techniques and analyses, including orthographic solutions, stereographic projections, and interpretation of maps. Two hours lab per week.

**Prereq. or Coreq.:** GEOL 3704.

## GEOL 3705 Structures and Landscapes 4 s.h.

A study of earth surface features and their relationship to rock structure. One or more required field trips. Three hours lecture and three hours lab per week.

**Prereq.:** GEOL 3700.

## GEOL 3706 Geology of Economic Mineral Deposits 3 s.h.

A study of the occurrence, origin, and distribution of mineral deposits, with special attention to their economic use. Field trips are mandatory.

**Prereq.:** GEOL 3700.

## GEOL 3708 Geological Field Methods 2 s.h.

A course designed to develop skills and confidence in field-based sampling, data collection and analysis of results. Two one to two day field trips are required.

**Prereq.:** GEOL 2600 and 3718 or permission of instructor.

**GEOL 3709 Subsurface Investigations 3 s.h.**

An introduction to subsurface investigative methods that integrate principles of geophysics, geochemistry, interpretation of well logs and other bore hole data, outcrops and published information in the solution of actual geological problems. Two hours lecture, two hours lab per week. Students are expected to perform field work in addition to regularly scheduled class time.

**Prereq.:** GEOL 3701; MATH 1571 recommended.

**GEOL 3710 Petroleum Geology of the Appalachian Basin 3 s.h.**

A survey of the history, science and technology of oil and gas exploration and production within the Appalachian Basin of North America. Course content will focus on conventional and non-conventional exploration and production history, methods, technologies and production. Three hours lecture per week. Field trip mandatory.

**Prereq.:** GEOL 2605 or permission of instructor.

**GEOL 3711 Mineralogy 3 s.h.**

Advanced study of the occurrence, classification and processes that lead to the formation of minerals and the rocks and materials in which they occur. Emphasis is placed on the study of rock-forming minerals using physical, chemical and optical properties. Field trip required. Two hours lecture and two hours lab per week.

**Prereq.:** CHEM 1515 and CHEM 1515L (may be concurrent) and GEOL 2605.

**GEOL 3714 Principles of Paleontology 3 s.h.**

A detailed study of fossil invertebrates, including their origin, classification, paleoecology and stratigraphic utilization. Two hours lecture and two hours lab per week.

**Prereq.:** GEOL 2605.

**GEOL 3717 Petrology 3 s.h.**

A modern approach to understanding rocks within the context of plate tectonics and the use of rocks and minerals as natural resources in support of modern society. Emphasis is placed on investigating the formation, occurrence and classification of igneous, sedimentary and metamorphic rocks using physical, chemical and optical properties. Field Trip Required. Two hours lecture and two hours lab per week. Prereq. GEOL 3711 and CHEM 1516/1516L may be taken concurrently.

**GEOL 3718 Igneous and Metamorphic Petrology 4 s.h.**

An in-depth study of the petrogenesis of igneous and metamorphic rocks based on their chemical and petrographic characteristics. Three hours lecture, three hours lab per week.

**Prereq.:** GEOL 3700.

**GEOL 3720 Field Investigations in Geology 1-4 s.h.**

A field-based approach to the study of geologic concepts and problems. Class and travel supervised by the Geology faculty; location, duration of stay, hours, credit, and grading criteria dependent on the site and nature of the geologic concepts and problems investigated. The course may be repeated. A maximum of 4 s.h. may be applied toward Geology major requirements.

**Prereq.:** By permit only.

**GEOL 3750 Geoscience Seminar 1 s.h.**

Guest lecture and student presentation forum course designed to provide students with exposure to a broad range of topics and current research relevant to the geosciences. Course may be repeated.

**Prereq.:** GEOL 1505.

**GEOL 3755 Geological Research Methods and Data Analysis 3 s.h.**

This course introduces students to the design and execution project phases applied in the solution of real world geological problems. Emphasis is placed on the recognition of geological problems, the design and execution of research plans and experience with solution-based software commonly used in research and professional practice. Students are required to complete a geological research problem, submit a formal write up and provide an oral and/or poster presentation.

**Prereq.:** GEOL 3717.

**GEOL 3775 Research Methods for Undergraduates 1 s.h.**

This course introduces the student to the fundamental and practical aspects of conducting research. The course emphasizes the scientific method, research methodologies, literature review, writing research proposals, and how research results are presented. Learn the process of developing, funding and conducting research. This course must be taken prior to any undergraduate research.

**Prereq.:** junior or senior standing.

**GEOL 4804 Ground Water 3 s.h.**

A study of the geologic and hydrologic factors controlling the occurrence and behavior of water beneath the earth's surface. Two hours lecture, two hours lab per week.

**Prereq.:** GEOL 2605; MATH 1571 recommended.

**GEOL 4806 Engineering Geology 3 s.h.**

An introduction to the concepts of engineering geology with an emphasis on the relationship between geologic materials, construction of infrastructure and environmental issues. Topics include case studies that involve rock mass classification, soil classification, and material properties including strength, soil phase relationships, soil consolidation. Required field trip. Three hours lecture.

**Prereq.:** GEOL 2605 and MATH 1510/1510C and MATH 1511/1511C or permission of instructor.

**GEOL 4812 GIS Applications to Geology 3 s.h.**

This course covers a variety of geologic applications of GIS software; topics covered include: flood mapping, landslide hazard mapping, modeling soil erosion, watershed delineation, etc. Although you will be exposed to the basic functions of ArcGIS, the course is designed primarily to provide experience in obtaining, managing, interpreting, displaying, and presenting geo-spatial data in a meaningful context.

**Prereq.:** GEOL 3701, GEOG 2611.

**GEOL 4820 Water Pollution Control 3 s.h.**

Sources and prevention methods of water pollution, human activities and natural conditions that influence water quality, protection methods and regulations of water quality, contamination and remediation of groundwater.

**Prereq.:** GEOL 1505 or ENST 2600.

**GEOL 4824 Tectonics 3 s.h.**

Geodynamics and the workings of plate tectonics. Kinetics and dynamics of plate motion, plate driving forces, thermal structure of the earth, and thermal convection in the earth. Tectonic and structural features on the earth. Geophysical, stratigraphic and structural signatures of extensional rifting, strike-slip faulting, subduction zones, plate collisions and mountain belts.

**Prereq.:** GEOL 3704.

**GEOL 4825 Geophysical Well Log Analysis 3 s.h.**

An introduction to geophysical well logging, analysis, and interpretation applications in the oil and gas industry. Topics include well construction, drilling mud properties, and interpretation of gamma ray, SP, resistivity, sonic, neutron density, and cement bond logs.

**Prereq.:** GEOL 2620 or permission of instructor, GEOL 3704, PHYS 1502 or PHYS 2611 recommended.

**GEOL 4830 Senior Thesis 4 s.h.**

Designed to be completed during the student's senior year and is expected to be a significant research-based contribution to the geosciences. A typical senior thesis topic will support the research program of full-time GES faculty. Students may develop their own research topic provided they have the support of one or more full-time GES faculty.

**Prereq.:** Junior standing, minimum cumulative GPA of 3.0, submission of approved research proposal, permission of GES Chairperson.

**Gen Ed:** Capstone.

**GEOL 4899 Special Topics 1-3 s.h.**

Selected aspects of geology not covered in existing courses. Topics to be announced each time course is offered. May be repeated for different topics.

**Prereq.:** appropriate 3700- or 4800- geology course and permission of the chairperson.

**GEOL 5802 Sedimentology and Stratigraphy 3 s.h.**

The study and interpretation of sedimentary rocks, including physical characteristics, petrography, depositional environments, principles of correlation, and principles of basin analysis. Two hours lecture, two hours lab per week.

**Prereq.:** GEOL 3704.

**Gen Ed:** Capstone.

**GEOL 5805 Special Problems in Geology 1-4 s.h.**

An in-depth study of a specific problem in one of the branches of geology. The problem depends on the student's interest and qualifications and the equipment availability. A maximum of 8 s.h. may be taken.

**Prereq.:** 8 s.h. in Geology, consent of the department chairperson and instructor.

**GEOL 5810 Groundwater Resource Evaluation 3 s.h.**

Geologic and hydrologic interpretation of groundwater data with emphasis on regional groundwater resources, groundwater management, groundwater supplies, and design and construction of water wells.

**Prereq.:** GEOL 2605 or permission of instructor.

**GEOL 5815 Geology and the Environment 2 3 s.h.**

In-depth examination of earth processes, earth resources, and properties of earth materials as they relate to human activities, and their geologic consequences.

**Prereq.:** GEOL 2615 or ENST 2600.

**GEOL 5817 Environmental Geochemistry 3 s.h.**

An application of low-temperature aqueous geochemistry and geochemical computer modeling to environmental problems such as acid mine drainage, geochemical cycling of trace elements and nutrients, hazardous waste remediation, nuclear waste disposal, and surface and ground-water contamination.

**Prereq.:** GEOL 3700 and CHEM 1516.

**GEOL 6900 Geology Workshop 1-6 s.h.**

Intensive study and activity in a topic related to geology or geoscience education. May be repeated once. Grading is S/U.

**Prereq.:** Permission of instructor.

**GEOL 6901 Geology of Ohio and Pennsylvania 3 s.h.**

The geologic history and development of the rocks, structure, landforms, and mineral resources of Ohio and Pennsylvania.

**Prereq.:** GEOL 5802 or equivalent.

**GEOL 6910 Advanced Aquifer and Well Hydraulics 3 s.h.**

Computer-based test analyses; heat flow in the subsurface; and modeling of groundwater flow and contaminant transport.

**Prereq.:** Permission of instructor.

**GEOL 6950 Selected Topics in Geology 1-3 s.h.**

Addresses specific topics in geology. The topics may vary and will be announced prior to registration. The course may be repeated provided different topics are addressed.