

EARTH AND ENVIRONMENTAL SCIENCES

Program Overview

The earth and environmental sciences minor, offered by the Department of Geological, Environmental, and Marine Sciences (GEMS), introduces students to basic geological and environmental principles, as well as advanced topics that unite the two disciplines. This minor not only helps students analyze and learn more about the multitude of the earth's functions, but also what the ever-changing face of environmentalism says about society and how students can help promote positive environmental change.

Minor Offered

- Minor in Earth and Environmental Sciences

Contact

Kathleen M. Browne, Ph.D.
GEMS Chairperson
Science and Technology Center 324C
609-896-5408
browne@rider.edu

Program Website: GEMS (<http://www.rider.edu/gems>)

Associated Department: Department of Geological, Environmental, and Marine Sciences (GEMS)

Related Programs

- Environmental Sciences (<http://catalog.rider.edu/undergraduate/colleges-schools/liberal-arts-sciences/majors-minors-certificates/environmental-sciences>)
- Environmental Studies (<http://catalog.rider.edu/undergraduate/colleges-schools/liberal-arts-sciences/majors-minors-certificates/liberal-studies-environmental>)
- Geosciences (<http://catalog.rider.edu/undergraduate/colleges-schools/liberal-arts-sciences/majors-minors-certificates/geosciences>)
- Integrated Sciences and Math (<http://catalog.rider.edu/undergraduate/colleges-schools/liberal-arts-sciences/majors-minors-certificates/integrated-sciences-math>) (<http://catalog.rider.edu/undergraduate/colleges-schools/liberal-arts-sciences/majors-minors-certificates/liberal-studies-environmental>)
- Liberal Studies: Marine Ecological Emphasis (<http://catalog.rider.edu/undergraduate/colleges-schools/liberal-arts-sciences/majors-minors-certificates/liberal-studies-marine-ecological>)
- Marine Sciences (<http://catalog.rider.edu/undergraduate/colleges-schools/liberal-arts-sciences/majors-minors-certificates/marine-sciences>)

Requirements for the Minor

(23-24 credits)

Geosciences and Environmental Sciences majors may not select this minor.

Code	Title	Credits
ENV 100	Introduction to Environmental Sciences	4
GEO 100	Earth Systems Science	3
GEO 102	Earth Materials and Processes Lab	1
GEO 350	Soil and Surficial Processes	4
GEO 407	Hydrology and Water Resources	4
MAR 210	Marine Life Through Time	4
Electives		3-4
Select one of the following:		
ENV 200	Statistical and Computer Applications in the Natural Sciences	
ENV 205/GLS 205	Introduction to Geographic Information Systems	
ENV 220	Weather and Climate Change	
ENV 375	Environmental Biogeochemistry	
GEO 168	Mesozoic Ruling Reptiles	
GEO 201	Elements of Mineralogy	
GEO 306	Sedimentology and Stratigraphy	
Total Credits		23-24

ENV 100 Introduction to Environmental Sciences 4 Credits

Examines how ecosystems function, with emphasis on the interactions between biological organisms and their physical environment, and the chemical processes that govern these interactions. The impact of human populations on natural ecosystems is investigated in detail using case studies from history and current events. The laboratory provides for hands-on experiences and/or short field trips to local sites for a better understanding of many of the concepts discussed. Weekday and weekend field trips may be required. Three hours of lecture and one three-hour lab per week. This course counts towards the fulfillment of the Disciplinary Perspectives element of the CLAS general education curriculum.

Corequisite(s): ENV 100L.

ENV 100L Introduction to Environmental Sciences Lab 0 Credits

This lab is a co-requisite and must be taken with the corresponding course.

Corequisite(s): ENV 100.

ENV 200 Statistical and Computer Applications in the Natural Sciences 4 Credits

This course introduces important statistical concepts, their application, and the usage of computer technology relevant to biological, environmental, geological, and marine problems. Students will learn various graphical and statistical techniques and how to execute them on personal computers. The curriculum emphasizes the integrated nature of these techniques and their importance to meaningful data evaluation and representation. Laboratory exercises are designed to emphasize useful solutions to problems found in many scientific disciplines using computer-based methodologies. Three hours of lecture and one three-hour lab per week.

Corequisite(s): ENV 200L.

ENV 200L Statistical and Computer Applications in the Natural Sciences Lab 0 Credits

This lab is a co-requisite and must be taken with the corresponding course.

Corequisite(s): ENV 200.

ENV 205 Introduction to Geographic Information Systems 3 Credits

This course introduces the computer-based concepts and skills of Geographic Information Systems (GIS). It covers the basic GIS concepts, such as map characteristics and projections, spatial data models and analysis, and relational databases. It explores data sources, data quality, and metadata, as well as implementation and management of specific GIS projects. Hands-on experience with ArcGIS software is provided through a series of student exercises completed throughout the semester. Students will also be taught how to process both vector and raster data using ArcGIS software. The course is relevant for students from numerous disciplines in the natural sciences, social sciences, and business, which require the analysis and graphical representation of spatial data. Three hours of lecture per week. Note: This course is cross-listed as GLS 205. Students may not receive credit for both ENV 205 and GLS 205.

ENV 220 Weather and Climate Change 3 Credits

This course introduces students to the concepts of weather and climate change. These concepts frame a continuum from short-term or daily changes in the atmosphere (meteorology) to those changes averaged over much longer periods of time (climatology). Students will learn the fundamentals of weather forecasting, the causes of natural variation in the Earth's climate, and the impact of human actions on the Earth's climate. Connections will be drawn to other current issues in the Earth system, including land use change, biodiversity, and pollution. Three hours of lecture per week.

Prerequisite(s): GEO 100 or permission of instructor.

ENV 375 Environmental Biogeochemistry 3 Credits

This course examines the biogeochemical interactions among various environmental components, including water, rock, soil, organisms, and atmosphere. Covered topics focus on the relation between the biosphere and changes in the Earth's environment and atmosphere. The transfer of energy and nutrients within terrestrial ecosystems also is explored. Case studies from various examples will be used to understand ecosystem dynamics. Long-term environmental change and present-day ecosystem restoration activities are examined in the context of biotic offsets and land-use planning. The biogeochemical cycles of some environmentally sensitive compounds and elements in natural systems, such as pesticides, mercury, and lead, also may be examined. Three hours of lecture per week.

Prerequisite(s): GEO 100 or GEO 113, CHE 120, CHE 121, CHE 122, CHE 123.

GEO 100 Earth Systems Science 3 Credits

Investigates the major global processes that occur on Earth. These processes can be grouped into four major systems: atmosphere, hydrosphere, lithosphere, and cosmosphere. Each system interacts with and affects the other systems creating, in a sense, a single Earth process. With this approach, the student will view the Earth as a whole, and understand that the many seemingly separate components that make up this planet are, in fact, a set of interacting processes, that operate in cycles through time, within a single global system. Three hours of lecture per week. This course counts towards the fulfillment of the Disciplinary Perspectives element of the CLAS general education curriculum.

GEO 102 Earth Materials and Processes Lab 1 Credits

This lab course introduces students to the origin, identification, and significance of geologic materials, processes, and landforms. Hands-on experiences with mineral and rock specimens, topographic and geologic maps, and GPS and other data collection techniques are emphasized, along with field trip and in-lab observations, measurements, and interpretations. One three-hour lab per week.

Prerequisite(s): concurrent enrollment in, or prior completion of, GEO 100 or GEO 113 is required.

GEO 168 Mesozoic Ruling Reptiles 3 Credits

This course provides an introduction to the vertebrate groups that dominated the land (Dinosaurs), the seas (Mosasaurs, Plesiosaurs, Pliosaurus, Tylosaurus, and Ichthyosaurs) and the skies (Pterosaurs, Pterodactyls) during the Mesozoic Era (65-250 million years ago). Students study the diversity of skeletal architectures and their reconstructed function and the often controversial, inferred anatomy, physiology, reproductive strategy, habit, and social behaviors of these animals that are different from mainstream reptiles, birds, and mammals. They also learn about the paleogeographical, and paleoclimatological conditions that facilitated the evolutionary rise to dominance and diversification of these vertebrate groups and the debated causes of their eventual extinction. These topics also serve to illustrate how the scientific approach works and how competing hypotheses are evaluated. Three hours of lecture per week. Weekend field trips may be required. This course counts towards the fulfillment of the Disciplinary Perspectives element of the CLAS general education curriculum.

GEO 201 Elements of Mineralogy 4 Credits

The physical properties, chemistry, atomic structure, crystallography, uses, and environmental impacts of important minerals of the lithosphere and biosphere are presented. In addition, lab assignments and exercises emphasize crystal symmetry and chemistry; polarizing microscope, ICP, and x-ray analytical techniques; the graphical display and interpretation of compositional data; optical properties of isotropic and uniaxial minerals; and the identification of mineral hand specimens. Three hours of lecture and one three-hour lab per week. At least one weekend field trip required. Prerequisite(s): GEO 100 or GEO 113, CHE 120, CHE 121 taken prior or concurrently; or permission of instructor.

Corequisite(s): GEO 201L.

GEO 201L Elements of Mineralogy Lab 0 Credits

This lab is a co-requisite and must be taken with the corresponding course.

Corequisite(s): GEO 201.

GEO 306 Sedimentology and Stratigraphy 4 Credits

The principles of weathering, erosion, transportation, and deposition of sediment are the focus of this course. Sediment characteristics are examined to identify the processes involved in transporting grains and the specific environment in which the grains were deposited. Students will learn how to collect, analyze, and interpret sedimentary data and how to interpret surface and subsurface stratigraphic data using various techniques, such as lithostratigraphic, biostratigraphic, and geophysical, correlations. Field trips will expose students to different sedimentary environments and provide opportunities for students to learn how to conduct fieldwork. Three hours of lecture and one three-hour lab per week. Weekend field trips may be required. Prerequisite(s): GEO 100.

Corequisite(s): GEO 306L.

GEO 306L Sedimentology and Stratigraphy Lab 0 Credits

This lab is a co-requisite and must be taken with the corresponding course.

Corequisite(s): GEO 306.

GEO 350 Soil and Surficial Processes 4 Credits

This course examines the physical, chemical, hydrological, and biological aspects of soil and their relation to geomorphologic development.

Specific topics include descriptions of soil texture and structures, soil classification, soil colloids, soil redox and pH, and their effect on vadose zone water chemistry. Soil genesis and erosion controls, microbiology/ecology, nutrient cycles, and modern soil pollution from sludge and pesticide applications, as well as domestic and industrial chemical spills, also are discussed. The lab portion of the course introduces the basic techniques of soil analysis, both physical and chemical, and field survey methods. Three hours of lecture and one three-hour lab per week. Prerequisite(s): GEO 100 or GEO 113, and GEO 102.

Corequisite(s): GEO 350L.

GEO 350L Soil and Surficial Processes Lab 0 Credits

This lab is a co-requisite and must be taken with the corresponding course.

Corequisite(s): GEO 350.

GEO 407 Hydrology and Water Resources 4 Credits

This course introduces the principles that govern both surface water and groundwater flows that have applications to societal water needs. Surface water topics cover the basics of the hydrologic cycle, the processes of precipitation, evapotranspiration, runoff, and infiltration, and various factors affecting water supply and water quality issues in a modern watershed. Groundwater topics examine the principles that govern flow through a porous medium and the basics of well hydraulics under different pumping conditions that community development requires. Laboratory exercises will give students hands-on experience with the delineation of watersheds, analysis of precipitation data, and flow contaminant transport modeling. The field portion of the laboratory includes runoff and stream discharge measurements, as well as hydraulic conductivity estimations from both slug and pumping tests. Three hours of lecture and one three-hour lab per week. Prerequisite(s): GEO 100 or GEO 113, GEO 102, and MTH 105.

Corequisite(s): GEO 407L.

GEO 407L Hydrology and Water Resources Lab 0 Credits

This lab is a co-requisite and must be taken with the corresponding course.

Corequisite(s): GEO 407.

MAR 210 Marine Life through Time 4 Credits

Survey of the important developments in marine life over the last three billion years from the Pre-Cambrian evolution of one-celled organisms, through the Cambrian explosion of complex marine invertebrate life and subsequent diversification of backboned organisms in the Ordovician time, to the colonization of marginal marine and freshwater habitats in the Silurian-Devonian geological periods, and ultimately to extinctions during global crises of the late Devonian, Permian, Triassic, Cretaceous, and Pleistocene time intervals. The emphasis is on evolutionary adaptive breakthroughs within each phylum, particularly the significant morphological and anatomical innovations, and the subsequent radiation of these higher taxa into new habitats and niches through geologic time. Three hours of lecture and one three-hour lab per week.

Prerequisite(s): GEO 100 & GEO 102; or GEO 113 & GEO 102 (can be signed in to take 102 with 113); or ENV 100; or MAR 120 & MAR 121; or BIO 115; or BIO 116; or permission of instructor.