ENVIRONMENTAL SCIENCES

Program Overview

All Environmental Sciences majors will participate in extensive fieldwork, exploring a rich diversity of ecological environments and acquiring the knowledge and skills required for a wide range of potential careers. Depending on an individual student's area of interest, Environmental Sciences majors can study such subdisciplines as climate change, forest dynamics, coastal processes, cell and molecular biology, environmental biogeochemistry, organic and inorganic chemistry, plant ecology, or sustainability studies; the latter is available as a multidisciplinary (non-GEMS) minor program.

Curriculum Overview

Drawing on programs and faculty from the Departments of Biology, Chemistry and Physics, and Geological, Environmental, and Marine Sciences (GEMS), the Environmental Sciences program crosses social, political, and scientific boundaries.

Honors Program in Environmental Sciences

Graduation with honors in Environmental Sciences is awarded in recognition of majors who have demonstrated outstanding academic ability. Enrollment in the program is by invitation of the GEMS faculty. Eligibility requirements include a minimum GPA of 3.5 in courses required for the major and the satisfactory completion of a senior thesis. In addition, an honors candidate must maintain an overall minimum GPA of 3.0.

Degrees Offered

- B.S. in Environmental Sciences

Contact

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Program Website: Environmental Sciences (http://www.rider.edu/academics/colleges-schools/college-liberal-arts-education-sciences/science-programs/geological-environmental-marine-sciences)
Associated Department: Department of Geological, Environmental, and Marine Sciences (GEMS) (http://www.rider.edu/academics/colleges-schools/college-liberal-arts-education-sciences/science-programs/geological-environmental-marine-sciences)

Related Programs

- Earth and Environmental Sciences (http://catalog.rider.edu/undergraduate/colleges-schools/liberal-arts-sciences/majors-minors-certificates/earth-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)
- 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)

Environmental Sciences Major Requirements

(64-65 credits)

Code	Title	Credits
CLAS General Education Curriculum		
See CLAS General Education Curriculum Page (http://catalog.rider.edu/undergraduate/colleges-schools/liberal-arts-sciences/general_education_requirements)		
Geological, Environmental, and Marine Sciences		
ENV 100	Introduction to Environmental Sciences	4
ENV 200	Statistical and Computer Applications in the Natural Sciences	4
ENV 205	Introduction to Geographic Information Systems	3
ENV 220	Weather and Climate Change	3
GEO 100	Earth Systems Science	3
or GEO 113	Environmental Geology (also cross listed as GLS-113)	
GEO 102	Earth Materials and Processes Lab	1
GEO 350	Soil and Surficial Processes	4
GEO 407	Hydrology and Water Resources	4
Biology		
BIO 115	Principles of Biology I	4
BIO 116	Principles of Biology II	4
BIO 350	General Ecology	4
Chemistry		
BCH 225	Introduction to Organic and Biochemistry	4
CHE 120	Principles of Chemistry	3
CHE 121	Principles of Chemistry Lab	1
CHE 122	Intro to Chemical Systems	3
CHE 123	Quantitative Methods Lab	1
Physics		
PHY 100	Principles of Physics I	3
PHY 100L	Principles of Physics I Lab	1
Electives		
Select three courses from the following, one from each group:		10-11
Group A		
Biotic Processes		
BIO 272 & 272L	Intro to Marine Biology and Marine Biology Laboratory	
BIO 321	Microbiology	
BIO 335	Modern Plant Biology	
BIO 372	Behavior of Marine Organisms: Evolutionary Approach	
ENV 340	Environmental Field Methods and Data Analysis	

MAR 227	Introduction to Field Marine Science: Subtropical Environments	
MAR 228	Introduction to Field Marine Science: Boreal Environments	
MAR 229	Introduction to Field Marine Science: Tropical Environments	
MAR 360	Plankton Ecology	
Group B		
Abiotic Processes		
ENV 340	Environmental Field Methods and Data Analysis	
ENV 350	Principles of Environmental Toxicology	
ENV 375	Environmental Biogeochemistry	
GEO 201	Elements of Mineralogy	
GEO 306	Sedimentology and Stratigraphy	
MAR 330	Chemical Oceanography	
MAR 410	Physical Oceanography	
Group C		
Social Processes		
AMS 250	America and the Future	
AMS 304	Technology and Science in America	
BHP 231	Honors Sem: Natural Adventures	
BHP 232	Honors Seminar: Science and Politics of the Jersey Shoreline	
BHP 259	Honors Seminar: The Environment: a Conflict of Interest	
HIS 224	American Environmental History	
PHL 215	Environmental Ethics	
POL 215	Global Politics	
POL 328	Environmental Policy	
POL 329	Comparative Environmntl Policy	
SOC 225	Population Study	
Total Credits		64-65

Majors will also take either MTH 105 or MTH 210 to fulfill their math core requirement.

Upper-level MAR courses require MAR 120 and MAR 121 as prerequisites.

Academic Plan of Study

The following educational plan is provided as a sample only. Rider students who do not declare a major during their freshman year; who change their major; or those who transfer to Rider may follow a different plan to ensure a timely graduation. Each student, with guidance from his or her academic advisor, will develop a personalized educational plan.

Course	Title	Credits
Year 1		
Fall Semester		
CMP 120	Expository Writing [1]	3
BIO 115	Principles of Biology I	4
ENV 100	Introduction to Environmental Sciences	4
ENV 100L	Introduction to Environmental Sciences Lab	0
BIO 115L	Principles of Biology I Lab	0
MTH 105	Algebra and Trigonometry [1]	4
NCT 010	Freshman Seminar	0
	Semester Credit Hours	15
Spring Semester		
CMP 125	Research Writing	3
GEO 100	Earth Systems Science	3
GEO 102	Earth Materials and Processes Lab	1
Social Perspectives		3
Foreign Language		3
Aesthetic Perspectives: Fine Arts		3
	Semester Credit Hours	16
Year 2		
Fall Semester		
CHE 120	Principles of Chemistry	3
CHE 121	Principles of Chemistry Lab	1
ENV 200	Statistical and Computer Applications in the Natural Sciences	4
BIO 272	Intro to Marine Biology	3
BIO 272L	Marine Biology Laboratory	1
Foreign Language		3
	Semester Credit Hours	15
Spring Semester		
CHE 122	Intro to Chemical Systems	3
CHE 123	Quantitative Methods Lab	1
Social Perspectives		3
Philosophical Perspectives		3
Aesthetic Perspectives: Literature		3
Elective Course [2]		3
	Semester Credit Hours	16
Year 3		
Fall Semester		
PHY 100	Principles of Physics I	3
PHY 100L	Principles of Physics I Lab	1
ENV 205	Introduction to Geographic Information Systems	3
BIO 350	General Ecology	4
HIS 150	World History to 1500	3
	Semester Credit Hours	14
Spring Semester		
Select one of the following:		**4**
GEO 350	Soil and Surficial Processes	
GEO 407	Hydrology and Water Resources	
BCH 225	Introduction to Organic and Biochemistry	4
HIS 151	World History Since 1500	3
Environmental Science Elective from Group A, B, or C		3-4
	Semester Credit Hours	14-15
Year 4		
Fall Semester		
Five Elective Courses [2]		15
	Semester Credit Hours	15
Spring Semester		
Select one of the following:		**4**
GEO 350	Soil and Surficial Processes	

GEO 407	Hydrology and Water Resources	
Four Elective Courses [2]		12
	Semester Credit Hours	16
	Total Credit Hours for Graduation	121-122

Note: Natural and Physical Science core requirement included in major.

1 For course placement information see http://www.rider.edu/offices-services/orientation/course-placement

2 Please note that elective credits may be used to complete requirements in a second major or minor.

Courses and Descriptions

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 110 Future of Natural Resources 4 Credits
In this combined lecture and lab-based natural science course, students study the future of selected natural resources (e.g. water, fisheries, mineral resources) through readings, classroom activities, lectures and lab exercises about relevant science concepts, and research projects. The course work includes a study of the scientific process and how it can contribute to solutions to contemporary issues. Students monitor and reflect on how their experiences in class mimic the scientific process. Topics covered will include factors that influence real world decisions made about exploiting natural resources (e.g. political, economic, ethical factors). During the six hours of class meetings each week, lecture and lab components will be integrated. Field trips will be required. The course may be linked to an introductory political science course, however the design of each course will enable students to enroll in just one of the linked courses without experiencing any disadvantages to their success in either course. This course counts towards the fulfillment of the Disciplinary Perspectives element of the CLAS general education curriculum.

ENV 110L Future of Natural Resources Lab 0 Credits
This lab is a co-requisite and must be taken with the corresponding course.
Corequisite(s): ENV 110.

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 290 Directed Research and Study in Environmental Sciences 1-4 Credits
Provides an opportunity for freshman and sophomore students to gain hands-on research experience in the environmental sciences. This is an individual program of study and each student will work with a selected faculty member on a topic of mutual interest. The course consists of a combination of project meetings, supervised research, and guided readings. The focus will be on formulating research questions, designing and conducting experiments, collecting the necessary data, reviewing the scientific literature as it relates to each student's research topic in weekly meetings with the instructor, and communicating the findings by writing a final project report.

ENV 340 Environmental Field Methods and Data Analysis 3 Credits
This course will provide students with practical experience in field methods and data analyses within the environmental sciences. The course will include advanced activities incorporating field-based exercises, GIS analyses, statistical analyses, and database management. Students will also complete an independent project focused on a relevant topic. Local field trips during lab and on weekends may be required.
Prerequisite(s): MTH 105, GEO 100, GEO 102, and ENV 100; or Permission of Instructor.

ENV 350 Principles of Environmental Toxicology 3 Credits
A comprehensive description of the important principles of toxicology, including the absorption, distribution, metabolism, and excretion of toxic substances. Target organs systems will be discussed as well as mechanisms of carcinogenesis and teratogenesis. Specific groups of toxins to be discussed include: pesticides, metals, radiation, solvents and vapors, and plant and animal toxins. Three hours of lecture per week.
Prerequisite(s): BCH 225 or CHE 211, BIO 115 or BIO 117.

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 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.

ENV 480 Senior Thesis 3 Credits
A senior thesis is optional for environmental science majors. However, a senior thesis is required for eligibility to graduate with honors in environmental science. The topic for investigation will be chosen by the student in consultation with the faculty of the Department of Geological, Environmental, and Marine Sciences. The student must initiate consideration of a proposal to the Department. The proposal must contain a discussion of the proposed project and a timetable to be followed in the study. A departmental committee consisting of a major and minor advisor will evaluate the written paper submitted at the conclusion of the study. An oral presentation before the department at the conclusion of the semester in which the study is completed is required. Proposals must be submitted in final form no later than the end of the ninth week of the semester prior to the semester in which the study is undertaken.
Prerequisite(s): senior standing in the geosciences major and permission of instructor.

ENV 490 Independent Study: Research and Creative Expression 1-4 Credits
Immerses the student in field or laboratory research. The student learns to organize material, use the literature, make precise measurements, and obtain reproducible data. If possible, the student will publish the results or present them at a scientific meeting.

ENV 491 Internship in Environmental Sciences 1-4 Credits
A supervised work experience in an approved organization where qualified students gain real-world knowledge and utilize their academic training in a professional environment. Placements may be in private, public, non-profit, or governmental organizations. These can include consulting firms, regulatory agencies, advocacy groups, and educational or research institutions. Normally, 50 hours of internship per credit is required. A mutually agreed upon method of evaluation will be formalized prior to the approval of the internship by the sponsoring faculty and could include a term paper or project report and a poster presentation.
Prerequisite(s): 2.5 GPA and permission of instructor.

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 113 Environmental Geology 3 Credits
Examines the fundamental premise that "society exists by geologic consent subject to change without notice" by studying a number of important global geologic processes and cycles, and the hazards and/or resources they present to individuals, societies, and the natural environment. Topics discussed include earthquakes, volcanism, stream flooding, coastal erosion, global climate change, and global water, soil, mineral, and energy resources. Cost/benefit considerations, hazard mitigation concepts, economic and political ramifications, and interactions among the lithosphere, hydrosphere, atmosphere, and biosphere also are presented. The course is designed to give non-science majors a deeper appreciation and understanding of the basic scientific concepts involved, as well as individual and societal connections to the global geologic environment, leading to better, more informed business, political, policy, and personal decisions. This course counts towards the fulfillment of the Disciplinary Perspectives element of the CLAS general education curriculum. Note: This course is cross-listed as GLS 113. Students may not get credit for both GEO 113 and GLS 113.

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 120 Oceanography 3 Credits
In this course, students will investigate the geological, chemical, physical, and biological processes that shape the ocean. Emphasis will be placed on how these processes interact with each other and with human populations. These interactions influence important global phenomena that impact all our lives, including weather and climate, the distribution of marine organisms and other natural resources, and coastal processes. Understanding these phenomena will enable students to make more informed decisions and contribute to serious global marine issues. Students will learn through lectures, readings, practical experiences with real data, and hands-on exercises designed to foster a deeper understanding of the scientific process. This course counts towards the fulfillment of the Disciplinary Perspectives element of the CLAS general education curriculum. Note: This course is cross-listed as GLS 120. Students may not get credit for both MAR 120 and GLS 120.

MAR 121 Introductory Oceanography Lab 1 Credits
This lab course introduces students to the fundamental aspects of geological, chemical, physical and biological oceanography. Students learn through inquiry-based, hands-on exercises and activities using actual data collected in the lab and in the field. Independent projects and local field trips during lab and on weekends may be required. 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): MAR 120 or GLS 120 or as prerequisite(s).

MAR 227 Introduction to Field Marine Science: Subtropical Environments 4 Credits
In this two-week field course, students will explore various topics in marine science through practical, hands-on, inquiry-based exercises and activities. The course will focus on the biological, geological, chemical, and physical processes that influence diverse marine flora and fauna found in subtropical environments, emphasizing shallow subtidal and intertidal environments such as coral reefs, sandy beaches, turtle grass beds, rocky intertidal pools, and mangrove swamps. Examples of topics include the diversity, abundance, size, zonation, and morphological adaptations of marine organisms; the composition and texture of sediments; and the physical processes and chemical properties of water. These topics will be examined using field team exercises, a group mapping project, and individual research projects. Activities will help students develop their skills in research, use of field and laboratory equipment, computer analysis of data, and scientific writing. The course is taught at an appropriate marine field station located in a subtropical environment. Field portion of course is completed during the summer. Additional travel costs vary, depending on location.
Prerequisite(s): BIO 115 or BIO 116, and permission of instructor.

MAR 228 Introduction to Field Marine Science: Boreal Environments 4 Credits
In this two-week field course, students will explore various topics in marine science through practical, hands-on, inquiry-based exercises and activities. The course will focus on the biological, geological, chemical, and physical processes that influence diverse marine flora and fauna found in boreal environments, emphasizing the rocky shallow subtidal and intertidal environments. Examples of topics include diversity, abundance, size, zonation, and morphological adaptations of marine organisms; day-night fluctuations in tide pool chemistry; plankton dynamics; predator-prey relationships; the physical processes and chemical properties of water; and comparisons of wave-exposed and wave-protected sides of a shoreline. These topics will be examined using field team exercises, a group mapping project, and individual research projects. Activities will help students develop their skills in research, use of field and laboratory equipment, computer analysis of data, and scientific writing. The course is taught at an appropriate marine field station located in a boreal environment. Field portion of course is completed during the summer. Additional travel costs vary, depending on location.
Prerequisite(s): BIO 115 or BIO 116, and permission of instructor.

MAR 229 Introduction to Field Marine Science: Tropical Environments 4 Credits
In this two-week field course, students will explore various topics in marine science through practical, hands-on, inquiry-based exercises and activities. The course will focus on the biological, geological, chemical, and physical processes that influence diverse marine flora and fauna found in tropical environments, emphasizing the shallow subtidal and intertidal environments, such as coral reefs, sandy beaches, turtle grass beds, rocky intertidal pools, and mangrove swamps. Examples of topics include diversity, abundance, size, zonation, and morphological adaptations of marine organisms; the composition and texture of sediments; and the physical processes and chemical properties of water. These topics will be examined using field team exercises, a group mapping project, and individual research projects. Activities will help students develop their skills in research, use of field and laboratory equipment, computer analysis of data, and scientific writing. The course is taught at an appropriate marine field station located in a tropical environment. Field portion of course is completed during the summer. Additional travel costs vary, depending on location.
Prerequisite(s): BIO 115 or BIO 116, and permission of instructor.

MAR 330 Chemical Oceanography 4 Credits
Introduction to the chemical aspects of the oceans and their influence on marine ecosystems and Earth processes. Emphasis is placed on chemical and physical properties of seawater, atmosphere-ocean interactions, biogeochemical cycles with marine components, production and destruction of marine organic matter, chemical ecology, and marine pollution. During the lab portion of this course, students gain hands-on experience in analyzing ocean water samples, experimental design, and interpreting marine chemical data. Three hours of lecture and one three-hour lab per week. Weekend field trips and independent projects may be required. Prerequisite(s): CHE 120, CHE 121, MAR 120, and MAR 121; or permission of instructor.
Corequisite(s): MAR 330L.

MAR 330L Chemical Oceanography Lab 0 Credits
This lab is a co-requisite and must be taken with the corresponding course.
Corequisite(s): MAR 330.

MAR 360 Plankton Ecology 4 Credits
Examines the diversity, physiology, and ecology of marine phytoplankton and zooplankton. Students will survey the dominant plankton groups, their distribution, nutritional requirements, growth kinetics, and behavior. Planktonic predator/prey interactions and food web dynamics will be discussed. Students will also examine the interdisciplinary nature and role of plankton in biogeochemical cycles. Three hours of lecture and one three-hour lab per week. Weekend field trips may be required. Prerequisite(s): MAR 120 and MAR 121; or BIO 116.
Corequisite(s): MAR 360L.

MAR 360L Plankton Ecology Lab 0 Credits
This lab is a co-requisite and must be taken with the corresponding course.
Corequisite(s): MAR 360.

MAR 410 Physical Oceanography 3 Credits
Introduction to the physical aspects and processes of the oceans and their influence on marine ecosystems and Earth processes. Topics include distribution of salinity and water temperature and their effect on water movement, the oceanic heat budget, atmospheric and oceanic interactions, ocean currents including surface and deep water circulation, waves, tides, and medium- to small-scale circulation features. Throughout the course, emphasis is placed on how these physical processes affect the biology and chemistry of the ocean. Three hours of lecture per week. Weekend field trips may be required.
Prerequisite(s): MAR 120.

BIO 115 Principles of Biology I 4 Credits
An introductory biology course focusing on major themes of biology: what is life?; Cells as fundamental structure and functional unit of life; information transmission, storage and retrieval; Diversity and unity of life explained by evolution. Three hours of lecture and one three- hour lab per week.
Corequisite(s): BIO 115L.

BIO 115L Principles of Biology I Lab 0 Credits
This lab is a co-requisite and must be taken with the corresponding course.
Corequisite(s): BIO 115.

BIO 116 Principles of Biology II 4 Credits
An introductory biology course focusing on major themes of biology: Energy and matter to carry out life's essential functions; Interdependent relationships characterize biological systems (homeostasis, growth & development); Behavior of living things; Ecology and the environment. Three hours of lecture and one three-hour lab per week.
Corequisite(s): BIO 116L.

BIO 116L Principles of Biology II Lab 0 Credits
This lab is a co-requisite and must be taken with the corresponding course.
Corequisite(s): BIO 116.

BIO 272 Intro to Marine Biology 3 Credits
Introduces students to the study of marine environments, emphasizing the diversity, ecology, and physiology of marine animals, algae, and plants. Aspects of the human impact on marine environments are also discussed. Prerequisite(s): BIO 115 or BIO 116 or BNS 118 and grade of "C" or better.
Corequisite(s): BIO 272L.

BIO 272L Marine Biology Laboratory 1 Credits
This lab is a co-requisite and must be taken with the corresponding course.
Corequisite(s): BIO 272.

BIO 321 Microbiology 4 Credits
An introduction to the discipline of microbiology, with an emphasis on the biology of prokaryotes found in all the natural realms of our environment, including the oceans, soil, atmosphere, and extreme habitats. Emphasis will be placed on microbial diversity, fundamental microbial processes, and the continual interaction between microbes and the natural environment. Classical and modern methods of identification are introduced in the laboratory. Three hours of lecture and one three-hour lab per week. Some field trips are required. Prerequisite(s): BIO 115, BIO 116 with a grade of C or better in each course.
Corequisite(s): BIO 321L.

BIO 321L Microbiology Lab 0 Credits
This lab is a co-requisite and must be taken with the corresponding course.
Corequisite(s): BIO 321.

BIO 335 Plant Biology 4 Credits
Biology of seed plants, including growth, development, and reproduction of flowering plants. Emphasis is placed on acclimation and adaptations demonstrating environmental influences on plant structure and function. Current literature involving molecular mechanisms of control will be discussed. Three hours of lecture and one three-hour lab per week. One Saturday field trip. Prerequisite(s): BIO 115, BIO 116, CHE 122.
Corequisite(s): BIO 335L.

BIO 335L Modern Plant Biology Lab 0 Credits
This lab is a co-requisite and must be taken with the corresponding course.
Corequisite(s): BIO 335.

BIO 350 General Ecology 4 Credits
An investigation of the processes that regulate the distribution of plants and animals throughout the biosphere. Relationships among species and their interactions with the environment are stressed. Quantitative analyses of experimental results and current research in basic and applied ecology are discussed. Laboratory activities explore conceptual models using both field activities and computer simulations. Three hours of lecture and one three-hour lab per week. One Saturday field trip (laboratory time will be adjusted accordingly). Prerequisite(s): BIO 115, BIO 116, with a grade of "C" or better in each course.
Corequisite(s): BIO 350L.

BIO 350L General Ecology Lab 0 Credits
This lab is a co-requisite and must be taken with the corresponding course.
Corequisite(s): BIO 350.

CHE 120 Principles of Chemistry 3 Credits
For students who have successfully completed one year of high school chemistry. This systematic study of the fundamental principles and concepts of chemistry covers atomic structure, bonding, stoichiometric relationships, including solution and oxidation-reduction reactions, and molecular structure. Three hours of lecture per week. Prerequisite(s): High school chemistry or CHE 100 is recommended before taking this course.
Corequisite(s): CHE 121.

CHE 121 Principles of Chemistry Lab 1 Credits
For students concurrently taking CHE 120. Experiments involve gravimetric, volumetric, and spectrophotometric quantitative analysis. One three-hour lab per week. Fall.

CHE 122 Intro to Chemical Systems 3 Credits
A continuation of CHE 120. For students majoring in the sciences but may be taken by others. Chemical systems in which the study of kinetics, thermodynamics, equilibrium, and radiochemistry are emphasized. Three hours of lecture per week. Prerequisite(s): CHE 120, MTH 105 or higher.
Corequisite(s): CHE 123.

CHE 123 Quantitative Methods Lab 1 Credits
Usually taken concurrently with CHE 122. Primarily for students majoring in the sciences. A number of quantitative classical and instrumental methods of analysis are used to determine thermodynamic properties and reaction mechanisms. One three-hour lab per week. Prerequisite(s): CHE 121.
Corequisite(s): CHE 122.

BCH 225 Introduction to Organic and Biochemistry 4 Credits
An introductory course describing the basic principles of organic chemistry and biochemistry as they relate to human metabolism and disease. The nature of the chemical structure and reactivity of organic functional groups such as alcohols, aldehydes, ketones, carboxylic acids and amines will be presented with biological processes in mind. The biochemistry of the macromolecules DNA, RNA, proteins, carbohydrates and lipids will be discussed leading in to a discussion of some of the more important metabolic pathways. This course is intended for science majors who do not take the full two semester sequence of organic chemistry and two semesters of biochemistry and desire a background in biochemistry. Non-science major students who have had one semester of general chemistry and one semester of biology may also enroll in the course. Three hours of lecture and one three-hour lab per week. Prerequisite(s): CHE 120, CHE 121; BIO 115 or BIO 117.
Corequisite(s): BCH 225L.

BCH 225L Introduction to Organic & Biochemistry Lab 0 Credits
This lab is a co-requisite and must be taken with the corresponding course.
Corequisite(s): BCH 225.

PHY 100 Principles of Physics I 3 Credits
Introductory noncalculus physics with applications for pre-professional, biology, and geological, environmental and marine sciences majors. Classical mechanics, energy, mechanical waves, fluid statics and dynamics, thermodynamics. Elements of modern physics are interwoven with those of classical physics from the beginning. Not open to chemistry, physics, or mathematics majors. Three hours of lecture per week. Prerequisite(s): MTH 105, MTH 210, MTH 211 or MTH 212.
Corequisite(s): PHY 100L.

PHY 100L Principles of Physics I Lab 1 Credits
For students concurrently taking PHY 100. One three-hour lab per week.
Corequisite(s): PHY 100.

AMS 304 Technology and Science in America 3 Credits
An overview of the development and impact of technology and science on American institutions. Topics include innovation, economic growth, science and its relation to technology, social theory, and the politics of science.

BHP 231 Honors Seminar: Natural Adventures 3 Credits
Examines connections among environmental history, biology, and ecology. Human attitudes toward the natural environment are complex and have changed overtime, ranging from terror to exaltation from exploitation to preservation. Focus will be on the impact of changes in human land use and technology on natural ecosystems, exploring feedbacks between the two. Hands-on experiences will supplement readings from the primary literature both in science and history as well as literary explorations of nature.

BHP 232 Honors Seminar: Science and Politics of the Jersey Shoreline 3 Credits
Designed to acquaint the student with the scientific basis for evaluation of coastal problems and the political realities of funding and policy, focusing on the New Jersey Shoreline. Course topics will include consideration of waste disposal in ocean systems, depletion of ocean resources, physical and biological ramifications of human activities on the environment, and the political problems in dealing with mitigation of environmental stresses.

BHP 259 Honors Seminar: The Environment: a Conflict of Interest 3 Credits
Examines critical environmental issues such as global warming; food, water and energy resources; population trends; and global industrialization. Topics for context will include the origin of the elements, the origin of solar systems, and the origin of life as well as the basic principles of the current biotechnical revolution. Scientific understanding will be combined with knowledge about strategies for raising community awareness in order to (re)formulate public policy. In teams, students will be asked to define the problems; research available and prospective solutions; identify the technical, social, political, and economic constraints; and finally propose a workable strategy for making progress toward solutions.

HIS 224 American Environmental History 3 Credits
Surveys the history of the North American environment from pre-Columbian times through the 20th century. Topics include Native American uses of the environment; the reshaping of ecosystems under European colonization; U.S. frontier expansion; the ecological impact of industrialization and urbanization; and the rise of the environmental movement.

IND 316 Nature's Business 3 Credits
This interdisciplinary, team-taught, experiential learning course brings together various science, liberal arts, and business perspectives in examining the relationships among biological, social, environmental, economic, geological, and political issues. Topics to be discussed and researched by students can include, but are not limited to, ecotourism, sustainable development, biodiversity, local and regional environmental and historical geology, cultural norms, and the legal and political systems of the country being visited. The study tour component of the course provides students with a first-hand opportunity to observe and record field data from settings outside of the United States and in their discipline of interest. Typically, there are approximately 12 hours of pre-trip lectures, seminars, and/or faculty/student presentations during the fall semester, an international study tour, 9-14 days in length, during January (exact dates and length depend on the international location), and approximately three hours of post-trip meetings, seminars, and student presentations during the spring semester. Students enroll in the course during the spring semester. Note: This course is cross-listed as CBA 316; Students may not get credit for both CBA 316 and IND 316. For Business students who take the course as CBA 316, the course will count as a business course. If taken as IND 316, the Business student will receive credit as a liberal arts and science course.
Prerequisite(s): Permission of Instructor.

PHL 215 Environmental Ethics 3 Credits
A comprehensive introduction to environmental ethics that examines the major theoretical approaches, including anthropocentric (human-centered), zoocentric or sentientist (animal-centered), and biocentric or ecocentric (nature-centered) value systems, as well as the most important critiques of these ethical approaches. We will examine and analyze several classical ethical theories that are particularly relevant to a study of contemporary environmental controversies. We will also address specific issues such as biodiversity and wilderness preservation; human use of animals as food, entertainment, and research subjects; environmental racism and toxic dumping; sustainable development, population and consumption. Students will analyze and discuss the ethical dimensions of several contemporary environmental controversies. This course counts towards the fulfillment of the Disciplinary Perspectives element of the CLAS general education curriculum.

POL 328 Environmental Politics 3 Credits
Environmental Politics examines how policymakers deal with the political challenges of unsustainable resource consumption, which is a primary determinant of environmental problems such as climate change, adverse health effects, and biodiversity loss. The course introduces students to environmental politics and policies at the local, state, national, and international levels. The course is designed to provide students with a framework for understanding how varied interests compete within political institutions in order to transform contending ideas into public policy. With that in mind, students will not only become more informed consumers of political information, but will also become more effective at analyzing and advocating for policies as it relates to the environment.

POL 329 Comparative Environmental Policy 3 Credits
Comparative Environmental Policy analyzes cross-national approaches in developing, implementing, and evaluating policy responses to environmental problems. The course analyzes the political factors, actors, and tools that help and explain why some societies have been more likely to develop effective responses to environmental threats. Note: This course is cross-listed as GLS 329. Students may not get credit for both GLS 329 and POL 329.

SOC 225 Population Study 3 Credits
Demography; its definition, historical emergence, and growth; population as a social problem in developing and developed nations; population theories, sources and methods of demographic data, population composition, and distribution; demographic processes including fertility, mortality, and migration.
Prerequisite(s): SOC 101.