EES. EARTH AND ENVIRONMENTAL SCIENCES

EES-395/396. INDEPENDENT RESEARCH
Credits: Varies with topic. 1-3 credits.
Independent study or research of specific earth or environmental science topic at an advanced level under the direction of a departmental faculty member.
Click here for course fees.

Pre-Requisites
Upper class standing and approval of academic advisor, research advisor, and department chairperson.

EES-198/298/398. TOPICS IN EES
Credits: Varies with topic
Departmental courses on topics of special interest, not extensively treated in regularly scheduled offerings, will be presented under this course number on an occasional basis. May be repeated for credit.
Click here for fee for courses with a lab.

Pre-Requisites
Varies with topic studied.

EES-105. PLANET EARTH
Credits: 3
The nature of our planet and how it works are examined in the context of Earth as a constantly changing dynamic system. An emphasis on global scale processes and the interaction of humans and their physical environment is coupled with in-depth coverage of how science is done and the scientific principles that influence our planet, its rocks, mountains, rivers, atmosphere, and oceans. Major sub-topical areas in the Planet Earth series may include geology (Forces of Geologic Change), oceanography (The Restless Ocean), astronomy (The Cosmic Perspective), geography (Global Regions and Geography), and the relationship between people and their physical surroundings (The Global Environment). Intended for students who are not majoring in science, engineering, pre-pharmacy, nursing, or B.S. programs in mathematics or computer science. Two hours of lecture and two hours of lab per week.
Click here for course fees.

Pre-Requisites
No previous background in science or college-level mathematics is required.

EES-201. ENVIRONMENTAL ETHICS AND SUSTAINABILITY
Credits: 1
This course entails an examination of the central topics of environmental ethics and sustainability as viewed from the perspectives of science. Ethical and sustainability paradigms that all environmental scientists should be aware of will be studied. Course is delivered online.

Pre-Requisites
[EE-240] or permission of the instructor.

EES-202. BIOGEOCHEMISTRY
Credits: 3
Fundamentals of the circulation of materials through the earth’s air, soils, waters, and living organisms are examined from the perspective of introductory chemical principles. Global cycles of water, carbon, nitrogen, phosphorus, and sulfur are investigated in detail with emphasis on the roles of microorganisms, chemical equilibrium, and oxidation-reduction processes in biogeochemical cycling. Laboratory focuses on 1) student designed projects to gather data that illustrate key concepts in chemical weathering processes in aqueous solutions, oxidation-reduction reactions, and microbial mediation of elemental cycling and 2) building problem solving skills. Two hours of lecture and three hours of lab per week.
Click here for course fees.

Pre-Requisites
[CHM-115].

EES-210. GLOBAL CLIMATE CHANGE
Credits: 3
The nature and function of earth’s global climate are examined from a unified system perspective. Major questions focus on scientific versus public understanding of trends in global temperature, precipitation, and sea level. The course emphasizes negative and positive feedback processes that force key changes in the earth’s climate system: past, present, and future. Topics include fundamentals of global and regional heat and water balance, the role of elemental cycles in controlling climate (e.g., the carbon cycle), descriptive climate classification, long-term, short-term, and catastrophic climatic change (e.g., ice ages and bolide impacts), and human effects on climate (e.g., enhanced greenhouse, rising sea level). This course integrates a scientific understanding of climatic change and explores contemporary social and economic policy responses to change scenarios. Three hours of lecture per week.

EES-211. PHYSICAL GEOLOGY
Credits: 4
Description, analysis, and laboratory studies of earth materials, structure, and processes, including earth’s surface, interior, age, and origin. Three hours of lecture and three hours of lab per week. Requirements: For CS, Engineering, Math, and Science majors only. Cross listed with [GEO-211].
Click here for course fees.

Pre-Requisites
[EE-211] or permission of the instructor.

EES-212. HISTORICAL GEOLOGY
Credits: 3
A study of the geologic record of the earth’s formation and evolution, including methods of dating. Two hours of lecture and three hours of lab per week. Cross listed with [GEO-212].
Click here for course fees.

Pre-Requisites
[EE-211] or permission of the instructor.
EES-213. CLIMATE MODELING  
Credits: 1  
Students will utilize software to construct basic models of Earth Systems. No prior knowledge of the software is assumed or required. Weekly assignments will consist of computer-based modeling exercises, each progressively building upon previous assignments. Specifically, students will utilize software to construct relatively simple models of world population growth, fossil fuel consumption, the global carbon cycle, and the Earth’s energy balance. The final modeling exercise couples the population growth, carbon cycle, and Earth energy balance assignments in an effort to explore the effect of future population growth and carbon dioxide emissions on global mean temperature. Two hours of lab per week.

Co-Requisites  
[[EES-210]]

EES-218. ENVIRONMENTAL ETHICS  
Credits: 3  
An examination of the central problems of environmental ethics as viewed from the perspectives of science and of philosophy. The value of nature and ‘natural objects,’ differing attitudes toward wildlife and the land itself, implications of anthropocentrism, individualism, ecocentrism, and ecofeminism, bases for land and water conservation, and other topics will be examined within a framework of moral and scientific argument. Cross-listed with [[PHL-218]].

Pre-Requisites  
[[PHL-101]] or [[EES-240]] or permission of the instructor.

EES-230. OCEAN SCIENCE  
Credits: 4  
An interdisciplinary approach to the study of the fundamentals of oceanography emphasizing physical, chemical, and biological interrelationships. Three hours of lecture and three hours of lab. Requirements: For CS, Engineering, Math, and Science majors only  
Click here for course fees.

EES-240. PRINCIPLES OF ENVIRONMENTAL ENGINEERING & SCIENCE  
Credits: 4  
A study of physical, chemical, and biological components of environmental systems and a discussion of processes involved in water quality management, air quality management, waste management, and sustainability. Three hours of lecture and three hours of lab per week.  
Click here for course fees.

Pre-Requisites  
[[MTH-111]] or higher. Requirements For CS, Engineering, Math, and Science majors only.

EES-242. ENVIRONMENTAL HEALTH  
Credits: 3  
To provide students with an understanding of man’s impact on the environment and how those impacts can be controlled or mitigated. Students completing this course should be able to recognize environmental problems and understand control and preventative measures. Three hours of lecture.

Pre-Requisites  
Introductory physics and chemistry. Students who have taken [[EES-240]] will be admitted only with the consent of the instructor.

EES-251. SYNOPTIC METEOROLOGY  
Credits: 4  
Topics include surface and upper air weather systems, weather phenomena, climate, and local weather influences. Synoptic map analysis and interpretation are emphasized. Three hours of lecture and three hours of lab per week. Requirements: For CS, Engineering, Math, and Science majors only  
Click here for course fees.

EES-261. REGIONAL GEOGRAPHY  
Credits: 3  
Topics covered include maps and charts and basic elements of physical, cultural, historical, and economic geography as applied to specific geographic regions. Three hours of lecture per week.

EES-271. ENVIRONMENTAL MAPPING I: INTRODUCTION TO GPS AND GIS  
Credits: 3  
Information Systems (GIS), and environmental mapping concepts and applications. Topics include coordinate systems, reference ellipsoids, geodetic datums, map projections, history of GIS, relational database management, quality control, GIS as a decision support tool, and data manipulation, processing, and analysis. Practical field use of GPS is emphasized within the context of understanding system components, satellite signal processing, selective availability, base station differential correction, and data export to GIS. Geospatial data science is discussed within the context of real-world locational phenomena. Two hours of lecture and two hours of lab per week.  
Click here for course fees.
EES-272. ENVIRONMENTAL MAPPING II: ADVANCED GIS AND REMOTES SENSING  
**Credits:** 3  
**Terms Offered:** Spring  
An advanced course on Geographic Information Systems (GIS) and Remote Sensing. GIS topics build upon introductory-level coursework in EES 271, and introduce more advanced applications of GIS software such as density mapping and interpolation of point data (geostatistical methods), surface analysis and 3D modeling of environmental data, open source alternatives to ArcGIS, and web map development and design. Remote sensing topics include aerial and satellite visual imagery, digital image processing, photogrammetry, Light Detection and Ranging (LiDAR), and multispectral remote sensing systems and theory. The course will also include case studies of remote sensing and GIS techniques applied in environmental studies. Field use of GPS is emphasized, in addition to the use of small Unmanned Aerial Systems (sUAS) to capture aerial digital imagery. Laboratory component emphasizes practical skills and tools in achieving desired results in processing geospatial data, particularly raster data types. Two hours of lecture and three hours of lab per week. 
Click here for course fees.

EES-280. PRINCIPLES OF ASTRONOMY  
**Credits:** 4  
Topics include orbital mechanics, results of planetary probes, spectra and stellar evolution, and cosmology. Three hours of lecture and three hours of lab per week. Requirements: For Science majors only. 
Click here for course fees.

EES-302. SCIENCE RESEARCH AND COMMUNICATION  
**Credits:** 1  
The aim for this course is to provide students with the necessary foundation to think critically about scientific research and communication. The course introduces students to the (1) philosophy of science, (2) design, execution, and evolution of scientific projects, (3) exploration, evaluation, and management of scientific literature, (4) methods and ethics of scientific communication, and (5) proposal design for a project to be continued into Senior Project (EES/GEO 391/392) that includes a literature review, definition of research questions, objectives, or testable hypotheses, and the methods used to carry out the project. The broader social and political context in which scientific research is situated and must respond to and interact with is also explored. More than that, this course explores the important connections between research design and communication by having students focus on the application of learned theory and skills to projects with Senior Project advisor. 

**Pre-Requisites**  
Junior standing.

EES-304. ENVIRONMENTAL DATA ANALYSIS  
**Credits:** 2  
To acquaint students majoring in earth and environmental sciences with the techniques and methods of data acquisition and analysis, including environmental sampling methodology and data management. Emphasis will be placed on examination of real data sets from various areas of the earth and environmental sciences with particular emphasis placed on using and applying graphical and statistical procedures used in [[EES-391]]-392 (Senior Projects). Two hours of lecture per week.

**Pre-Requisites**  
[[MTH-150]] and Junior standing or permission of the instructor.

EES-340. CONSERVATION BIOLOGY  
**Credits:** 3  
This course will cover the major topics of conservation biology including an introduction to biodiversity, threats to biodiversity, and solutions to diminish extinctions and population declines. Lecture: three hours per week. Cross-listed with [[BIO-340]].

**Pre-Requisites**  
BIO 121-122, BIO 225-226 or permission of the instructor.

EES-341. FRESHWATER ECOSYSTEMS  
**Credits:** 3  
A study of the biological and ecological aspects of streams, lakes, and wetlands from a watershed perspective. An initial introduction to physical, chemical, and geological principles of limnology is followed by a focus on freshwater biology. Laboratories include field-based watershed investigations and lake management assessments using geographic information systems techniques. Cross-listed with [[BIO-341]]. Two hours of lecture and three hours of lab per week. Offered in alternate years. 
Click here for course fees.

**Pre-Requisites**  
[[EES-211]] or 240 or [[BIO-121]]-122 or permission of the instructor.

EES-343. MARINE ECOLOGY  
**Credits:** 3  
An examination of the biology of marine life within the context of modern ecological principles. The structure and physiology of marine organisms will be studied from the perspectives of adaptation to the ocean as habitat, biological productivity, and interspecific relationships. Emphasis will be placed on life in intertidal zones, estuaries, surface waters, and the deep sea. Two hours of lecture and three hours of lab per week. Cross-listed with [[BIO-343]]. Offered in alternate years. 
Click here for course fees.

**Pre-Requisites**  
[[EES-230]] and [[BIO-121]]-122 or permission of the instructor.
EES-344. ECOLOGY  
Credits: 4  
Ecology examines contemporary ecological thinking as it pertains to the interrelationships of organisms and their environments. Interactions at the population and community level are emphasized. Two hours of lecture and three hours of lab per week. Cross-listed with [BIO-344]. Offered in alternate years.  
Click here for course fees.

Pre-Requisites  
[[BIO-121]-122, 223-224, or permission of the instructor. 

EES-366. FIELD BOTANY  
Credits: 3  
This is a specialized summertime field course, which emphasizes a taxonomic, phylogenetic, and ecological survey of higher plants indigenous to Northeastern Pennsylvania. Due to the extensive field work, enrollment is somewhat more restricted than in other courses; therefore, written permission from the instructor is the primary prerequisite for those upperclassmen who wish to register for the course. Cross-listed with [[BIO-366]]. Offered in alternate years.  
Click here for course fees.

Pre-Requisites  
[[BIO-121]-122, 223-224, or permission of the instructor. 

EES-370. GEOMORPHOLOGY  
Credits: 3  
Land forms, their evolution, and the human role in changing the surface of the earth, utilization of geologic and hydrologic information, and field investigations. Two hours of lecture and three hours of lab per week. Cross listed with [[GEO-370]].  
Click here for course fees.

Pre-Requisites  
[[EES-211]]. 

EES-381. MINERALOGY  
Credits: 4  
Terms Offered: Not Currently Offered  
The systematic study of the major classes of the mineral kingdom utilizing the department's collection. Concepts in crystal chemistry, crystal structure, mineral behavior, crystallography and optical mineralogy are studied and advanced techniques in mineral analysis are used. Three hours of lecture and three hours of lab per week. Cross listed with [[GEO-281]].  
Click here for course fees.

Pre-Requisites  
[[EES-211]] and [[CHM-115]]. 

EES-382. PETROLOGY  
Credits: 3  
A study of the identification, classification, composition, genesis, and alteration of igneous, sedimentary, and metamorphic rocks and their relation to crustal processes and tectonic environments. Two hours of lecture and three hours of lab per week. Cross listed with [[GEO-282]].  
Click here for course fees.

Pre-Requisites  
[[EES-381]] 

EES-390. SENIOR PROJECTS I  
Credits: 3  
This course is presented seminar-style, focusing on Environmental Science topics relevant to current problems, trends, and news. The course serves as an open and constructive venue where students will have an opportunity to delve into themed topics and more holistically discuss environmental science issues. The theme of the course will change each term, but will remain within the Environmental Sciences: ecology, environmental chemistry, sustainability, climate change, hazardous waste, etc. Students are required to read and actively discuss scientific literature, assemble and analyze relevant data, formulate and criticize quantitative/qualitative theories, and explore case studies. Three hours of seminar per week. Requirement: students with senior standing only.  
Click here for course fees.

Pre-Requisites  
[[EES-391]] or department permission. (See the department for more details about the department permission.) 

EES-391. SENIOR PROJECTS II  
Credits: 1  
Design and development of selected projects in earth and environmental sciences and other related fields under the direction of a staff member. Technical as well as economical factors will be considered in the design. A professional paper and detailed progress report are required. Requirements: Senior standing in Earth and Environmental Sciences and department permission. (See the department for more details about the department permission.)  
Click here for course fees.

Pre-Requisites  
Department permission  

EES-392. SENIOR PROJECTS III  
Credits: 2  
Design and development of selected projects in earth and environmental sciences and other related fields under the direction of a staff member. Technical as well as economical factors will be considered in the design. A professional paper to be presented and discussed in an open forum is required.  
Click here for course fees.

Pre-Requisites  
[[EES-391]] or department permission. (See the department for more details about the department permission.)
EES-394. FIELD STUDY  
**Credits:** 1-3  
On-site study of an earth or environmental problem or situation incorporating field documentation and investigative techniques. May be repeated for credit when no duplication of experience results. One hour of lecture, plus field trips.  
[Click here for course fees.](#)  

**Pre-Requisites**  
[[EES-211]] and [[EES-240]].

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EES-399. COOPERATIVE EDUCATION  
**Credits:** 1-6  
Professional cooperative education placement in a private or public organization related to the student’s academic objectives and career goals. In addition to their work experience, students are required to submit weekly reaction papers and an academic project to a Faculty Coordinator in the student’s discipline. See the Cooperative Education section of this bulletin for placement procedures.

**Pre-Requisites**  
Sophomore standing; minimum 2.0 cumulative GPA; consent of the academic advisor; and approval of placement by the department chairperson.

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EES-498. TOPICS  
**Credits:** Varies with topic  
Departmental courses on advanced topics of special interest, not extensively treated in regularly scheduled offerings, will be presented under this course number on an occasional basis. Available for either undergraduate or graduate credit. May be repeated for credit.  
[Click here for fee for courses with a lab.](#)  

**Pre-Requisites**  
Senior or graduate standing