

NATURAL RESOURCES AND THE ENVIRONMENT (NRE)

NRE 1000E. Environmental Science. (3 Credits)

An introduction to basic concepts and areas of environmental concern and how these problems can be effectively addressed. Topics include human population; ecological principles; conservation of biological resources; biodiversity; croplands, rangelands, forestlands; soil and water conservation; pollution and water management; and wildlife and fisheries conservation.

Skill Codes: COMP: Environmental Literacy

Content Areas: CA3: Science & Technology

Topics of Inquiry: TOI4: Environmental Literacy, TOI6: Science & Empirical Inq

NRE 1235E. Environmental Conservation. (3 Credits)

Overview of the history of natural resource use and environmental conservation policy development from prehistoric to present times. Examination of the emergence of the 20th century conservation movement in North America and the transition to the environmental movement is used to highlight recurring environmental issue themes such as: private ownership vs. public trust doctrine; commercial trade in natural resources; development vs. protection; sustainability; and the role of society and governments in regulation. Through selected readings and case studies, students are challenged to begin development of their personal ethics regarding the development, conservation and protection of the environment.

Skill Codes: COMP: Environmental Literacy

Content Areas: CA1: Arts & Humanities

Topics of Inquiry: TOI3: Div, Equity, Soc Just, TOI4: Environmental Literacy

NRE 1250. Community Engagement for Environmental Action. (1 Credit)

Introduction to equitable and inclusive community engagement practices that support community-based environmental efforts. Relevant topics covered are principles of authentic community engagement, environmental education practices that promote collective environmental action, culturally relevant environmental education, trauma-informed care mentorship, and basic knowledge of local environmental issues. Student teams will plan, develop, and deliver a culturally relevant environmental education activity, with the potential of integrating it into an existing community-based extension program.

Enrollment Requirements: Not open for credit to students who have passed NRE 4695 when offered as Leadership in Community-Based Conservation.

NRE 2000. Introduction to Geomatics. (4 Credits)

Principles and applications of geographic information systems (GIS), global positioning system (GPS), and remote sensing. Students will be provided with the scientific knowledge and technical skills needed to collect and use spatial data effectively in a GIS.

NRE 2010. Natural Resources Measurements. (3 Credits)

Principles and instrumentation used in the measurement of environmental conditions and processes. Field trips required.

Enrollment Requirements: Open only to Natural Resources and Environmental Sciences majors, or by instructor consent.

NRE 2146. Climatology. (3 Credits)

Fundamentals of climatology: elements, processes, and mechanisms that govern or affect the climate and climate change, climatological theories and observations, climate across spatial and temporal scales, scientific methods for climatic analysis and applications. Formerly offered as NRE 3146.

Topics of Inquiry: TOI6: Science & Empirical Inq

NRE 2215E. Introduction to Water Resources. (3 Credits)

Introduction to surface and ground water resource assessment, development and management. Integration of scientific, legal, environmental and human factors that enter into developing and maintaining sustainable water resources. Examines current and future plight of water shortages and water quality issues here and abroad. Three class periods and two field trips (two virtual field trips if taken online).

Enrollment Requirements: Open to sophomores or higher. Recommended preparation: NRE 1000 and EARTH 1050.

Skill Codes: COMP: Environmental Literacy

Topics of Inquiry: TOI1: Creativity: Des, Expr, Innv, TOI4: Environmental Literacy

NRE 2345. Introduction to Fisheries and Wildlife. (3 Credits)

An introduction to the basic principles used in the management of wildlife and fish populations, their habitats and ecosystems, and their human stewards. Students will be introduced to the fundamental concepts, topics, and skill sets that are commonly needed in the wildlife and fisheries profession.

NRE 2415. Trees and Forests. (3 Credits)

Introduction to trees and forests and their role in the global ecosystem and human society. Distribution and characteristics of forest types across the globe. The response of forests to global change and their value in mitigation of environmental change and its effects on humans. Taught concurrently with SANR 215.

Enrollment Requirements: Recommended preparation: BIOL 1108 or 1110. May not be taken out of sequence after passing NRE 3500 or 4475.

NRE 2416. Trees and Forests Lab: Dendrology. (1 Credit)

Field-based introduction to taxonomy, silvics, and distribution of trees and shrubs of the United States with emphasis upon Northeastern species. Field trips will be required. Taught concurrently with SANR 216.

Enrollment Requirements: Instructor consent.

NRE 2455. Forest Ecology. (3 Credits)

Forest structure and functional processes and their relation to physical environment (light, temperature, water, soil); the influence of time (succession, disturbance, stand dynamics) and space (landscape ecology, ecosystem management). Laboratory will be in the field or computer lab.

Enrollment Requirements: Recommended preparation: NRE 2415, which may be taken concurrently.

NRE 2550. Nature-based Outdoor Recreation Resource Management. (3 Credits)

Overview of major issues, concepts, theories, and management approaches related to nature based outdoor recreation and its management. Introduces a historical overview, the role of various agencies and interest groups, current stakeholder issues, impacts of recreation, and contemporary management approaches for addressing topics such as satisfaction, crowding, and conflict.

Enrollment Requirements: Recommended preparation: Prior coursework in environmental science, environmental studies, natural resources, or a related field.

NRE 2600E. Global Sustainable Natural Resources. (3 Credits)

Sustainable management of natural resources across cultural, political, and ecological boundaries. Topics include marine and fresh waters, forests, food production, and urban development.

Skill Codes: COMP Environmental Literacy

Content Areas: CA4INT: Div & Multi - Intl

Topics of Inquiry: TOI4: Environmental Literacy, TOI5: Indiv Values Soc Inst

NRE 3000. Human Dimensions of Natural Resources. (3 Credits)

Understanding the diverse perspectives of stakeholder groups involved in natural resources management. Analysis of decision-making behaviors based on social, psychological, and motivational factors; communication tools for working with stakeholder groups; and conflict resolution will be covered.

Enrollment Requirements: Open to juniors or higher.

NRE 3105. Wetlands Biology and Conservation. (3 Credits)

An exploration of wetland science, an interdisciplinary field at the interface of terrestrial and aquatic ecology, chemistry, hydrology and engineering. The course emphasizes biological, physical, chemical, and ecological aspects of major wetland ecosystems, and addresses ecosystem services, classification, legal protection of wetlands, drivers of change, and wetland restoration and management.

Enrollment Requirements: Recommended Preparation: BIOL 1107 or 1108 or consent of instructor.

NRE 3115. Air Pollution. (3 Credits)

The atmospheric effects and controls of air pollution and air quality, air pollution emissions and assessments, and impacts of atmospheric air pollutants.

Enrollment Requirements: Open to juniors or higher. Recommended preparation: NRE 3145 or 3146.

NRE 3125. Watershed Hydrology. (3 Credits)

Fundamental hydrologic processes, water balances, precipitation analyses, infiltration, soil water, evapotranspiration, open channel flow, discharge measurements, and analysis, flow frequencies, ground water-surface water interactions, runoff processes and prediction. Problem oriented course requiring use of computer spreadsheets.

Enrollment Requirements: Open to juniors or higher. Recommended preparation: NRE 2010.

NRE 3145. Meteorology. (3 Credits)

A survey course in meteorology at the introductory level covering weather and climate processes.

Enrollment Requirements: Open to juniors or higher.

NRE 3150. Green Stormwater Infrastructure Practices. (3 Credits)

Design specifications, installation processes, and maintenance of bioretention/rain gardens, pervious pavements, and green roofs will be covered. Stormwater retrofit analysis for municipalities will be introduced.

Enrollment Requirements: Recommended preparation: NRE 3125.

NRE 3185W. Wetland Techniques. (4 Credits)

Wetland research techniques and skills associated with wetland delineation. Field, lab, and data analysis techniques commonly used by wetland professionals, including experience in data collection, analysis, interpretation, and written presentation. Field trips to implement field methods used to quantify wetland vegetation, soils, and hydrology.

Enrollment Requirements: STAT 1000Q or higher; ENGL 1007 or ENGL 1010 or 1011; NRE 3105.

Skill Codes: COMP Writing Competency

NRE 3201. Conservation Law Enforcement. (3 Credits)

Basic pre-professional course for majors in natural resource conservation and related disciplines. Recommended for persons considering a career in wildlife, fisheries, law enforcement, or other natural resource conservation and management disciplines.

NRE 3245E. Environmental Law. (3 Credits)

An overview of environmental law including the common law principles of nuisance, negligence, and trespass. Students will become acquainted with legal research techniques; emphasis will be on federal, state, and municipal programs addressing clear air, clean water, hazardous waste, inland wetlands, coastal zone management, and prime agricultural farm land and aquifer protection.

Enrollment Requirements: Open to juniors or higher.

Skill Codes: COMP Environmental Literacy

Topics of Inquiry: TOI4: Environmental Literacy

NRE 3250W. Contaminants in the Environment. (3 Credits)

Types and sources of environmental contaminants that threaten the integrity of aquatic and terrestrial ecosystems and the quality of natural resources; how contaminants cycle and distribute within and among ecosystems; and approaches for monitoring contaminant burdens in areas of concern. Experience in the written presentation of environmental contaminants data for broad and scientific audiences, including a focus on the process of writing and on writing skills development.

Enrollment Requirements: ENGL 1007 or 1010 or 1011. Recommended preparation: CHEM 1122 or 1124Q or 1131Q and EEB 2244E.

Skill Codes: COMP Writing Competency

NRE 3265. Sustainable Urban Ecosystems. (3 Credits)

Evaluating the state of the knowledge about natural resources in urban systems from the perspectives of natural science and social science. Exploring the complexity of managing ecosystems in and in relation to urban environments.

Enrollment Requirements: Recommended preparation: prior coursework in environmental conservation.

NRE 3275. Recreational Trails: Design, Construction, and Management. (3 Credits)

This course provides an overview of sustainable, natural surface trail design principles and best practices. Students will learn to plan, construct and maintain trails in a variety of environmental settings. Coursework includes trail planning, field design and layout, assessing trail conditions, and working with hand-tools outside. This course will also provide students with a foundation for understanding the trail experience, as well as a natural resources management perspective towards using recreational trails for public outdoor recreation.

Enrollment Requirements: Open to sophomores or higher.

NRE 3305. African Field Ecology and Renewable Resources Management. (4 Credits)

An intensive, field oriented methods course conducted primarily in South Africa at the Basil Kent Field Station, Great Fish River Reserve in collaboration with the University of Fort Hare. An introduction to South Africa culture and history, ecology, and natural resources is provided in weekly meetings during the semester. This is followed by three weeks in the field in South Africa. Topics covered include vegetation and faunal surveys, data collection and analysis, biodiversity monitoring, and conservation management. A research paper relating to an independent study conducted by the student in the field is required.

Enrollment Requirements: Recommended preparation: EEB 2244.

Content Areas: CA4INT: Div & Multi - Intl

NRE 3335. Wildlife Management. (3 Credits)

Brief review of wildlife conservation and ecological principles; management of wetlands, farmlands, rangelands, and forest lands for wildlife; programs dealing with exotic, urban, nongame, and endangered wildlife; contemporary economic, administrative, and policy aspects of management.

Enrollment Requirements: NRE 2345. Recommended preparation: Prior course work in ecology.

NRE 3345. Wildlife Management Techniques. (4 Credits)

Design and implementation of projects for wildlife research and monitoring that address conservation and management issues. Topics include capture and handling of animals, population estimation, wildlife-habitat relationships, resource selection, and space use. This course is designed for pre-professional students and meets professional certification requirements. One or more field trips will be required.

Enrollment Requirements: NRE 2345; open to junior or higher Natural Resources majors, others by instructor consent. Recommended preparation: STAT 1100; MATH 1060, and MATH 1110 or higher; and EEB 2244E.

NRE 3345W. Wildlife Management Techniques. (4 Credits)

Design and implementation of projects for wildlife research and monitoring that address conservation and management issues. Topics include capture and handling of animals, population estimation, wildlife-habitat relationships, resource selection, and space use. This course is designed for pre-professional students and meets professional certification requirements. One or more field trips will be required.

Enrollment Requirements: NRE 2345; ENGL 1007 or 1010 or 1011; open to junior or higher Natural Resource majors, others by instructor consent. Recommended preparation: STAT 1100Q; MATH 1060Q and MATH 1110 or higher; and EEB 2244E.

Skill Codes: COMP. Writing Competency

NRE 3385W. Fisheries Techniques. (3 Credits)

Techniques used in fisheries science to manage and conserve wild populations of fishes (and select bivalves and crustaceans). Topics include sampling design, gear selection, gear bias, animal capture and handling, habitat measurement and characterization, population estimation, commonly used data analyses, and scientific report writing. Laboratory meetings are often held outside at local waterbodies. Course is designed as a pre-professional experience for students interested in fisheries careers, and counts towards individual certification requirements set by the American Fisheries Society.

Enrollment Requirements: STAT 1000Q or higher, ENGL 1007 or 1010 or 1011; open to junior or higher Natural Resources majors, others with instructor consent.

Skill Codes: COMP. Writing Competency

NRE 3390. South African Ecosystems and Diversity. (4 Credits)

(Also offered as EEB 3390.) Taught in South Africa. Understanding South Africa's diverse ecosystems with an emphasis on savannas. Classroom instruction and fieldwork in Kruger National Park, South Africa. Form and function of individual organisms and ecosystems. This course is offered in partnership with the Organization for Tropical Studies.

NRE 3425. Fundamentals of Arboriculture. (3 Credits)

Theory, science, and practice of evaluating, growing, managing and safe removal of trees within or in built environments. Laboratories are field-based and will take place in outdoor conditions. Taught with SANR 325.

Enrollment Requirements: Recommended preparation: NRE 2415.

NRE 3490. Conservation, Biodiversity, Management, and Protected Area Design in South Africa. (4 Credits)

(Also offered as EEB 3490.) Study abroad in South Africa. History of conservation biology as a science and practice. Emphasis on the links between pattern and process, strategies and tools available to conservationists to maintain biodiversity; the relationship between biodiversity and ecosystem functioning and debates on the maintenance of biodiversity in human-dominated landscapes. This course is offered in partnership with the Organization for Tropical Studies.

NRE 3500. Silviculture: Applied Forest Ecology. (4 Credits)

Application of ecological principles in promoting forest establishment, composition, health, and growth. Study of cultural treatments that maintain and enhance desired benefits from the forest on a sustainable basis, with an emphasis on the diverse needs and values of landowners and society.

Enrollment Requirements: NRE 2415; recommended preparation: NRE 2455.

NRE 3535. Remote Sensing of the Environment. (3 Credits)

The principles of the interpretation of remote sensing imagery acquired from aircraft and satellite platforms will be studied. Applications of remote sensing to natural resources and the environment will be discussed.

Enrollment Requirements: Open to juniors or higher. Recommended preparation: NRE 2000 or equivalent.

NRE 3690. Field Study Internship. (1-6 Credits)

Designed to acquaint students through actual work experience with research and management activities not available on campus. Students will work with professionals in an area of concentration. Student evaluation will be based upon the recommendation of the field supervisor and a detailed written report submitted by the student. This course may be repeated provided that the sum total of credits earned does not exceed six. Students taking this course will be assigned a final grade of S (satisfactory) or U (unsatisfactory).

Enrollment Requirements: Open to juniors or higher. May be repeated for credit

NRE 3693. Foreign Studies in Natural Resources. (1-6 Credits)

Courses taken in Natural Resources and related areas as part of an approved Study Abroad Program. Students may only count a maximum combined credit total of 6 credits toward the Natural Resource major of foreign study, Independent Study and Internship credits.

May be repeated for credit

NRE 3699. Independent Study. (1-6 Credits)

Enrollment Requirements: Open to juniors or higher. May be repeated for credit

NRE 4000W. Natural Resources Planning and Management. (3 Credits)

Concepts and methods of planning for the allocation, management and utilization of terrestrial and aquatic ecosystems. Techniques and methods of managerial decision making. Written technical reports required.

Enrollment Requirements: Senior standing; ENGL 1007 or 1010 or 1011; open only to Natural Resources and Environmental Science majors, or by instructor consent.

Skill Codes: COMP. Writing Competency

NRE 4094. Seminar. (1 Credit)

Enrollment Requirements: Open only to senior Natural Resources majors, others with consent of instructor.

May be repeated for credit

NRE 4135. Introduction to Ground Water Hydrology. (4 Credits)

(Also offered as EARTH 4735.) Basic hydrologic principles with emphasis on ground water flow and quality, geologic relationships, quantitative analysis and field methods. Occasional field trips.

Enrollment Requirements: Open to juniors or higher. Recommended preparation: EARTH 1050, or both EARTH 1052 and one of EARTH 1010, 1051, 1055, or 1070. Not open for credit to students who have passed EARTH 5735.

NRE 4150. Ecosystem Science and Management. (3 Credits)

Ecosystem biogeochemical processes, the organism-environment interactions that regulate them, and natural resources management strategies that explicitly consider ecosystem structure and function.

Enrollment Requirements: EEB 2244E or equivalent general ecology course; CHEM 1127Q or equivalent general chemistry course; instructor consent required. This course and NRE 5150 may not both be taken for credit.

NRE 4170. Climate-Human-Ecosystem Interactions. (3 Credits)

Understanding pathways of interactions among climate change, ecological processes, and human activities through time are studied. Feedbacks that either reinforce or limit such interactions will also be discussed.

Enrollment Requirements: Open to juniors or higher. Recommended preparation: introductory courses in climate and environmental science.

NRE 4180. Climate Change Adaptation Science. (3 Credits)

An overview of climate change adaptation science including knowledge, principles, and applications of adaptation practices, technologies, tools, and strategies. Topics include the scientific evidence of anthropogenic climate change, climate change impacts on our lives and society, two-way relationships between climate change and humans, and multiple approaches applied in adaptation across diverse sectors (agriculture, forestry, fisheries, etc.) from local to regional and global scales. Emphasis on the fundamental concepts of climate change adaptation science, different disciplinary perspectives and interconnections, and its effectiveness, limitations, and future needs.

NRE 4205. Stream Ecology. (3 Credits)

A broad overview of stream ecology will be presented. Topics covered will include stream habitats and the diversity of organisms which inhabit them, adaptations to life in running water, and energy flow and nutrient cycling in stream ecosystems. Efforts targeted at the conservation of streams will be integrated throughout the semester. One or more field trips required. Taught with NRE 5335.

Enrollment Requirements: Open to juniors or higher. Recommended preparation: BIOL 1108 or equivalent.

NRE 4255. Water Quality Management. (3 Credits)

An introduction to all aspects of water quality problems relating to the many beneficial uses of water, including the physical, chemical, and biological properties. Formerly offered as NRE 3155.

Enrollment Requirements: Open to juniors or higher. Recommended preparation: NRME 3125 or 4165.

NRE 4335. Fisheries Management. (3 Credits)

Introduction to fisheries management principles with application to the biotic, habitat, and human components of fisheries. Selected topics include harvest regulations, stocking, population dynamics, endangered species, and habitat management practices in coastal and freshwater fisheries. Students will practice interpreting fisheries data which can inform the adaptive management of and regulation decision making in fisheries.

Enrollment Requirements: STAT 1000Q or higher; open to juniors or higher. Recommended preparation: NRE 3385W.

NRE 4340. Ecotoxicology. (3 Credits)

Understanding the fate and effects of environmental contaminants. Major classes of contaminants and their sources, uptake, biotransformation, elimination, bioaccumulation, biomagnification and toxicological effects in organisms will be covered. Discussions are focused around case studies, readings, and class presentations that further explore toxicant exposures and responses in ecosystems.

Enrollment Requirements: Open to juniors or higher. Recommended preparation: a course in chemistry and biology.

NRE 4370. Population Health and Dynamics. (3 Credits)

Factors that influence the growth, decline, and stability of fish and wildlife populations over time. Integrates principles of ecology, mathematical modeling, and the impact of disease epidemics and environmental change on populations. Provides students with skills to design, evaluate, and use a population model for effective decision-making in fish and wildlife conservation and management.

Enrollment Requirements: Open to juniors or higher. Advanced sophomores (above 50 credits) may be considered. Recommended preparation: STAT 1100Q or MATH 1060Q or MATH 1110Q or higher, or EEB 2244E.

NRE 4425. Urban and Community Forestry. (3 Credits)

The theory, science and practice of evaluating and managing urban trees and forest resources, recognizing urban forest resources as part of socio-ecological economic systems.

Enrollment Requirements: Recommended preparation: NRE 2415 and 3425.

NRE 4475. Forest Management. (4 Credits)

Application of forest mensuration, ecology, and silviculture in sustainable forest management. Field trips required.

Enrollment Requirements: NRE 2415; open to juniors or higher. Recommended preparation: NRE 3500.

NRE 4490. Tropical Biology on a Changing Planet. (4 Credits)

(Also offered as EEB 4490.) Taught in Costa Rica or South Africa. Fundamental principles of tropical biology and natural history of local plants and animals. Coursework highlights ecological complexity of the tropics, patterns of species diversity, and species interactions. Field visits to a variety of ecosystems including tropical wet forest, dry forest/wetland, premontane wet forest, cloud forest, páramo, oak forest, mangrove forest, or coastal marine. This course is offered in partnership with the Organization for Tropical Studies.

NRE 4535. Remote Sensing Image Processing. (3 Credits)

The principles of quantitative remote sensing, image processing and pattern recognition will be studied. Computer-assisted data analysis techniques will be used.

Enrollment Requirements: NRE 2000 or 3535; open to juniors or higher.

NRE 4665. Natural Resources Modeling. (3 Credits)

Applications of conservation of mass, energy and momentum in modeling natural resources systems. Defining systems; determining flows and storages; interactions and feedback mechanisms within systems. Problem oriented course including computer solutions using spreadsheets or modeling programs.

Enrollment Requirements: MATH 1120 or higher; open only to Natural Resources majors, others with instructor consent; open to juniors or higher.

NRE 4695. Special Topics. (1-6 Credits)

Topics and credits to be published prior to the registration period preceding the semester offerings.

Enrollment Requirements: Open to juniors or higher. May be repeated for credit

NRE 4696. Undergraduate Research in Natural Resources. (2-6 Credits)

Field or laboratory research performed by the advanced undergraduate student in an area of natural resources under the supervision of a NRE faculty member. A report and/or an oral presentation will be required at the end of the semester.

Enrollment Requirements: Open to juniors or higher.

May be repeated for a total of 6 credits

NRE 4697W. Undergraduate Research Thesis in Natural Resources. (3 Credits)

Writing of a formal thesis based on independent research conducted by the student. Thesis proposal and final thesis must follow guidelines developed by the Department; and be submitted to, and approved by, a department review committee.

Enrollment Requirements: Three credits of either NRE 3699 or 4696, which may be taken concurrently; ENGL 1007 or 1010 or 1011; open to juniors or higher; open only with consent of instructor.

Skill Codes: COMP. Writing Competency

NRE 4990. Directed Field Experience. (4 Credits)

(Also offered as EEB 4990.) Taught in Costa Rica or South Africa. An introduction to research design, field methods, and basic data analysis in a tropical context. Hypothesis testing and statistical analysis, including orientation to basic software packages. Students design, implement, and analyze data for their own field projects. This course is offered in partnership with the Organization for Tropical Studies.

NRE 4998. Variable Topics. (1 Credit)

Prerequisites and recommended preparation vary.

May be repeated for credit