School of Natural Resources & Environment

NRE 110/AOSS 171/Biol 110/Environ 110 Introduction to Global Change I (F) **4 hours credit**
Pass/Fail or S/U optional
An interdisciplinary (team-taught) introduction to the evolution of life and the human species on Earth, with focus on problems of global change produced by recent human advances in technology and institutions. The discussion includes reference to evolution of the universe, the Earth and its environments; evolution of living organisms with their environments; ecological roles of organisms. Topics include: evolution of the universe, solar system; evolution of the planets and moons; evolution of life: fossils, geologic strata, impact of life processes on earth systems; evolution of complex life forms, eukaryotes; the cell, respiration and photosynthesis; atmospheres: paleoclimates and paleoclimate record, climate models; oceans: evolution, circultion, nutrients, sea level changes; land: lithosphere, vulcanism, plate tectonics, soils weathering; how green plants work: energy pathways, growth, development, reproduction; how animals work: function and anatomy, growth, development and reproduction; how animals work: function and anatomy, growth, development and reproduction; biogeochemical cycles: water, carbon, nutrient cycles; ecosystem dynamics: energy flows, examples of ecosystems; biosphere interactions: ozone and greenhouse warmings, acid rain, the Gaia Hyposthesis. Extensive use is made of multi-media presentation tools: videos, slides, etc. Course grade will be based on a midterm exam and a final exam, plus successful completion of the required weekly laboratory exercises. There are no prerequisites for this course and no science background is assumed. The course is appropriate for all first year students, irrespective of intended major.
Staff

NRE 111/AOSS 172/Soc 111/Environ 111 Introduction to Global Change II (W) **4 hours credit**
Pass/Fail or S/U optional
The purpose of this course is to guide students in learning about the natural world, the processes of science, and the role of human activities in shaping and changing the environment. Global Change II will examine the growth and spread of human population, and the problems of global environmental change produced by recent human advances in technology and institutions. We will consider the methods available for detecting global change, and then examine change in a number of key resources, including land, water, the atmosphere, and biological diversity. The course concludes by considering the political and policy considerations relevant to the transition to a more sustainable future. Global Change II is appropriate for all students and will assume no prior background. The homework and laboratories will depend heavily on the use of computers to perform spatial analysis, develop quantitative reasoning, write crititcally, and to promote personal interaction with the faculty. Three 1-hour lectures and one 2-hour lab/discussion per week. Grades will be based on weekly written lab exercises, midterm, and final exam.
Allan

NRE 210/Environ 210 Introduction to Environmental Policy Making (W) **3 hours credit**
*** Offered Fall 2003; not offered Winter 2004 ***
Pass/Fail or S/U optional
Introduces social, political, and organizational processes that influence and shape environmental and natural resources policy. Topics include the legislative processes; agency functioning and behavior; interest-group activity; interaction in the political arena; the role and influence of technical information, public opinion, historical antecedent, and prevailing social conditions and institutions.
Staff

NRE 239/Environ 239 Introduction to Environmental Analysis (W) **4 hours credit**
Pass/Fail or S/U optional
Applications of maps, aerial photographs and computer methods in natural resource inventory, environmental monitoring, and ecosystem analysis.
Prerequisite: Math 115
Staff

NRE 256/Anthrcul 256/Environ 256 Culture, Adaptation and Environment (F) **3 hours credit**
*** Not offered Fall 2003 ***
Pass/Fail or S/U optional
This course explores anthropological approaches to human relationships with their environments and resources. We will examine diverse conceptions of culture and nature, an time and space, and the impacts that contemporary global forces are having on indigenous societies and their ecosystems. We will be particularly interested in the relative strengths and weaknesses of materialistic and cultural analyses of human-environment relationships, and models that attempt to combine them.
Staff

NRE 270/Environ 270 Our Common Future: The Ecology, Economics, and Ethics of Sustainable Development (F) **4 hours credit**
NO Pass/Fail option
An interdisciplinary foundation of the concepts and strategies of sustainability from an ecological, economic, and sociopolitical perspective. Explores the discourse, methodologies, and limitations of these interrelated disciplines. Environmental and natural resource issues are presented in a series of case studies.
Staff

NRE 300/Environ 300 Special Problems and Research - Undergraduates (F, W, Sp, Su) **1-6 hours credit**
Pass/Fail or S/U optional
Independent study covering different resource issues. A maximum of eight hours will be counted toward degree requirements.
Prerequisite: Permission of Instructor.

Staff

NRE 305/Environ 305 Society and Environment (F) **3 hours credit**
Pass/Fail or S/U optional
Students will investigate society and behavior by exploring humankind's relationship with the biophysical environment. We will develop a better understanding of how society functions and how humans behave by looking at our interactions with nature, natural resources, and the larger biophysical environment.
Crowfoot

NRE 306 Topics in Natural Resources (F, W, Sp) **1-4 hours credit**
Pass/Fail or S/U optional
A lecture and/or seminar on current natural resource topics.
Staff

NRE 308/Environ 308/Environstd 356 Homeplace: Life in the Huron Valley **3 hours credit**
NO Pass/Fail option
This course is an interdisciplinary examination of interactions between humans and nature using the Huron Valley as a laboratory. We will examine social, biophysical, and humanities influences on our relationship with the environment, and use this study of a particular place as the basis for the discovery of general principles.
Knott/Webb

NRE 310/Environ 310 Environmental Chemicals and Disease (W) **3 hours credit**
Pass/Fail or S/U optional
Explores the relationship between environmental chemical exposures and adverse health consequences, examining factors that determine and influence toxicity, such as chemical dose and structure, metabolism, and the age and genetic make-up of the individual. The role of chemical exposure in the etiology of specific diseases, such as cancer, birth defects, and neurological disorders, is described. The assessment of risk to human health from chemicals is discussed. This course aims to improve students abilities to interpret the risk to human health from eposure to environmental chemicals. It is intended for non-toxicology students.
Prerequisite: Introductory Biology and Chemistry.
Loch-Caruso

NRE 311/Environ 311 Introduction to Aquatic Ecosystems (W) **4 hours credit**
NO Pass/Fail option
Introduces fundamental physical/chemical/biological concepts and basic techniques necessary for the study of aquatic ecosystems. Covers physical-chemical processes, overview of aquatic fauna and flora, and surveys major types of aquatic ecosystems including rivers and streams, lakes, wetlands, oceans. Interactions between the hydrological cycle and the landscape provide the basic theme around which ecosystem presentations are organized. Laboratory sections present basic taxonomic materials during the first half of the course; during later half lab sessions will focus on field trips to representative environments and on the collection of biological specimens for required individual collections.
Prerequisite: Introductory Biology/Ecology.
Wiley

NRE 312/Environ 312/Polsci 380 Environmental Politics and Policy (F, W) **3 hours credit**
Pass/Fail or S/U optional
This course is an advanced offering on environmental politics and the environmental policymaking process. The course will consider both processes of policy formation and implementation, placing particular emphasis on the development of alternatives to conventional regulatory practices at federal, state, and local levels of government.
Prerequisite: Undergraduate standing and NRE 210 or Political Science 111.
Rabe

NRE 317/Environ 317 Conservation of Biological Diversity **3 hours credit**
NO Pass/Fail option
Overview of historic and present-day causes of species extinction, and of biological principles central to species conservation and sustainable management of ecosystems. Topics covered include: episodes of extinction and diversification over earth history; geographic distribution strategies and sustainable use of ecosystems. Weekly recitation sections discuss material from lectures, assigned readings and films, and perform computer and gaming simulations.
Staff

NRE 330/Environ 330 Habitats and Organisms: Science of Interactions (Su) **5 hours credit**
NO Pass/Fail option
Covers terrestrial and aquatic organisms and the interaction between organisms and habitats, using landscape ecosystems as a framework for study. The effects of human and natural disturbances on ecosystems and organisms are also examined. Appropriate field skills and techniques are used. Taught at Biological Station.
Prerequisite: Introductory Biology. NO Pass/Fail Option
Witter/Diana

NRE 333/Environ 333 Writing About Natural Resources and Environment (F, W, Sp, Su) **1 hours credit**
Pass/Fail or S/U ONLY
A course taken in conjunction with regular SNRE courses by which the upper-level writing requirement is met.
Prerequisite: First-year undergraduate writing course, SNRE undergraduate standing.

Staff

NRE 335/CAAS 322/Envion 335 Introduction to Environmental Politics: Race, Class, and Gender (F) 4 hours credit
This class may be used to satisfy the Upper-level Writing Requirement.
Pass/Fail or S/U optional
This course will analyze the development of political action from the 1860s to the present. It will analyze the role of race, gender, and class in defining environmental issues and environmental action. It will explore the following questions. Why have people of color traditionally not participated in the mainstream environmental movement? What are the consequences to environmental hazards? Why did the mainstream environmental movement refrain from making toxic exposures a major part of their platforms for so long? How do minorities and the poor respond to toxics in their communities? What is the role of women and minorities in the traditional and newly emerging grassroots environmental groups? How does that emergence of large numbers of minority grassroots environmental groups change the dynamics in the environmental movement?
Taylor

NRE 336/Environ 336/CAAS 332 Environment and Inequity 4 hours credit
This class may be used to satisfy the upper-level writing requirement.
Pass/Fail or S/U optional
The course explores the relationship between environment and social inequality. It focuses on American urban environment. The course examines how educational experiences influence occupational and social class outcomes. It examines how globalization and other economic transformations affect urban residence.
Taylor

NRE 337/Bio 355/Environ 337 Woody Plants: Biology and Identification (F) 4 hours credit
NO Pass/Fail option
Ecology, biology and identification of trees, shrubs, and vines are studied in weekly field trips. Woody plants are studied in their natural ecosystems - including upland (oak-hickory, beech-sugar maple, lake plain), wetland (swamp, bog), and floodplain forests. Non-native species and ornamental plants are taught in the Nichols Arboretum, Saginaw Forest, and Main Campus. Lecture topics include vegetative and reproductive morphology; woody plant biology, ecology, and diversity; variation and genetics; systematics of woody plants; ornamental plants; and forest ecosystems of eastern and western North America.
Barnes/Gunn

NRE 353/Environ 353 Tropical Conservation and Resource Management (F) 4 hours credit
*** Not offered Fall 2003 ***
NO Pass/Fail or S/U option
This is a multidisciplinary course that will examine the underlying problems of conservation and natural resource management in the tropics. Ecological aspects as well as socio/political and economic ones will be discussed. The first two weeks will consist of a review of basic ecological principles, but with an emphasis on how those principles relate to the conservation and management of renewable resouces. The next part of the course will examine the complexity of social, political and economic factors that interact with environmental ones to limit, enhance, or somehow affect the conservation and management of resources. Finally, the last, but more extensive, part of the course will examine various tropical ecosystems, their ecology and management and the challenge that their consevation represents. An emphasis will be placed on the interactions between conservation and development and on the perspective of the people of the Third World, since most tropical countries are part of the Third World.
Prerequisite: Students are strongly recommended to have previously taken an ecology course.
Perfecto

NRE 360/Environ 360 Behavior and Environment: The Psychology of Human-Environment Interaction (F) 3 hours credit
Pass/Fail or S/U optional
This course deals with two central themes: First, environmental problems are people problems, requiring an understanding of how people think, what they care about, what motivated them, and the conditions under which they behave most reasonably and creatively. Second, human behavior makes the most sense when studied in the context of the environment both present and evolutionary. This course builds a model of human nature based upon research in the field of environmental psychology. The course will explore such topics as environmental perception and knowledge; preferred environments and coping with the failure of preference; and mental attention fatigue and restoration. It then applies this model to such issues as common property resource management and the psychology of sustainability. The course is cross-disciplinary both in emphasis and student population with the disciplines of natural resource policy, planning and management; environmental education and communication; conservation behavior and conservation psychology; landscape architecture and urban planning; and green and sustainable business typically represented.
DeYoung

NRE 361/Environ 361 The Psychology Of Environmental Stewardship (W) 3 hours credit
NO Pass/Fail option
The Psychology of Environmental Stewardship: This course will explore the techniques available for changing individual conservation behavior with a focus on achieving durable change. It will be argued that individuals require information and motivation before they are willing to alter their behavior. Furthermore, only certain types and combinations of information and motivation result in long-lasting, durable behavior change. Source Reduction and Recycling: While the behavior change framework could be applied to any conservation behavior (e.g., control measures) this course will apply it to non-hazardous solid waste management. The course will also examine a waste management hierarchy that focuses first on pollution prevention (i.e., source reduction) and will be as concerned with natural resource conservation as with the

current waste management crisis.
DeYoung

NRE 365/Environ 365 International Environmental Policy (W) **3 hours credit**
Pass/Fail or S/U optional
This course explores institutions, actors and outcomes in international environmental policymaking. It examines international dimensions of industrialized and developing country policies and considers normative and ethical issues, effects of political and economic power, institutional setting and world views. Special attention is given to negotiations in bilateral, regional, and global contexts; and to actors ranging from superpowers to small states, international organizations to non-governmental actors. An effort is made to identify the key actors, processes, and institutional arrangements necessary to address critical transboundary environmental problems. This is not a how-to-save-the-planet course. Nor is it a course on the state of the environment or on environmentalism. Rather, the focus is on key actors and the processes by which disputes are or can be managed. The course uses extensive readings, case studies and simulations and applies a variety of theoretical perspectives on international affairs. There are no prerequisites. Students must, however, be willing to fully engage in discussions and authentically perform roles assigned for simulations.
Staff

NRE 370/UP 423/Arch 423/Environ 370 Introduction to Urban and Environmental Planning (F, W) **3 hours credit**
Pass/Fail or S/U optional
A comprehensive introductory course. Methods and processes in governmental planning and development of human activity systems requiring space, capital, and management components in the metropolitan environment. Major topics include: space and location planning, zoning and subdivision regulations, urban form and design, new town planning, housing urban renewal, transportation, metropolitan intergovernmental relations, comprehensive urban developmental planning, population and economic planning studies, planning techniques and methods. Emphasis is placed on recent developments and emerging problems.
Norton

NRE 375/Econ 370/Environ 375 Natural Resource Economics (W) **3 hours credit**
Pass/Fail or S/U optional
A one-semester introduction to Environmental and Natural Resource Economics. Topics include externalities, unpriced goods, cost-benefit analysis, resource scarcity, exhaustible resource depletion, renewable resource harvesting and common property problems.
Prerequisite: Economics 101.
Helfand

NRE 392/Environ 392 Applications of Environmental Justice **3 hours credit**
Pass/Fail or S/U optional
The fundamental purpose of this course is to provide an enriching, hands-on learning experience that teaches the signficant role that race and socioeconomic standing play in environmental issues. The student facilitated class will allow students to discss and further explore the mulitdiminsional nature of Environmnental Justice in a way that differs from traditional lecture style learning. The course will develop a series of case studies. During the Monday class time there will be a variety of guest lectures, discussions, as well as applicable environmental justice simulations and activities. As a part of the course requirement, each student will also serve as a volunteer in a situation where environmental justice issues exist. Through this experience, students will develop their own opinions, explanations, and definitions of environmental racism. The class will be divided into field groups assigned to one site for the semester. There will also be a one day field trip to Del Ray.
Taylor

NRE 396/Environ 396/CAAS 396 History of Environmental Thought and Activism **3 hours credit**
Pass/Fail or S/U optional
The course uses a race, class and gender approach to examine the history of American environmental activism (1850-present). It identifies the major period of environmental mobilization and significant forms of environmental activism among the white middle class, white working class and people of color. Taylor
Taylor

NRE 398/Environ 398 Natural Resource Internship Program (F, W, Sp, Su) **1-3 hours credit**
Pass/Fail or S/U ONLY
Undergraduate students, under the guidance of a faculty advisor, participate in an internship relevant to their field of study.
Prerequisite: Permission of Faculty Sponsor and Internship Coordinator.
Staff

NRE 399/Environ 399 Junior Honors Seminar (W) **3 hours credit**
Pass/Fail or S/U optional
This course is intended to start SNRE Honors students on their thesis projects. Students will develop a topic of interest into a research proposal. This requires identifying the topic, accessing pertinent literature, finding a faculty sponsor, and preparing a research design. Course readings and discussions will focus on research methodology.
Prerequisite: Departmental Permission
Staff

NRE 402/Environ 402 Spring Ecosystems and Plants (Sp) **4 hours credit**
Pass/Fail or S/U optional

This field course is open to undergraduate and graduate students. This course is appropriate as an introduction or continuation of plant and ecosystem identification skills. It serves as an excellent complement to NRE 337/Bio 355 Woody Plants and NRE 435 Forest Ecology. Course materials emphasizes identification of herbaceous flowering plants, horsetails, scouring rushes, club mosses, and ferns of landscape ecosystems in southern Michigan. All labs are in the field: habitats include moraine, ice contact, river floodplain, deciduous and coniferous swamps, lake, bog, fen, marsh, and lake plain sites. Two extended field trips explore the plants and ecosystems of great lake shores and Walpole Island lake plain prairies. Site/habitat conditions and ecological relationships, as well as plant indicator values are stressed. NRE 337/437 or Bio 355 recommended.
Gunn

NRE 403/History of Art 403/Environ 403 History of Human Interaction with the Land (W) **3 hours credit**
Pass/Fail or S/U optional
This course will survey the design and management of human settlements and their surrounding landscapes throughout history. The range of examples and sites will be viewed within the context of the cultural, political, social and environmental forces which shaped them, and also their lingering effect on 20th century perceptions of the landscape.
Brabec

NRE 408/Environ 408 Wetland Ecology (W) **3 hours credit**
Pass/Fail or S/U optional
Class discussions will include the following topics: types, functions and values of wetlands, wetland hydrology, wetland biogeochemistry, wetland development and succession, wetland plants, animals, and interactions, peat lands, Great Lakes coastal wetlands, wetland management and restoration of wetlands.
Wilcox

NRE 409/EEB 487/Environ 409 Ecology of Fishes (W) **3-4 hours credit**
Pass/Fail or S/U optional
Covers physiological, behavioral, and numerical responses of fishes to biotic and abiotic factors; the relationship between fish and the physical, chemical, and biological parameters of major habitat types; adaptations of fish for survival under different constraints.
Prerequisite: One ecology course.
Rutherford

NRE 411/Environ 411 Fluvial Ecosystems (F) **4 hours credit**
NO Pass/Fail or S/U option
[biennially - odd] Introduces key concepts and theory pertinent to understanding and managing fluvial ecosystems (rivers and streams). Emphasis on rivers as largescale physical and biological systerms; properties and processes. Laboratory includes intensive comparative field study of distinctive types of Michigan rivers.
Prerequisite: NRE 311/511 or an upper level course in aquatic ecology or hydrology.
Allan

NRE 415/Environ 415 Behavioral Ecology & Conservation Biology (F) **4 hours credit**
Pass/Fail or S/U optional
Basic theory in behavioral ecology and life history strategies. Basic natural selection theory, environmental constraints, and the evolution of behavior and life history strategies are stressed.
Prerequisite: 8 hours of Biology including Biology 162. NRE 438 or equivalent is recommended.
Low

NRE 416/Environ 416 Field Skills in Wildlife Behavior (F) **2 hours credit**
Corequisite: Concurrent enrollment in NRE 415.NRE 438 or equivalent statistics is recommended.
Pass/Fail or S/U optional
Students gain field skills in testing behavioral ecological hypotheses. Field work stresses repeatable, quantitative observation, generation of testable hypotheses, graphical and statistical data analyses, and oral and written communication.
Low

NRE 418/Environ 418 Biology and Management of Insects (W) **2-4 hours credit**
NO Pass/Fail or S/U option
Introduction to systems, problems, and current topics of the insect world. Examines relationships of insects to woody plants, other animals, their environment, and each other. Systematically and integratively examines pests of functional plant parts. Selected topics: insect structure and function, adapted features, IPM, control techniques, and insects and their impacts in a variety of ecosystems. Course is divided into 3 modules: 1) concepts of insect biology and management [2 credits; required of all students], 2) interactions in three landscape ecosystems: aquatic, forest, and agricultural [1 credit; optional], and 3) lab, emphasizing identification of insects and field trips [1 credit; optional]. Students select module 1 only for 2 credits, modules 1 and 2 only for 3 credits, or modules 1, 2, and 3 for 4 credits. Note that 418 must be elected for a minimum of 4 credit hours to meet the requirement for an applied ecology course, and a minimum of 3 credit hours to satisfy the Resource Management Requirement or be included in the REM Concentration. Students are strongly encouraged to elect the course for 3-4 credits.
Witter

NRE 419/Environ 419 Agricultural/Forest Pest Management (W) **1-4 hours credit**
Taught bienially in even years.
Pass/Fail or S/U optional

Ecological basis of pest management with emphasis on components and processes of ecosystems, plant and insect herbivore relations, predator and prey interactions, parasites and host interactions, and population dynamics of insects. Fundamental principles and techniques of pest management with emphasis on predators, parasites, diseases, insecticidal and behavioral chemicals, cultural control and host resistance. Effect of insecticides of biological control systems. Current examples in pest management. Special problem assignments to meet the needs of graduate students with diverse backgrounds.

Prerequisite: NRE 418 or Bio 442 or Permission of Instructor.
Witter

NRE 420/Environ 420 Principles of GIS (W) **4 hours credit**
NO Pass/Fail or S/U option
This class will provide a firm understanding of the issues that affect the use of geographic information systems (GIS) for application, research and planning in natural resources. Students will learn to conceptualize and implement geographic data management and analysis for research and application.
Prerequisite: NRE 239 or Grad Standing
D.Brown

NRE 422/EEB 440/Environ 422 Biology of Fishes (F) **3 hours credit**
NO Pass/Fail or S/U option
Lectures cover many aspects of the biology of lower vertebrates known as fishes, including evolution, physiology, functional morphology, phylogeny, biogeography, ecology, and reproduction. The systematic position of fish among vertebrates is discussed and exemplary assemblages examined. Special attention is given to the effect of the physical properties of water on form, function and mode of life of fishes. Discussions examine current papers in the primary literature.
Prerequisite: Introductory biology and one additional course in biology.
Staff

NRE 423/EEB 441/Environ 423 Biology of Fishes Laboratory (F) **1 hours credit**
NO Pass/Fail or S/U option
This laboratory provides an introduction to field methods used in fish biology and fisheries, and examines the diversity of the Michigan ichthyofauna and major groups of world fishes.
Prerequisite: Introductory biology and one additional course in biology.
Staff

NRE 425/EEB 496/Environ 425 Applied Population Ecology (W) **4 hours credit**
Pass/Fail or S/U optional
A quantitative second course in ecology in which principles of population ecology (single and multiple species) are examined from both theoretical and applied viewpoints. Principles will be examined using a wide range of organisms. Many applications of population ecology will be considered, including: conservation of long-lived species, harvest optimization, biological control, biology of introduced and invading species, biodiversity, island biogeography, metapopulations, and ecological risk assessment. Computer applications will use spreadsheets and mathematical software.
Prerequisite: General Ecology and Calculus. NRE 438 or equivalent is recommended. Experience with computer spreadsheets is desirable.
Breck

NRE 427/Environ 427 Aquaculture **3-4 hours credit**
Pass/Fail or S/U optional
The principles of animal physiology, physical and chemical limnology, and animal ecology underlying the production of freshwater and marine crops. Emphasis is placed upon food production rather than recreational use and on lesser intensive and natural systems commonly used in developing countries. This course can be taken as a lecture for 3 credits or as a lecture and discussion (with permission of instructor) for 4 credits.
Prerequisite: 2 courses in biology.
Diana

NRE 430/EEB 489/Environ 430 Soil Properties and Processes (F) **3 hours credit**
NO Pass/Fail or S/U option
Soils as central components of terrestrial ecosystems, with emphasis on physical and chemical soil properties and their relationships to soil-resource problems. Quantitative analysis and interpretation of soil data are stressed in lecture and laboratory. Soil in forest ecosystems is the major focus, though examples from other systems are examined.
Prerequisite: Introductory biology and chemistry.
Zak

NRE 432/Environ 432 Forest Hydrology and Watershed Management (F) **3 hours credit**
Pass/Fail or S/U optional
Principles and processes affecting hydrologic cycles of forested watersheds: precipitation, interception, infiltration, evapotranspiration, groundwater and stream flow. Major emphasis on how hydrologic processes affect watershed management of forest and other terrestrial ecosystems, and how watershed management affects water yield and quality. Floods, soil erosion, and water pollution will be emphasized as special problems.
Richards

NRE 433/EEB 433/Environ 433 Ornithology (F) **4 hours credit**
Taught bienially in even years.

NO Pass/Fail or S/U option
During the lecture portion of the class the students will have the opportunity to learn about many unique features of birds. These include flight, physiology, feathers, feeding, visual and vocal communication, the annual cycle, migration and navigation, social behavior, reproduction, parental care, growth and development, conservation, systematics and history. In the mandatory lab, the students will have the opportunity to learn about birds by using museum specimens (labs will run from 1:00 to 4:00) and by observing birds on field trips during lab time (trips will run from 1:00 to 5:00, except for the trip to Pt. Pelee, Canada, which will be an all day trip Saturday, September 19, with a rain date on Sunday, September 20).
Prerequisite: Biology 162 or equivalent.
Paine

NRE 435/Environ 435 Forest/Terrestrial Ecology (F) **4 hours credit**
NO Pass/Fail or S/U option
Landscape ecosystems and forest species are emphasized in weekly field trips and lectures stressing the ecology of species and the structure and function of forest ecosystems. Landscape ecosystems are studied by integrating physiography, climate, soil, and vegetation. Major emphasis on physiography and site-species relationships, establishment ecology, and competitive and mutualistic relationships. Fire ecology and genetic ecology are also stressed. Special field trips to northern Michigan and the Great Smoky Mountains.
Prerequisite: NRE 337/437 and Permission of Instructor.
Barnes

NRE 437 Woody Plants: Biology and Identification **4 hours credit**
NO Pass/Fail or S/U option
Ecology, biology and identification of trees, shrubs, and vines are studied in weekly field trips. Woody plants are studied in their natural ecosystems - including upland (oak-hickory, beech-sugar maple, lake plain), wetland (swamp, bog), and floodplain forests. Non-native species and ornamental plants are taught in the Nichols Arboretum, Saginaw Forest, and Main Campus. Lecture topics include vegetative and reproductive morphology; woody plant biology, ecology, and diversity; variation and genetics; systematics of woody plants; ornamental plants; and forest ecosystems of eastern and western North America. Term paper required.
Prerequisite: Graduate standing or Permisison of Instructor. NO Pass/Fail or S/U Option
Barnes/Gunn

NRE 438/Environ 438 Natural Resource Statistics (F) **4 hours credit**
Pass/Fail or S/U optional
Basic concepts of biometrics and its application to natural resource problem solving to include descriptive statistics, probability, underlying distributions, sampling distributions, estimation, hypothesis testing, goodness-of-fit procedures, contingency tables, sampling, simple linear correlation and regression, one-way analysis of variance, and nonparametric statistics.
Prerequisite: NRE 239 or Graduate Standing
Silverman

NRE 441/Environ 441 Remote Sensing of Environment (W) **4 hours credit**
NO Pass/Fail or S/U option
Use of aircraft and satellite remote sensors for inventory, monitoring and assessment of Earths ever changing resources. Problem analysis to determine which remote sensing systems can supply needed data and determination of cost-effective approaches to problem solution. Case studies from several fields.
Prerequisite: NRE 239 or Jr. Standing
Bergen

NRE 446/Environ 446 Quantitative Analysis of Ecological Issues (W) **4 hours credit**
Pass/Fail or S/U optional
Many global environmental problems are studied with mathematical modeling and simulation. In this course concepts and skills for development and exploration of such models are developed by study of case histories. The emphasis is development of concepts and secondarily development of quantitative and computing skills.
Prerequisite: NRE 438, calculus, and at least Junior standing; PC and some mainframe experience desirable.
Jensen

NRE 449/Environ 449 Organizational Theory and Change **3 hours credit**
Pass/Fail or S/U optional
Have you ever wondered how organizations as varied as state natural resource management agencies, NGOs, multi-lateral development banks, international development agencies, and community groups impact environmental policy and management both in the U.S. and internationally? Why do organizations behave in certain ways and not in others? NRE 449 addresses these questions by exploring how different types of organizations and organizational arrangements can influence organizational decision-making, behavior, and outcomes in complex political arenas such as endangered species recovery, protected area management, risk assessment, community forestry and community-based resource management and development. The course begins with an in-depth look at the literature on organizational theory and change. It focuses on organizational behavior but also examines organizations as carriers of environmental programs and as implementers of environmental policy. The course includes a series of case examples that apply organizational theory to specific policy and management problems. The course is intended for graduate and advanced undergraduate students. There are no prerequisites for registration.

Staff

NRE 451/EEB 451/Environ 451 Biology of Mammals (F) **4 hours credit**
*Taught biennially in odd years. ** Not offered Fall 2003 **
Pass/Fail or S/U optional
This course introduces students to the diversity of mammals. Through laboratory exercises (one four-hour laboratory period per week) and lectures, participants will have opportunity to see and learn about species representing all of the major groups of mammals. We will review their evolutionary history; examine adaptations such as those for running, digging, swimming, and flying; and discuss current research in ecology, behavior, zoo-geography, and systematics. A text supplements the lectures, and a published manual is required for the laboratory. Grades will be based on lecture and laboratory exams, participation in discussions, and several brief papers.
Prerequisite: Biology 162 or equivalent
Myers

NRE 455/Environ 455 Laboratory in Field Ecology (F) **5 hours credit**
Students may not receive credit for both NRE 455 and Biology 477.
Pass/Fail or S/U optional
This is a field course, emphasizing observation and hypothesis formation in ecology. Students will work in small groups on specific topics, which will change from week to week. Ecology students require intensive practice in making field observations and systematically exploring the implications of those observations. One vehicle for doing so is the \\\"field problem\\\" based course, in which a faculty member chooses a general topic and works with a small group of students exploring that topic for an entire day. The field problem-based course is distinct from the laboratory course in that field problems seek to explore an unknown area. The course does not include \\\"set labs\\\" or repeats of well-known patterns. The professor and students seek to explore an area that has not been explored before. The exercise of working out the details of a new problem along with the professor gives the student practice in the creative part of the scientific endeavor. Working with a variety of faculty members gives the student experience with a variety of styles of doing science. The general structure of the course, which is centered on the field problem, encourages a great deal of discussion among students and between students and faculty. A major goal of the course is to facilitate that discussion. Additionally, there is a relatively large lecture load, with an average of four lectures per weekend.
Prerequisite: A course in ecology or advanced undergraduate biology, Graduate Standing or Permission of Instructor.
Perfecto/Vandermeer

NRE 460/Environ 460 Fishery Science (F) **4 hours credit**
Taught biennially in odd years.
Pass/Fail or S/U optional
The theoretical and practical ecological considerations necessary for management of sport and commercial fisheries are developed. Growth, mortality, reproductive, yield, recreational value, the effects of fishing, impacts of environmental factors, interactions among species, and modeling are among topics studied. The emphasis is the ecological basis for management, but economic analyses and water quality also are considered. Offered biennially.
Prerequisite: NRE 438.
Rutherford

NRE 465/Environ 465 Environmental Decision Making in Business (W) **3 hours credit**
NO Pass/Fail or S/U option
A survey course for students interested in learning about the impact of corporations on environmental quality and the choices that organizations are making to reduce these impacts. Also involved is the use of case studies and guest speakers to address the intersection between science, business, and human behavior.
Prerequisite: Senior Standing.
Zint

NRE 471/Environ 471 Analytical Tools for Environmental Policy (F) **4 hours credit**
Pass/Fail or S/U optional
An introduction to policy analysis and some of the tools useful for analyzing data, with emphasis on environmental and resource applications. The course will cover methods of policy analysis, modeling, and applications of linear regression and linear programming.
Prerequisite: Statistics (NRE 438, Stats 350, or equivalent); Economics (NRE 375, 570 or Econ 401).
Helfand

NRE 475/Environ 475/EHS 588 Environmental Law (F) **3 hours credit**
Pass/Fail or S/U optional
Introduces students to Environmental Law and the impact of the legal process on decisions that affect the environment. Topics include common law tort actions, toxic tort actions, statutory controls of pollution and other environmentally harmful activities. Additonal areas include administrative agency structure and performance, constitutional rights to environmental quality and more.
Abrams/Churchill

NRE 476/Environ 476/EEB 476 Ecosystem Ecology (W) **3 hours credit**
*Taught biennially in even years ** Not offered Winter 2004 **
Pass/Fail or S/U optional
Ecosystem Ecology focuses on current theories regarding the control and function of aquatic and terrestrial ecosystems, the approaches and techniques being used to test these theories, and the application of theory to the management and restoration of ecosystems. The scope includes examples from terrestrial, marine, and freshwater ecosystems.

Prerequisite: General Ecology and a 400-level course in Aquatic or Terrestrial Ecology.
Zak/Kling

NRE 477/Environ 477/CAAS 477 Women/Gender and Environment (W) **3 hours credit**
Pass/Fail or S/U optional
This course explores issues related to gender, race, class and environmental inequality. It looks at the historical role of women in the environment in the U.S., explores the development of environmental ideologies, and looks at the relationship between women, environment and social justice. It examines environmental sub-movements like ecofeminism and environmental justice. The course also examines gender and inequality in the international context. In particular, it focuses on women and development issues.
Prerequisite: Junior, Senior, or Graduate Standing.
Taylor

NRE 481/Environ 481/Edcurins 474 Foundations of Environmental Education (F) **3-4 hours credit**
SNRE Students should register for 4 credit hours, Education students should register for 3 credit hours.
Pass/Fail or S/U optional
Provides a theoretichal understanding of the field of environmental education (EE) with special emphasis on relevant human behavior models, guidelines for developing, implementing and evaluating EE materials/programs, and current issues in EE. Presents opportunity to gain hands-on experience in using popular EE materials and writing grant proposals.

Prerequisite: One course in English composition.
Zint

NRE 482/Environ 482/CAAS 482 Environmental Justice: Theoretical Approaches **3 hours credit**
Pass/Fail or S/U optional
This course should be of interest to students wanting to understand and study issues related to the environment, inquality, and social change. It examines theoretical approaches that are either currently being used or could be applicable to environmental justice research. Students will study several theories including: race relations theories, power elite theory, social movement theories - relative deprivation, rational choice, political opportunity, resource mobilization, micro-structural recruitment, identity theories - and organizational theory. The course provides students interested in environmental justice research, advocacy, policymaking, or community organizing an opportunity to see how the aforementioned theoretical frameworks can help them understand environmental justice cases that arise. The course will help students organize information they glean from observations of community groups contending with environmental justice issues, from reading case studies, or from working in the environmental field. A sound understanding of these theoretical approaches will enhance the students understanding of how and why communities organize around environmental justice issues, why some people participate and not others, why some communities succeed and not others, why the environmental justice discourse differs from the mainstream environmental discourse, and how movements are maintained.
Taylor

NRE 492/Environ 492/UP 492 Environmental Justice: Domestic & International (F) **3 hours credit**
Satisfies the race and ethnicity requirement.
Pass/Fail or S/U optional
This is primarily a lecture course. Information in the course includes: 1) the definition of environmental racism, environmental equity, envioronmental justice, and environmental advocacy, 2) key research issues in the field of environmental justice which includes race vs. income, intent vs. nonintent, pollution prevention vs. pollution control, cause and effect vs. association, 3) understanding energy and its relation with environmental justice, 4) the social structure of accumulation vs. the social structure of sustainability, 5) comparing issues of environmental justice within the U.S. and within developing countries, 6) comparing the Basel Treaty and the Organization of African Unitys ban on the transport of toxic waste internationally, and the First National Environmental Leadership Summits Seventeen Principles of Environmental Justice. Both domestic and international examples will be used in the course to enhnace teaching and learning. Students will be required to: 1) take a midsemester and a final examination, and 2) develop case studies on environmental justice.
Bryant

NRE 495/Environ 495 Small Group, Organization and Advocacy Planning **3 hours credit**
Pass/Fail or S/U optional
Emphasizes both skill and theoretical development. Provides opportunities to learn about small groups, organizations, power structure research, advocacy planning, coalitions and contemporary social movements. Students are also expected to do field work.
Bryant

NRE 499/Environ 499 Senior Honors Thesis (F, W, Sp, Su) **1-6 hours credit**
Generally the SNRE Senior Honors students elect this course for 3 hours credit in the Fall of their senior year, and elect it for 3 hours in the Winter of their senior year. The total credit for NRE/Environ 499 should be 6 hours.
Pass/Fail or S/U optional
The primary goal of the course is to carry out the Honors thesis research, with guidence and support of a faculty sponsor. Class sessions in the Winter term provide the opportunity to discuss thesis progress and problems, issues related to writing the thesis, and preparation for the final presentation.
Prerequisite: Completion of Junior Honors Seminar (NRE/Environ 399) and permission of instructor.
Staff

NRE 501 Integrated Scientific Assessments at the Science/Policy Interface (F) **3 hours credit**
Section 118
Pass/Fail or S/U optional
Scientific information for policy and decision making can be more effective if framed within an integrated assessment. This course will describe the integrated assessment process from science, stakeholder, and decision making perspectives, and explore it's role in framing difficult issues and guiding future research. Through lectures, readings, case studies, student prepared papers, and guest lectures, the course will explore conveying uncertainty, the role of peer review, the value of stakeholder input, interpretation of trends, limits and value of prediction, issues of scale and government interaction.
Prerequisite: Graduate Standing
Scavia

NRE 501 Systems Thinking for Sustainable Enterprise (W) **3 hours credit**
Meets with BA 745 001.
Pass/Fail or S/U optional
Challenges to sustainable human and corporate futures, such as climate change, biodiversity loss, mega-city explosion, and persistent poverty, are characterized by extraordinary detail and dynamic complexity, large uncertainties, non-linear causation, unknown thresholds and irreversibilities, significant time and space lags, and multiple scales, resolutions and rates of change. Comprehending (and leveraging for) sustainable development and associated enterprise thus necessitates DYNAMIC SYSTEMS THINKING, emphasizing wholes over parts, relationships over objects, feedback processes over linear cause-effect chains, etc. This course will develop an evolutionary, dynamic understanding of the role of business in relation to natural and social systems. Participants will learn to recognize dynamic complexity, think at the level of structure rather than events or behavior, test and develop their intuition systemically, build causal loop diagrams, uncover recurring systemic structures, and to see how to change systems with effective intervention. Using a mix of primers, simulations, games, videos, reading and exercises, the course will model a variety of global challenges in relation to business risk and opportunity.
Prerequisite: Graduate Standing
Gladwin

NRE 501 Workshop on Environmental Mediation (W) **1 hours credit**
Pass/Fail or S/U optional
This course is structured to build hands-on skills in mediation and facilitation in environmental disputes, and is an extension of NRE 533, Negotiation Skills. It is taught in an intensive 20-hour format using several role-plays and interactive exercises. The course will meet March 17-19.
Prerequisite: NRE 533 or Permission of Instructor
Wondolleck/Yaffee

NRE 501 Graduate Experimental Course (F, W) **1-4 hours credit**
Pass/Fail or S/U optional
Lecture or seminar on current natural resource topics, such as endangered species, hazardous waste management, acid deposition, and social impact assessment
Staff

NRE 502 Graduate Experimental Course **1-4 hours credit**
Pass/Fail or S/U optional
Lecture or seminar on current natural resource topics offered only on a Pass/Fail basis for undergraduates or on a Satisfactory/Unsatisfactory basis for graduate students. Descriptions of each section for the coming semester are listed below.
Staff

NRE 505 Human Resource Ecology **2-4 hours credit**
Pass/Fail or S/U optional
Examines how resource distribution, richness, and predictability interact with systematic and historical constraints to yield patterns of resource control, mating systems, and life histories (including sex differences) in mammals, particularly humans. Students wishing to take this course for 2 hours credit must have previous or concurrent enrollment in NRE 415, Biology 494, or Psychology 430. Students wishing to take this course for 4 hours credit will, in addition to the W 1-3 lecture, attend the lecture section of NRE 415 for part of the term MWF 12-1.
Prerequisite: Permission of Instructor.
Low

NRE 507 Habitats and Organisms: Science of Interactions (Su) **5 hours credit**
NO Pass/Fail or S/U option
Covers terrestrial and aquatic organisms and the interaction between organisms and habitats, using landscape ecosystems as a framework for study. The effects of human and natural disturbances on ecosystems and organisms are also examined. Appropriate field skills and techniques are used. Taught at the Biological Station.
Prerequisite: Graduate standing and introductory biology. NO Pass/Fail or S/U Option
Witter/Diana

NRE 511 Introduction to Aquatic Ecosystems (W) **4 hours credit**
Pass/Fail or S/U optional
Introduces fundamental physical/chemical/biological concepts and basic techniques necessary for the study of aquatic ecosystems. Covers physical-chemical processes, overview of aquatic fauna and flora, and surveys major types of aquatic ecosystems including rivers and streams, lakes, wetlands, and oceans. Interactions between the hydrological cycle and the landscape provide the basic theme around which ecosystem presentations are organized. Laboratory sections present

basic taxonomic materials during the first half of the course; during later half, lab sessions will focus on field trips to representative environments and on the collection of biological specimens for required individual collections. Course offered biennially.
Prerequisite: Introductory biology and one course in chemistry or Permission of Instructor.
Wiley

NRE 512/BA 512 Ethics of Corporate Management (F) **2 hours credit**
Students may NOT receive credit for both NRE 512 and BA 512.
Pass/Fail or S/U optional
Will introduce students to the complex ethical problems associated with the management of large business organizations under conditions of rapid economic change and intense global competition. It will focus on the responsibilities of senior executives to the various constituents of the firm--customers, employees, owners, creditors, suppliers, distributors, local residents, national citizens and global inhabitants--and on the treatment of those constituencies that can be considered to be "right" and "proper" and "fair".
Prerequisite: Graduate Standing
Fort

NRE 513 Strategies for Environmental Management (F) **3 hours credit**
Students may not receive credit for both NRE 513 and CSIB 564/CSIB 565.
Pass/Fail or S/U optional
In the past 20 years, companies have been forced to comply with increasingly stringent environmental regulations. Over the next 20 years, they will be challenged to create entirely new strategies rooted in the concept of environmental sustainability. This course examines how competitive advantage can be secured through environmental management strategies such as environmental partnerships, pollution prevention, industrial ecology, life-cycle design, and product stewardship.
Prerequisite: Graduate Standing and CSIB 502 or Permission of Instructor.
Staff

NRE 514/EHS 572 Environmental Impact Assessment (W) **3 hours credit**
Pass/Fail or S/U optional
This course develops a comprehensive framework for evaluating and predicting the environmental impacts of manmade projects. The theory and application of mathematical and computer models predicting the transport and fate of environmental contaminants in air, water and soil media are presented. The selection, application, integration and evaluation of models is emphasized.
Prerequisite: Environmental Chemistry and Physics (EIH 574), graduate statistics, and graduate standing.
Batterman

NRE 515/EHS 579 Environmental Risk Communication (W) **3 hours credit**
Pass/Fail or S/U optional
This course provides an introduction to risk assessment and management but emphasizes risk communication (i.e., any purposeful exchange of information about environmental risks between interested parties regarding levels of risk, their significance, and actions aimed at controlling these risks). With the help of case studies drawn mostly from industry, students will evaluate existing risk communication practice and formulate ways to improve public involvement in environmental risk decisions.
Prerequisite: Graduate student standing or permission of instructor.
Zint

NRE 516 Aquatic Entomology (W) **3 hours credit**
[biennially - odd years]
Pass/Fail or S/U optional
Provides thorough taxonomic knowledge and basic understanding of the biology and ecology of aquatic insects for advanced students in ecology, fisheries, and entomology. Lectures focus on ecology; laboratories concentrate on taxonomy. A student insect collection is required.
Prerequisite: One biology course.
Wiley

NRE 517/EHS 580/ENVIRON 317/NRE 317 Conservation of Biological Diversity (F) **3 hours credit**
NO Pass/Fail or S/U option
Overview of historic and present-day causes of species extinction, and of biological principles central to species conservation and sustainable management of ecosystems. Topics covered include: episodes of extinction and diversification over earth history; geographic distribution strategies and sustainable use of ecosystems. Weekly recitation sections discuss material from lectures, assigned readings and films, and perform computer and gaming simulations.
Prerequisite: Graduate Standing and General Ecology or Permission of Instructor. NO Pass/Fail or S/U Option
Foufopoulous

NRE 521 Insect Ecology (W) **4 hours credit**
[bienially in odd years]
Pass/Fail or S/U optional
This course examines interactions of insects with their environment through use of case history examples. Framework for the course is examination at the levels of individuals, populations, communities, ecosystems, and landscapes. Lecture/discussion format; course includes field trip.
Prerequisite: General Ecology is required; one introductory insect course is beneficial but not required; Senior or Graduate

Standing and Permission of Instructor required.
Witter

NRE 525 Ecological Inference: Data & Experiments (W) **3 hours credit**
NO Pass/Fail or S/U option
This course will concentrate on the interplay between data collection and ecological investigation. We will explore these connections using a variety of examples drawn from the ecological and environmental literature. The first half of the course will cover statistical sampling, the second half will cover experimental design.
Prerequisite: NRE 438 or Stat 400
Silverman

NRE 528 Advanced Forest Ecology (W) **3 hours credit**
Pass/Fail or S/U optional
Students critically review and discuss classical and modern research papers in landscape and forest ecology. Studies in disturbance ecology (e.g. fire, wind and flooding), forest succession, ecological and biological diversity, and physiological ecology are examined at regional and local scales. forest ecology and and its application in silviculture in regions outside of Michigan (PNW, New England, Southwest. etc.) are emphasized. Forest ecosystems and species-site relationships are stressed. Lecture/discussions on selected research themes are interspersed with literature reviews, visiting speakers, and student seminar presentations. One field trip to study old-growth forests of southern Indiana. Offered biennially.

Prerequisite: Forest/Terrestrial Ecology (NRE 435) or Permission of Instructor.
Barnes

NRE 530 Geography: Spatial Analysis, Theory and Practice **3 hours credit**
Pass/Fail or S/U optional
A spatial view of the environment is one that often involves maps. A the context in which one views an environmental issue is a critical matter, so too is the context in which one views a map. Thus, the exciting state-of-the-art electronic capability of GIS, and of other mapping software, is cast in the broader context of geography and mathematics - the theoretical foundations from the political, cannot survive in the world of geographically literate. Creative, scientific approaches to topics, using well established but untapped tools are encouraged, as are traditional approaches which clearly exhibit the spatial components of an environmental problems with suggested directions for action. Students learn mapping in the context of project development. They are presented in lecture with a diverse body of theoretical material, from the geometric to the topological. They are trained in the lab on a wide variety of state-of-the-art mapping and visualization software. In both, they are encouraged to make selections appropriate to their project needs: be that with the instructor, each student builds a document or website and presentations to enhance his/her research and teaching portfolio.
Arlinghaus

NRE 532 Natural Resource Conflict Management **3 hours credit**
Pass/Fail or S/U optional
This course builds an understanding of the causes, dynamics and consequences of natural resource and environmental conflicts as well as the range of possible procedural interventions that can be used to manage these conflicts. The course emphasizes the practical application of dispute resolution theories to the environmental and natural resource context. Case materials for the course are drawn from current conflicts in situations including public lands management, air and water pollution regulation, solid and hazardous waste facility siting, wildlife and endangered species management, and community planning.
Prerequisite: Graduate Standing or Permission of Instructor.
Wondolleck

NRE 533 Negotiating Skills In Environmental Dispute Resolution (W) **3 hours credit**
Pass/Fail or S/U optional
This course is a half-term module that develops skills in bargainaing and negotiation as they can be appled to the resolution of environmental disputes. It will help a student prepare for and carry out a negotiation, become a more effective communicator, and understand the psychological dimensions inherent in negotiation processes. In addition, the courses examines mechanisms for assisting negotiations including facilitation and mediation. The course employs a series of gaming simulations that allow students to engage in controlled bargaining situations, followed by debriefings that critique strategy and styles. In addition, a framework for negotiation analysis is developed that draws on literature in the areas of decision analysis, social psychology, and public policy.
Prerequisite: NRE 562 or NRE 532 or Permission of Instructor.
Wondolleck/Yaffee

NRE 534 GIS and Landscape Modeling (F) **3 hours credit**
Pass/Fail or S/U optional
The goal of this class is to explore various approaches to modeling landscape pattern and change. The course will necessarily move between social and ecological processes and applications of the models, always with a geographical focus. During the course we will read about different modeling approaches, discuss applications of models and work on 5-6 exercises. We will explore GIS suitability models through a number of statistical and computational approaches.
Prerequisite: NRE 420 or equivalent NRE 438 or equivalent
Dan Brown

NRE 538 Natural Resource Data Analysis (W) **4 hours credit**
Pass/Fail or S/U optional

Theory and application of regression and analysis of variance models to natural resource data analysis with an emphasis on the role of these models in research and management. Concepts include matrix algebra, linear and nonlinear regression, analysis of variance, analysis of covariance, BASIC computer language, and the use of statistical computer software.

Prerequisite: NRE 438 or equivalent.
Jensen

NRE 540 GIS and Natural Resource Applications (F, W) **2 hours credit**
Pass/Fail or S/U optional
This course is intended to give students the ability to plan, design and execute a GIS project for natural resources management. Students should learn the potentials and limitations of geographic analyses. They will learn how to build geographic databases, analyze data spatially and produce output that succintly summarizes their results. Students will learn the differences, advantages and disadvantages of raster and vector systems for addressing different resources management projects. They will also learn where to acquire geographic data and the errors associated with using it. The teaching will revolve around four case studies that will allow the student to see what is entailed in developing a GIS project, and introduce the student to the resource management question.
Prerequisite: Graduate standing or Permission of Instructor. NRE 420: Principles GIS (or equivalant)
Brines

NRE 543 Environmental Spatial Data Analysis (F) **3 hours credit**
Pass/Fail or S/U optional
Information about events and attributes that is referenced to locations can provide special insights into social and environmental processes. By analyzing this information in ways that take advantage of the spatial dimensions, we search for spatial patterns to generate and test hypotheses about the causes and effects of these patterns. This course deals with the processing and quantitative treatment of spatial data for use in ecological and environmental analysis and assessment. The first topics of the class will address spatial data representation and visualization that make use of GIS for spatial analysis. The topics include discussion of transformation among spatial feature types, scale and resolution issues, sampling and data display. The remaining topics introduce multiple approaches to analysis of point and area data. We begin with point pattern analysis to test for patterns of points (e.g. clustering), then discuss geostatistical methods for estimation when the points represent locations of attribute measurements. We will look at a specific set of analytical tools for describing landscape patterns, derived from teh field of landscape ecology. Finally, we will look at methods for inferential analysis using area-based measurements. Assignments involve computer exercises using real social and physical environmental data. Students are to read and report on applications of the methods studied in the lectures and assignments.
Prerequisite: NRE 420 or equivalent NRE 438 or equivalent
Dan Brown

NRE 553 Agroforestry **3 hours credit**
biennially-even years - Not offered in Winter Term 2001
NO Pass/Fail or S/U option
Provides an overview of agroforestry systems worldwide, focusing on their strengths and limitations. Explores the social, economic, and political factors that promote and constrain their implementation. Provides an underlying theoretical focus for understanding agroforestry systems.
Prerequisite: One general ecology course.
Perfecto

NRE 556 Environmental History and the Tropical World (F) **3 hours credit**
Pass/Fail or S/U optional
Patterns of historical change in major ecosystems of the tropics and subtropics, in relation to theories of global environmental history. Transformations of the Third Worlds natural resources by colonial governments and capitalist economies since 1800, in tropical forests, savannah lands, and mountain systems; especially in the rapid escalation since 1945. The rise of modern systems of tropical resource management and conservation is also discussed.
Prerequisite: Graduate standing.
Tucker

NRE 557 Industrial Ecology (W) **3-4 hours credit**
Pass/Fail or S/U optional
Analysis of material and energy flows in industrial and ecological systems to enhance eco-efficiency and sustainability in meeting human needs. Methods: life cycle assessment quantifies energy, wastes and emissions for materials production, manufacturing, product use, and recovery/disposition; life cycle design integrates environmental, performance, economic, and policy/regulatory objectives. This interdisciplinary course also includes a series of industrial/municipal site assessments (one-credit optional).
Prerequisite: Senior or Graduate Standing.
Keoleian

NRE 558/CEE 587 Water Resource Policy (F) **3 hours credit**
Pass/Fail or S/U optional
Consideration of policy processes associated with the development and utilization of water resources. Special attention is given to the history and development of policy related to water quality. Multi-objective planning is presented, and institutional problems associated with the implementation of water policy in the federal-state-regional-local arenas are considered.

Prerequisite: Senior or Graduate Standing.

Bulkley

NRE 560/UP 560 Behavior and Environment: The Psychology of Human-Environment Interaction (F) **3 hours credit**
Pass/Fail or S/U optional
This course deals with two central themes: First, environmental problems are people problems, requiring an understanding of how people think, what they care about, what motivated them, and the conditions under which they behave most reasonably and creatively. Second, human behavior makes the most sense when studied in the context of the environment both present and evolutionary. This course builds a model of human nature based upon research in the field of environmental psychology.
The course will explore such topics as environmental perception and knowledge; preferred environments and coping with the failure of preference; and mental attention fatigue and restoration. It then applies this model to such issues as common property resource management and the psychology of sustainability. The course is cross-disciplinary both in emphasis and student population with the disciplines of natural resource policy, planning and management; environmental education and communication; conservation behavior and conservation psychology;landscape architecture and urban planning; and green and sustainable business typically represented.
DeYoung

NRE 561 The Psychology Of Environmental Stewardship (W) **3 hours credit**
NO Pass/Fail or S/U option
One of the enduring challenges of crafting a sustainable society is to create one in which people will want to live. A restrained and austere existence will likely prove to be an ecologically necessity. It is unlikely, however, that people will eagerly pursue such a life if it is represented as the unfortunate necessity of survival. The issue here is how to reframe and then promote such a future so that people not only willingly accept it but actually seek it out. This is primarily a behavioral, not political or technological, challenge. To meet this challenge behavior change tools and strategies are developed. Emphasis is on informational and moricational means of changing behavior in a durable manner. Case studies provide examples of programs at the individual, institutional and community level.
DeYoung

NRE 562 Resource Policy and Administration (F) **3 hours credit**
Pass/Fail or S/U optional
Examines processes of resource policy formation and administration, and the behavior of government institutions as they shape natural resource policies and management programs. Develops an analytic ability to disaggregate complex political and management situations, assess the feasibility of resource policy changes, and build strategy to get such changes adopted and implemented. Cases explore situations at the federal, state, and local levels.
Prerequisite: SNRE Graduate Standing or Permission of Instructor.
Yaffee

NRE 565 Institutions for Sustainability **3 hours credit**
[biennially, odd years]
Pass/Fail or S/U optional
Develops analytic concepts and draws on cases of resource practice to understand problems of collective action in achieving ecological and social sustainability. Focuses on institutions, broadly defined, from the local to the global,and their ability to reverse trneds in environmental degradation and promote long term goals. Issues include questions of durable resource use, production and consumption, property, development, conservation, trade, local-global interactions, international cooperation, diplomatics practice, and third party intervention. Uses readings, case discussion, simulation and lecture.

Princen

NRE 566 Public Opinion and the Environment **3 hours credit**
(biennially odd years)
Pass/Fail or S/U optional
This research seminar will examine trends in public opinion on the environment, influences on peoples concerns about the environment, and how such concerns affect personal behaviors and the political process. Specifically, the objectives will be to: 1. Examine the extent of concern for the environment in society. 2. Understand what influences peoples concerns about the environment. 3. Determine whether concern varies for different subgroups in society. 4. Assess the impact peoples concerns have on the actions they take (political actions and personal behaviors). 5. Assess the impact public opinion on the environment has on the political process. 6. Examine the environmental attitudes of policy makers. 7. Predict where public opinion on the environment is likely to head in the future.
Prerequisite: Graduate Standing or Permission of Instructor.
Mohai

NRE 569/CEE 570 Introduction to Geostatistics **3 hours credit**
Pass/Fail or S/U optional
Geostatistics provides a set of statistical tools for incorporation the spatial and temporal coordinates of observations in data processing. This course will introduce the main geostatistical tools for description and modeling of spatial variability, and interpolation of environmental attributes (e.g., pollutant concentrations) at unsampled locations. Important topics such as sampling design or the incorporation of different types of information (continuous categorical)in prediction will also be addressed. Homework will consist of small problems to get familiar with the theoretical part of the class, and assignments dealing with the analysis and interpretation of various data sets (soil, water pollution, remote sensing) using the geostatistical software GSLIB. moreover, each student will be asked to read a scientific publication in the field of applied geostatistics and asked to give a short presentation at the end of the term. emphasizing the objectives, methodology, and main findings (merits, drawbacks) of the paper. This course is a prerequisite to a more advanced course CEE 625

on the geostatistical modeling of uncertainty through stochastic simulation and its incorporation of decision making.
Prerequisite: An undergraduate class in statistics and probability, eg. NRE 438.
Goovaerts

NRE 570 Microeconomics With Natural Resource Applications (F) **3 hours credit**
Pass/Fail or S/U optional
Develops the tools of microeconomics at an intermediate level. Supplementary materials highlight relevance of course concepts to natural resource and environmental issues. Emphasis is on skill development for natural resource policy analysis. Applications include oil cartels, forestry, common property fisheries, valuation of recreational sites, irreversible development projects, and below-cost timber sales.
Prerequisite: Graduate Standing or Permission of Instructor.
Moore

NRE 571/Econ 471 Environmental Economics (F) **3 hours credit**
Not offered in Winter Term 2001
Pass/Fail or S/U optional
This course is a three-part introduction to the economics of environmental policy. The first part of the course compares the four main policy measures used to regulate polluters, namely (1) imposing taxes on pollution, (2) setting standards on allowable emissions, (3) issuing tradeable pollution permits, and (4) holding polluters legally liable for environmental damages. Also, a new policy measure is discussed that has recently become popular, namely (5) simply making information about the pollution available to the public. These measures are compared in terms of their overall efficiency, the incentives for technological innovation that they provide, and their ease of enforcement. The second part of the course discusses why it is difficult to put a dollar figure on the benefits of environmental regulation, and how economic theory can be used to get around this problem. Finally, the third part of the course covers miscellaneous topics such as the economics of biodiversity, the environmental effects of trade and development, and the economics of global warming.
Prerequisite: Econ 401 or NRE 570.
Vant Veld

NRE 573/UP 573 Urban and Regional Theory **3 hours credit**
Pass/Fail or S/U optional
This course presents a range of urban and regional theories which help to conceptualize the activities of people and societies in space, in the physical domain of cities and regions. They serve to enhance understanding of the growth and the development of human communities and assist in the prediction of future trends in the built and the natural environment. Concepts of sustainability and long term viability are featured. The theories are drawn broadly from the disciplines of architecture, urban planning, geography, landscape architecture, sociology, economics and political science. They are presented so as to be useful in application and action in the spatial realm. They address a range of scales from the neighborhood and community, through urban, metropolitan, national/sub-national, and global, environmental/economic regions.
Staff

NRE 574/PHYSICS 419/PUBPOL 519/RCNSCI 419 Sustainable Energy Systems **3 hours credit**
Pass/Fail or S/U optional
This course examines the production and consumption of energy from a systems perspective. Sustainability is examined by studying global and regional environmental impacts, economics, energy efficiency, consumption patterns and energy policy. First, the current energy system that encompasses resource extraction, conversion processes (e.g. electricity generation) and end-uses (transportation, residential and commercial buildings, industrial sectors), is covered. Responses to current challenges such as declining fossil fuels, carbon sequestration, emerging technologies (e.g., renewable sources: biomass, wind and photvoltaics; fuel cells) and end-use efficiency and conservation. This is a cross-disciplinary course that draws students from across campus including (but not limited to) SNRE, Engineering, Business, LS&A, RC, Architecture and Public Policy.
Prerequisite: Senior Standing and strong quantitative skills (e.g. a college physics or economics course)
Keoleian/Ross

NRE 579/UP 579 Land Use Planning and Design (F) **3 hours credit**
Pass/Fail or S/U optional
Introduces problems, issues, and opportunities in land use planning, development, and management. Covers basis of land use planning, determinants of land use allocation, visual resource management processes and problem solving approaches. Develops skills in land use problem identification and analysis, graphic evaluation, and planning and design techniques.

Erickson

NRE 581 Advanced Environmental Education **3 hours credit**
Pass/Fail or S/U optional
An advanced seminar on a variety of conceptual issues related to environmental education. Sample topics include: assumptions and pitfalls implicit in different EE approaches, the challenge of reaching multicultural and urban audiences, the expanding scope of EE, EE in the international setting. Seminar will center around 4-5 guest educators who will lead a seminar and full day workshop.
Prerequisite: Graduate standing and NRE 481 or similar experience, or Permission of Instructor.
Zint

NRE 583/ECON 472 Intermediate Natural Resource Economics (W) **3 hours credit**
Offered sporadically, odd # years

Pass/Fail or S/U optional
This course is an introduction to the economics of natural resources. Both replenishable resources (such as water, trees, fish, whales, wildlife, and agricultural products) and non replenishable resources (such as oil and minerals) are considered. The defining characteristic of such resources is that increased consumption today has future consequences. The course therefore emphasizes intertemporal choices. Comparisons are made between the market outcome when self-interested agents interact over time and efficient intertemporal exploitation of the resource. Such comparisons are made under certainty and uncertainty and when the resource is privately owned or "common property." For balance, models of animal behavior are also considered including optimal foraging behavior and evolutionary stable equilibria.
Prerequisite: NRE 570 or Econ 401 or Permission of Instructor.
Salant

NRE 585 Water Resource Economics (W) **3 hours credit**
Pass/Fail or S/U optional
Applies natural resource economic and environmental economic analyses to water resource policy and law, and social benefit-cost analysis to water project evaluation. Public policy implications of New Resource Economics, an alternative resource economics paradigm, contrasted to traditional water policy prescriptions. Physical aspects of water resources incorporated into economic analysis.
Prerequisite: NRE 570 or Econ 401 or Permission of Instructor.
Moore

NRE 586 Visualizing the Environment (F) **2 hours credit**
Pass/Fail or S/U optional
This class is an introduction to the basic techniques and terminology relating to the visual communication component of landscape architecture. This class will integrate computer applications and enhance hand drawing capabilities. Efforts to effectively and efficiently communicate will be stressed and students will explore a range of presentation formats.
Prerequisite: Permission of Instructor.
Larsen

NRE 587 Watershed Design (F) **4 hours credit**
Pass/Fail or S/U optional
This course establishes an understanding of watersheds as a basis for design at site and regional scales. It also teaches how to read and explain landscape patterns through drawing in the field and in the studio.
Prerequisite: Admission to the Landscape Architecture program or Permission of Instructor.
Grese

NRE 588 Site Engineering (W) **4 hours credit**
Pass/Fail or S/U optional
Substantial technical development must be carried forward to produce a complete design in landscape architecture. Principal elements such as precise alignment and specifications of road and walk systems, the location and design of utilities, choice of materials for detail construction, and site grading must be completed for a finished project. NRE 588 introduces the skills necessary to produce a set of working drawings that are capable of implementing a proposed design.
Prerequisite: Admission to the Landscape Architecture program or Permission of Instructor.
T. Brown

NRE 589 Ecological Restoration **3 hours credit**
Not offered in Winter Term 2001
Pass/Fail or S/U optional
The Society for Ecological Restoration defines ecological restoration as "the process of renewing and maintaining ecosystem health (or integrity)." This course is designed to provide a practical overview of various facets of ecological restoration, particularly as related to restoring and managing the kinds of habitats found in Southeastern Michigan and the upper Midwest. Through a combination of lectures, readings, field trips, and project work, we will examine background theory and issues relating to ecological restoration and attempt to develop approaches for solving specific problems associated with local habitats. While most of the examples we will study will be local, the principles and processes will have applications world-wide. The sequence of class lectures/readings/discussions is intended to provide basic information and philosophies on ecological restoration/natural areas management and the field trips are intended to provide first hand exposure to local ecosystems and the challenge of putting restoration ideas into practice. Class work will include discussions, labs/short exercises, group projects, and one individual term paper/project. There will also be a final examination.
Prerequisite: Senior or Graduate Standing.
Grese

NRE 590 Landscape Ecology Design (W) **4 hours credit**
Pass/Fail or S/U optional
This course draws from landscape ecology, conservation biology, and aesthetics to design supportive environments for human experience and to protect habitats for other species.
Prerequisite: NRE 587.
Nassauer

NRE 591 Materials and Methods (F) **3 hours credit**
Pass/Fail or S/U optional
Includes the study of construction materials (concrete, masonry, wood, and metals), construction detailing (graphic procedure), cost estimating, specifications, and the relationship of specifications to the construction document package. Also includes

a construction documentation component that encompasses the preparation of a construction document package, including planting designs, grading plans, layout plants, and construction details.
Prerequisite: Admission to the Landscape Architecture program and NRE 588 or Permission of Instructor.
T. Brown

NRE 593 Environmental Justice: New Directions (F) **3 hours credit**
Pass/Fail or S/U optional
This course will examine current research on the topic of environmental justice, including the evidence concerning the occurrence of environmental injustices, explanation for this phenomenon, and how affected groups and government have responded. The course will also explore solutions to the problem.
Prerequisite: Graduate Standing or Permission of Instructor
Mohai

NRE 594/CAAS 594 Research for Environmental Justice (F) **3 hours credit**
Pass/Fail or S/U optional
Government agencies at all levels are collecting information for data analysis in order to make informed policy decisions. Public demands on federal, local and state agencies for information on toxic exposure in the air, water, food, soil, dust and their possible effects are increasing, particularly as thousands of new chemicals find their way onto the market. This information has been of value in agency decision making, yet a considerable amount is never analyzed. Agency personnel seldon have the time or interest to exhaust the analysis of their databases. The more pressing problems of policy implementation and enforcement takes precedence over data analysis. We, at the Universit of Michigan believe we can provide a service to government agencies and to graduate students and faculty interested in inproving their quantitative and analytical skills. This course will focus on graduate students with quantitative skills- skills to allow them to to sophisticated data analysis.
Bryant

NRE 595/CEE 589 Risk Benefit Analysis in Environmental Engineering **3 hours credit**
Pass/Fail or S/U optional
Introduction to techniques of risk benefit analysis as applied to water resource and environmental engineering. Techniques of multi-objective water resource planning, the engineering-political interfaces, and political bargaining and decision making are also discussed.
Prerequisite: Senior or Graduate Standing. It is highly desirable for students to have taken differential and integral calculus.
Bulkley

NRE 597 Environmental Education Field Placement **2 hours credit**
Not offered in Winter Term 2001
Pass/Fail or S/U optional
Placement of a team of students (3-6) under close supervision of the instructional staff -- into a particular school, community, organization, interpretative center or some other educational institution in order to develop the students instructional techniques and skills.
Prerequisite: Permission of Instructor.
Zint

NRE 598 Natural Resource Internship - Graduate (F, W, Sp, Su) **1-3 hours credit**
Pass/Fail or S/U ONLY
Graduate students, under the guidance of a faculty advisor, participate in an internship relevant to their field of study.
Prerequisite: Permission of Faculty Sponsor and OAP Internship Coordinator.
Internship Coordinator/SNRE Staff

NRE 600 Directed Research and Special Problems (F, W, Sp, Su) **1-8 hours credit**
Pass/Fail or S/U optional
Individual problems and research for graduate students.
Prerequisite: Graduate Standing and Permission of Instructor.
Staff

NRE 625/CEE 625 Geostatistical Modeling of Uncertainty (W) **3 hours credit**
Pass/Fail or S/U optional
Rick assessment: parametric and non-parametric approaches. Optimal estimates. Decision making in the face of uncertainty. Classification of categorical attributes. Stochastic spatial simulation: continuous and categorical environmental attributes. Propagation of uncertainty. Soil and water pollution data will be analyzed using geostatistical software.
Prerequisite: NRE 569/CEE 570
Staff

NRE 631/UP 631 Land Use and Physical Planning Studio (F, W) **6 hours credit**
Pass/Fail or S/U optional
Professional practice courses emphasizing an interdisciplinary approach to the preservation, conservation and design of urban areas. These courses are designed to fulfill the requirements established by the concentration guidelines under Urban Design and Preservation/ Conservation, as well as to act as one of the key studio courses for students pursuing the Dual Degree Program leading to simultaneous master's degrees in architecture and urban planning, and in urban planning and lanscape architecture. During the first semester, students from architecture, landscape architecture and urban planning work individually and collaboratively on three design problems, such as: urban infill housing; urban space; preservation/conservation

of an uban area. In the second semester, students work individually or collaboratively on preservation/conservation, landscape, and architecture design problems in an urban setting of their choosing, or set by the instructors.
Prerequisite: UP 518 and 519 or Permission of Instructor.
Inam

NRE 639 Advanced Seminar in Resource Ecology (F, W) **1-3 hours credit**
Pass/Fail or S/U optional
Topics include current leading-edge problems in various resource ecology related areas considered essential to a distinctive and challenging research program for doctoral and advanced masters students. Sections for the coming term are listed below.
Prerequisite: Graduate Standing.
Staff

NRE 641 Research Methods in Environment and Behavior (F) **3 hours credit**
Pass/Fail or S/U optional
This course in intended for students who are likely to engage in reseach of any kind, formal or informal, that is concerned with people and the environment. Major emphasis on is placed on conceptualization - on going from a topic of interest to measurable constructs. A focus on anticipating possible outcomes and possible alternative interpretations leads to consideration of various research designs and strategies. A concern for ethical and humane reseacrh is examined in terms of the researcer's role both with respect to participants and the ultimate recipients of the information.
Prerequisite: Graduate Standing.
Kaplan

NRE 661 Conservation Behavior Seminar (F) **3 hours credit**
NO Pass/Fail or S/U option
The objective of this course is to develop the ability to understand and analyze conservation behavior research studies and formulate strategies for effective interventions. A broad set of classic and contemporary readings on conservation behavior theory and research will be discussed. ssues in the field. The course content will change annually to reflect new ideas and issues in conseravtion and behavior.
Prerequisite: Permission of Instructor. NO Pass/Fail or S/U Option
DeYoung

NRE 662 Seminar in Resource Policy and Administration **3 hours credit**
[biennially - odd years]
Pass/Fail or S/U optional
Provides an opportunity for advanced resource policy graduate students to discuss and analyze current topics and normative in the field. The course content will change annually to reflect new ideas and issues in resource policy and administration, and because two-thirds of the seminar sessions involve discussion of student prepared papers, the exact content of the course will vary from year to year.
Prerequisite: NRE 562 and Permission of Instructor.
Yaffee

NRE 664 Environment and Economy: Reading and Research Seminar **3 hours credit**
Pass/Fail or S/U optional
This course draws on a range of histories and analytic perspectives regarding environmental, political and economic relations that transcend boundaries. The aim is to understand patterns of degradation and to suggest possibilities for sustainability. Put differently, the proximate causes of degradation are well known (e.g., clear-cutting, auto use, refrigeration), but the driving forces (e.g, economic growth, technological change, political and economic institutions, values and attitudes) are less clear. By examining details of political and economic development with an eye towards environmental impacts and by scrutinizing a range of perspectives on such processes, this course attempts to grasp the underlying forces. A premise is that the design of policies to reverse degradative trends and to promote ecologically sustainable systems requires and understanding of such relations. This premise applies at all levels, for the local to the global and pertains to all comtemporary political economies, from industrializing to advances industrial.
Prerequisite: Graduate Standing.
Princen

NRE 665/CAAS 665 Research Methods: Traditional and New Grassroots Environmentalism **3 hours credit**
Not offered Winter Term 2001
NO Pass/Fail or S/U option
This course explores the differences and similarities between traditional environmental politics and the politics of the new grassroots sector. Students will examine some qualitative social science methods that can be used to enhance our understanding of activism in various types of environmenmtal groups.
Prerequisite: Graduate Standing. NO Pass/Fail or S/U Option
Taylor

NRE 668/Econ 661 Advanced Natural Resource Economics (F) **3 hours credit**
Pass/Fail or S/U optional
This course reviews the literature on the pricing of natural resources (agricultural goods, renewable and nonrenewable resources and durables) over time. The first half of the course considers resources which are privately owned; the second half considers resources that are common property. To provide a point of reference, the behavior of resource markets in the absence of government intervention is studied first. There is then an extensive treatment of the dynamic effects

on market equilibria of widespread government policies (unanticipated, partially anticipated or fully anticipated). Policies analyzed include: bufferstocks used to affect prices (ceilings, floors, bands, and pegs); bans, embargoes, price controls and whatever else is timely or of interest to participants. To simplify the mathematics, discrete-time methods are used predominately. The Kuhn-Tucker theorem is utilized when studying competitive equilibrium under certainty. Dynamic-programming is used to study single-agent (planning or monopoly) problems under uncertainty (with or without learning). Multi-stage game theory is used to investigate dynamic common-property problems. A working understanding of these methods is developed during the course.
Prerequisite: Econ 501 or 601m Econ 653 and 654 or Permission of Instructor.
Salant

NRE 669/Econ 662 Advanced Environmental Economics (F) **3 hours credit**
Pass/Fail or S/U optional
In the presence of pollution externalities, market allocations are typically inefficient and corrective government regulation may be desirable. This course first reviews solutions favored by economists, namely Pigovian taxes, tradable pollution permits, and judicial remedies, but then points out various real-world informational, technological, and political constraints that make such solutions difficult or impossible to implement in practice. The course then focuses on optimal interventions in the presence of these real-world constraints. Topics discussed are likely to include (1) optimal regulation when firms possess more information about compliance costs than regulators; (2) optimal enforcement of regulations when monitoring is costly; (3) non-market methods of measuring environmental and resource values; and (4) the interrelationship of environmental issues and international trade.
Prerequisite: Econ 501 or 601, 653, or permission of the instructor.
Vant Veld

NRE 677 RPB Research Seminar (F, W) **2 hours credit**
Pass/Fail or S/U optional
Meeting place and intellectual focus for students and faculty interested in the aspects of SNRE covered by the RPB concentration. Purpose is to discuss research, both early in its formulation and when the study is completed. RPB and Ph.D. students as well as affiliated faculty participate in presentations and discussions.
Prerequisite: Graduate Standing
Staff

NRE 686/HMP 686 The Politics of Environmental Regulation **3 hours credit**
Pass/Fail or S/U optional
This course will consider the capacity of existing North American political institutions to shape effective environmental regulatory policy and explore alternative institutional arrangements that might be necessary in future decades. Major themes will include regulatory fragmentation across governmental and medium (air, water, land) lines, the evolution of environmental regulatory politics and policy in recent decades, and the prospects for devising a more preventive, integrative approach in the future. The emphasis will be primarily on the United States, Canada, and Mexico, although non-North American examples will be introduced where appropriate.
Prerequisite: Graduate Standing.
Rabe

NRE 687 Landscape Planning and Analysis (F) **4 hours credit**
Pass/Fail or S/U optional
The general goals of this course are: to acquaint students with the important issues, problems, and approaches of landscape planning; to create an awareness and understanding that site planning and land planning are part of a continuum and are inseparable from each other within the design process; to provide an awareness and understanding of how spatial information can be collected, analyzed, then combined to generate maps (by the use of a Geographic Information System, GIS) that allow one to investigate land planning alternatives; and to create an awareness and applied understanding of various landscape planning methods.
Prerequisite: NRE 587 and NRE 590.
T. Brown

NRE 688 Site Planning and Design (W) **4 hours credit**
Pass/Fail or S/U optional
A semester long site planning project that integrates and deepens design and technical knowledge from previous LA courses in a complete design process from proposal to specifications.
Prerequisite: NRE 687.
Staff

NRE 691 Plants and Their Use in the Designed Landscape (F) **3 hours credit**
Pass/Fail or S/U optional
Focuses on the art and science of using plants in the landscape. Building on previous knowledge from NRE 437 Woody Plants, this course will expand the plant palatte of ornamental plants and focus on the cultural and design issues of using plants in the landscape.
Prerequisite: Admission to the Landscape Architecture program and NRE 587 and NRE 590.
Grese

NRE 695 Landscape Planning in Rural Environments (W) **3 hours credit**
NO Pass/Fail or S/U option
This course acquaints graduate students with issues affecting patterns and processes in the rural landscape (primarily

of the US). It is open to students from throughout the concentration areas of SNRE, as well as from outside the school. Topics include: farmland protection, historic landscape preservation, rural aesthetic assessment, sustainable agricultural efforts, farm policy, and rural/urban fringe issues, all as they affect the physical shaping of rural lands.
Prerequisite: Graduate Standing and NRE 579 or Permission of Instructor. NO Pass/Fail or S/U Option
Erickson

NRE 700 Masters Thesis/Practicum (F, W, Sp, Su) **1-6 hours credit**
Pass/Fail or S/U optional
Individual graduate student thesis work.
Prerequisite: Graduate standing and Permission of Instructor.
Staff

NRE 701 Master's Project Planning (W) **2 hours credit**
Pass/Fail or S/U optional
This course is designed to organize students into Master's Project groups, to help them develop work plans for their projects, and to give them skills in issues related to conducting a group activity with an external client. All students planning on working on a master's project are required to enroll in this course.
Prerequisite: Graduate standing
Jensen

NRE 701 Master's Project (F, W) **1-6 hours credit**
Pass/Fail or S/U optional
Master's projects are initiated and developed by teams of students and a faculty advisor, starting with informal meetings during each Fall semester. Projects begin each Winter term and usually run for two additional semesters. Student teams are comprised of 6 to 8 students who bring a diversity of backgrounds, skills and insights to the task of producing a multi-authored report.
Prerequisite: Graduate standing
Staff

NRE 741 Research Paradigms (W) **3 hours credit**
NO Pass/Fail or S/U option
This course offers a conceptual and critical treatment of issues relevant to doing research in natural resource/environmental areas. Topics addressed include: the nature of science and criteria for "quality research," characteristics of the scientific community, research value systems and ethics, and considerations of interdisciplinary research. The course is intended to broaden the students perspective of the diversity of research frameworks through class discussions stimulated by assigned readings, as well as workshop problem solving sessions and occasional guest lectures.
Prerequisite: Pre-candidate status in doctoral program. NO Pass/Fail or S/U Option
Kaplan

NRE 786 Design and Nature: Current and Historical Perspective **2 hours credit**
Pass/Fail or S/U optional
Explores the traditions that have shaped American landscape design and speculates on new directions for the future. Course format consists of lectures, readings, and discussion. Emphasis is on the role that nature has and continues to play in landscape design.
Grese

NRE 787 Metropolitan Studio (W) **2 hours credit**
Pass/Fail or S/U optional
This course focuses on the challeneges and oppurtunities of a developing metropoliyan region, and the sustainable design solutions that can result from a knowledge of the forces in effect in the region. The seven week format provides the oppurtunity to investigate design solutions for a specific site, starting at the regional scale and moving down to a site-specific design solution. The class provides the oppurtunity to study regional development patterns and the site level issues of how existing development is put on the ground. We will also discuss the questions of liveability - what makes a place attractive and liveable given our changing demographics and lifestyles - and ecologically sustainable as well. Assignments can be modified for students without a design background.
Brabec

NRE 791 Topical Interdisciplinary Studio (W) **2 hours credit**
Pass/Fail or S/U optional
This half-term studio focuses on a rotating selection of evolving topics in practice and research. The studio uses design and planning to engage interdisciplinary collaboration. A maximum of eight hours will be counted toward degree requirements.
Prerequisite: NRE 688 or Permission of Instructor.
Staff

NRE 990 Dissertation/Precandidate (F, W, Sp, Su) **1-8 hours credit**
Pass/Fail or S/U optional
Election for dissertation work by doctoral students not yet admitted to Candidacy.
Prerequisite: Advanced doctoral student not yet admitted to Candidacy.
Staff

NRE 995 Dissertation/Candidate (F, W, Sp, Su) **8 hours credit**

Pass/Fail or S/U optional

Election for dissertation work by doctoral students who have been admitted to Candidacy.

Prerequisite: Doctoral Candidate

Staff