

NATURAL RESOURCES (NR)

Visit the [Course Schedule Search website](#) to find out when courses will be offered during the academic year.

Read more about the courses within this subject prefix in the descriptions provided below.

NR 400 - Professional Perspectives in Natural Resources

Credits: 1

Lectures by departmental faculty provide an informal look at the various natural resource disciplines and professions represented by the Department of Natural Resources. These presentations acquaint students with our faculty and inform them of some of the exciting research being undertaken in the department. Students also learn of opportunities for professional involvement. Required for all first-semester Natural Resources majors.

Grade Mode: Credit/Fail Grading

NR 403 - Introduction to Environmental Science

Credits: 4

A multi-disciplinary introduction to Environmental Sciences, presenting basic concepts and controversies in geology, meteorology/hydrology, global biology and biogeochemistry, integrated through the study of the Earth as system. Intended primarily for declared or perspective majors in Environmental Sciences and related programs. Combines lecture and discussion with discovery and presentation experiences to address the history of ideas, and major questions and controversies, both settled and active.

Attributes: Inquiry (Discovery)

Grade Mode: Letter Grading

NR 411 - Environmental and Resource Economics Perspectives

Credits: 4

Microeconomic theory and analysis in resource management and use decisions. Survey of significant resource problems from an economic perspective and the application of economic analysis.

Attributes: Social Science (Discovery)

Equivalent(s): ECON 402, ECON 402A, ECON 402H, EREC 411

Mutual Exclusion: No credit for students who have taken ECN 412, ECN 412W.

Grade Mode: Letter Grading

NR 415 - Natural Resources Field Methods

Credits: 2

This course is intended to serve first or second year students in Forestry, Wildlife and Conservation Biology, and Environmental Conservation and Sustainability. After taking this course, students are able to navigate successfully in wild terrain using pacing, map, compass, GPS; can conduct a simple planar survey including cartography; and can sample a forest in order to characterize the abundance and quality of forest resources. Moreover, students know the fundamental principles of navigation, surveying, and field sampling.

Grade Mode: Letter Grading

NR 417 - Sophomore Seminar: Wildlife and Conservation Biology

Credits: 2

This course provides a professional foundation and orientation for second-year Wildlife & Conservation Biology (WCB) students. Through readings, seminars, guest speakers, and conservation, students will explore the range of what it means to be a professional Wildlife & Conservation Biologist. After taking this course, students will be better able to navigate and critique the scientific literature, synthesize and communicate information, and understand and articulate the diverse field of Wildlife & Conservation Biology.

Grade Mode: Letter Grading

NR 425 - Field Dendrology

Credits: 4

Students study forest trees in natural communities and urban settings. Identification and nomenclature of important North American trees and shrubs is emphasized. Environmental factors influencing tree growth, combined with study of disturbance history, provide the context for understanding why tree species grow where they do. Students are introduced to the major forest regions of North America. Restricted to NR majors; others by permission.

Equivalent(s): EC 410, FOR 425, NR 420

Grade Mode: Letter Grading

Special Fee: Yes

NR 433 - Wildlife Ecology

Credits: 0 or 4

Historical, biological, ecological, and sociological factors influencing the wildlife resource and its management. Concepts in populations, communities, habitat, and contemporary wildlife issues. Lab.

Attributes: Biological Science(Discovery); Discovery Lab Course

Equivalent(s): WILD 433

Grade Mode: Letter Grading

Special Fee: Yes

NR 435 - Contemporary Conservation Issues and Environmental Awareness

Credits: 4

Explores the impacts of technology and human activity on our environment and natural resources. Key conservation issues are used as examples of past and present biological, social, and environmental conflicts.

Attributes: Environment,TechSociety(Disc)

Equivalent(s): EC 435, NR 435H, NR 435W, NR 535

Grade Mode: Letter Grading

NR 435H - Honors/Contemporary Conservation Issues and Environmental Awareness

Credits: 4

Explores the impacts of technology and human activity on our environment and natural resources. Key conservation issues are used as examples of past and present biological, social, and environmental conflicts.

Attributes: Environment,TechSociety(Disc); Honors course

Equivalent(s): NR 435

Grade Mode: Letter Grading

NR 437 - Principles of Sustainability**Credits:** 4

In this course, we investigate the foundational principles of the concept of sustainability. Our objectives include: understanding the many integrated dimensions of sustainability; examining illustrations of unsustainable human-environment relations; recognizing the complexity of sustainability problems and the challenges to finding solutions; comprehending that human-environment relations are a multi-level, complex and dynamic system, and appreciating that the sustainability of ecosystems is necessarily embedded in social, cultural and historical trends.

Grade Mode: Letter Grading**NR 439 - Environmental Biology****Credits:** 4

Environmental biology focuses on the origins, functions, and interactions of populations, communities, species and ecosystems in relation to dynamic environmental processes. The main course objective is to provide a basic understanding of ecosystem function and the ecological, evolutionary, and genetic principles necessary to understand biological diversity and its distribution.

Grade Mode: Letter Grading**Special Fee:** Yes**NR 444 - The New Pirates of the Caribbean****Credits:** 4

Inquiry into many facets of tourism from the standpoint of tourists and tour destination. Economic and institutional factors affecting human well-being from the use of land and water resources; discussions of distributional aspects of benefits from tourism activities.; environmental impacts; ownership patterns and uses; cultural attributes; and local economies in small Caribbean island nations. Cruise ships, time-shares, all-inclusive resorts, hurricanes, casinos, bars, rum, sex, and drugs are investigated through extensive readings and web surfing.

Attributes: World Cultures(Discovery); Inquiry (Discovery); Writing Intensive Course**Equivalent(s):** EREC 444**Grade Mode:** Letter Grading**NR 501 - Studio Soils****Credits:** 0 or 4

An overview of physical, chemical, and biological properties of soil. Sub-disciplines of soil chemistry, soil physics, soil microbiology, soil genesis, and classification. Lab.

Attributes: Writing Intensive Course**Equivalent(s):** SOIL 501**Grade Mode:** Letter Grading**Special Fee:** Yes**NR 504 - Freshwater Resources****Credits:** 0 or 4

Major determinants of freshwater resources including hydrologic cycle and water balance, precipitation, stream-flow measurement, pollution, water supply and sewage treatment, water resource management and regulation. Lab/field trips.

Attributes: Discovery Lab Course; Physical Science(Discovery)**Equivalent(s):** WARM 504**Grade Mode:** Letter Grading**Special Fee:** Yes**NR 506 - Forest Entomology****Credits:** 4

Insects are among the most diverse and abundant organisms on the planet and play a crucial role in forest ecosystems. Insects from the base of the consumer food web in forests and are key drivers of nutrient cycling, pollination, etc. This course surveys common and important insect orders, families, and species found in forest systems and provides the tools for basic identification and biological study of these fascinating creatures.

Equivalent(s): FOR 506**Grade Mode:** Letter Grading**Special Fee:** Yes**NR 507 - Introduction to our Energy System and Sustainable Energy****Credits:** 4

This course introduces students to our domestic energy system and the expanding efforts to develop our use and acceptance of sustainable energy. It provides a historical context of our system that explains where we are today in terms of the grid, technologies, energy use and production and energy markets, primarily for electricity and building use. The course examines how our current impedes and enhances opportunities for innovation in renewable technologies and financing.

Attributes: Environment,TechSociety(Disc)**Grade Mode:** Letter Grading**NR 508 - Communicating Science****Credits:** 4

Effective communication and community engagement with science are critical, particularly in our modern era of information overwhelm. In this course, we actively explore tools and techniques for oral, written, and visual communication of science in various mediums and with a range of publics and motivations. With an emphasis on critical and creative thinking, we will cultivate a set of skills and best practices as students develop a personal philosophy for communicating science with diverse audiences.

Prerequisite(s): ENGL 401 with a minimum grade of D-.**Grade Mode:** Letter Grading**NR 525 - Statistical Methods and Applications****Credits:** 4

Applications of elementary statistical concepts and methods including probability, descriptive techniques, statistical inference and bivariate and multivariate statistical analysis. Orientation is toward analysis and interpretation of data commonly encountered in social science disciplines.

Attributes: Quantitative Reasoning(Disc)**Equivalent(s):** EREC 525

Mutual Exclusion: No credit for students who have taken ADM 430, ADMN 420, ADMN 510, BIOL 528, HHS 540, MATH 439, MATH 539, MATH 644, PSYC 402, PSYC 402H, SOC 402, SOC 402H, SOC 502, SOC 502H.

Grade Mode: Letter Grading**NR 527 - Forest Ecology****Credits:** 4

Introduces basic and applied ecology of forests, with emphasis on ecosystem processes, including water, energy, and nutrient cycles; biological interactions, including biodiversity and plant-plant, plant-animal, and plant-microbe relationships; and human impacts, including forest management, land-use/land cover-change, and changes in atmospheric chemistry. Lab.

Equivalent(s): FORT 527**Grade Mode:** Letter Grading**Special Fee:** Yes

NR 561 - Chemistry of the Environment**Credits:** 4

The course is designed for students who desire a deeper understanding of chemical principles in environmental- and ecology-related disciplines. This course will focus on understanding key principles that underline many of the important chemical processes that influence the functioning and health of environmental systems. These include reaction rates, oxidation-reduction, kinetics and enzyme dynamics, pH and acid-base equilibria, organic transformations, colloids and particulate behavior, and analytical approaches to understanding environmental chemistry.

Prerequisite(s): CHEM 403 with a minimum grade of D- or CHEM 405 with a minimum grade of D- or CHEM 411 with a minimum grade of D-.

Grade Mode: Letter Grading**Special Fee:** Yes**NR 564 - Urban Forestry and Arboriculture****Credits:** 4

This course offers a comprehensive understanding of urban forested landscapes & arboricultural practices to maintain their health & function. In this course, we will explore the ecological benefits of urban trees, learn practical skills in tree care, & evaluate the socio-economic impacts of urban forests in communities. Tangible skills covered include tree climbing & pruning for tree maintenance, safety procedures in the industry, hazard tree assessment, & proper tree planting techniques.

Prerequisite(s): NR 527 with a minimum grade of D-.

Equivalent(s): FORT 564**Grade Mode:** Letter Grading**NR 572 - Introduction to Natural Resource Economics****Credits:** 4

Introduces theory, methods of analysis, and current literature of natural resource economics and policy. Topics include multiple use, taxation, optimal harvest scheduling, market failure, property rights, public goods, benefit-cost analysis, amenity values, non-market resource services and natural resource policy. Topics applied to forests and forestry, wildlife management, outdoor recreation, public lands, agriculture, fisheries, water, energy and mining/nonrenewable resources.

Equivalent(s): EREC 572**Grade Mode:** Letter Grading**NR 576 - Forest Products and Wood Science****Credits:** 0-4

Basics of structure and properties of wood as a raw material. Conversion of logs to lumber at Thompson School sawmill. Lumber and log grading and measuring. Studies in processing efficiency, lumber drying, and physical plant operations. Introduction to paper, veneer, and chip products. Marketing of forest products. 2 lec/1 4-hr lab.

Equivalent(s): FORT 476, FORT 576**Grade Mode:** Letter Grading**Special Fee:** Yes**NR 579 - Wildland Fire Ecology and Management****Credits:** 4

An exploration of the historical context of wildland fire and how our changing climate and past management practices influence future fire regimes at local and national scales. This course will provide instruction in fire ecology, and prescribed fire theory and methods. Students will learn the basic knowledge of forest fire control and use and will focus on firefighting, the impacts of fire on vegetation, and the use of prescribed fire in forest and wildlife management.

Equivalent(s): FORT 479, FORT 579**Grade Mode:** Letter Grading**Special Fee:** Yes**NR 600 - Work Experience****Credits:** 0

As part of their degree program, students are expected to engage in a work experience or internship under professional supervision and approved by natural resources faculty. This experience may occur at any time during their sophomore through senior years. Students are responsible for arranging their own experience in consultation with their advisor and NREN faculty members.

Equivalent(s): NR 599**Grade Mode:** Credit/Fail Grading**NR 602 - Natural Resources and Environmental Policy****Credits:** 4

Contemporary natural resource and environmental policy problems/issues are addressed from a policy sciences perspective with emphasis on domestic policy solutions. Critical assessment of major policy initiatives and their implementation toward sustainable resource use and a healthy environment. Public policies are analyzed to determine the extent to which their implementation strategies have succeeded, and to assess their adequacy within a bioregional or ecosystem approach, and/or capacity to integrate economic and environmental decisions. Cases include national and local policies in their global context. Students apply public policy analysis and decision tools in laboratory sessions.

Attributes: Writing Intensive Course**Equivalent(s):** EC 702**Grade Mode:** Letter Grading**Special Fee:** Yes**NR 606 - International Energy Topics****Credits:** 4

This course introduces students to international energy topics. Students will be exposed to a historical context and current status of several energy-related issues from an international perspective. Topics range from energy poverty, energy and climate change and global fossil fuel subsidies. Studies of specific technologies will be delivered through the context of international leaders, Iceland and geothermal, the UK and offshore wind and solar in Germany.

Grade Mode: Letter Grading**NR 607 - Land Economics Perspectives: Uses, Policies, and Taxes****Credits:** 4

Economic and institutional perspectives affecting human use of land resources; discussion of land ownership patterns and uses; land rent, location, and resource use; institutional constraints; partial ownership policies; and local planning for more efficient use of land. Real estate markets, transfers, valuation, and taxation.

Prerequisite(s): NR 411 with a minimum grade of D- or ECON 402 with a minimum grade of D- or ECON 402A with a minimum grade of D-.

Equivalent(s): EREC 606**Grade Mode:** Letter Grading**NR 608 - Economics of Sustainability****Credits:** 4

The concept of sustainability stands on 3 pillars: Ecology, Economy, & Equity. From the standpoint of the economy in general and social equity, there are specific economic tools that help project leaders and policy advocates perform sustainability evaluations. This course equips students with powerful economic tools they can use for such evaluations. These include Benefit-Cost Analysis, Life-Cycle Cost Analysis, and Regional Economic Impact Analysis. Students will use real data to perform evaluations.

Prerequisite(s): EREC 411 with a minimum grade of D- or EREC 572 with a minimum grade of D- or ECON 402 with a minimum grade of D-.

Grade Mode: Letter Grading

NR 615 - Wildlife Habitats**Credits:** 4

Introduces animal-habitat associations, including an examination of spatial and temporal features of wildlife habitat, the evolution of habitat selection, and how habitat suitability/productivity is evaluated.

Attributes: Writing Intensive Course**Prerequisite(s):** BIOL 541 with a minimum grade of D- or BIOL 541W with a minimum grade of D- or NR 527 with a minimum grade of D-.**Equivalent(s):** WILD 615**Grade Mode:** Letter Grading**Special Fee:** Yes**NR 640 - Wildlife Population Ecology****Credits:** 4

An overview of the mechanisms that influence the characteristics of terrestrial wildlife populations. Lecture covers concepts and theory, with a central focus on population growth, how it is influenced by demographic rates of survival, recruitment, immigration/emigration, with additional consideration given to predation and competition, and how population status is monitored for wildlife, including occupancy, abundance, and viability. Lab provides hands-on exercises, often using computer software, with analysis and interpretation of data from local case studies.

Prerequisite(s): (BIOL 412 with a minimum grade of D- or BIOL 412H with a minimum grade of D- or BIOL 414 with a minimum grade of D-) and (BIOL 541 with a minimum grade of D- or NR 527 with a minimum grade of D-) and (MATH 424B with a minimum grade of D- or MATH 420 with a minimum grade of D-).**Grade Mode:** Letter Grading**NR 641 - Wildlife Disease Ecology****Credits:** 4

This lecture and discussion-based course will provide an overview of the importance of wildlife diseases in the context of their emergence, One Health implications, and disease management using an ecological approach. In addition, the epidemiological, and evolutionary principles of diseases will be considered, as well as how to perform wildlife disease investigations. Diseases will be discussed for each of the major terrestrial and aquatic groups of animals. Guest lectures will be provided by experts in their fields.

Prerequisite(s): (NR 439 with a minimum grade of D- or BIOL 411 with a minimum grade of D- or BIOL 411H with a minimum grade of D- or BIOL 413 with a minimum grade of D-) and (BIOL 412 with a minimum grade of D- or BIOL 412H with a minimum grade of D- or BIOL 414 with a minimum grade of D-).**Grade Mode:** Letter Grading**NR 642 - Introduction to Biogeography****Credits:** 4

Biogeography is an integrative field of inquiry that unites concepts and information from evolutionary biology, ecology, systematics, geology, and physical geography. Students are introduced to the distribution patterns of wild animals and plants and to the factors that determine these patterns. In this course, the emphasis is on evolutionary aspects of biogeography, biodiversity, and implications for conservation issues.

Prerequisite(s): BIOL 541 with a minimum grade of D- or NR 527 with a minimum grade of D-.**Grade Mode:** Letter Grading**NR 643 - Economics of Forestry****Credits:** 4

Intermediate-level analysis of supply and demand for forest-based goods and services, managerial economics, taxation, capital investments.

Prerequisite(s): EREC 411 with a minimum grade of D- or ECON 402 with a minimum grade of D- or NR 411 with a minimum grade of D-.**Equivalent(s):** FOR 643**Grade Mode:** Letter Grading**NR 650 - Principles of Conservation Biology****Credits:** 4

Examines the major issues relevant to conservation of biodiversity from the genetic to the ecosystem level. In addition to addressing ecological and biological principles, the interdisciplinary nature and challenges of managing for conservation biology, including the role of economic and social factors are examined.

Equivalent(s): EC 502**Grade Mode:** Letter Grading**Special Fee:** Yes**NR 658 - Introduction to Geographic Information Systems****Credits:** 4

Introduces the use of geographic information systems (GIS) for natural resources and related fields. Data models/structures, map projections, data input/output/storage, data analysis/modeling, interpolation, and data quality/standards. Hands-on lab using ArcGIS Pro software.

Equivalent(s): GEOG 658**Grade Mode:** Letter Grading**NR 660 - Ecology and Biogeography of New Zealand****Credits:** 5

Covers the principles of ecology and biogeography, with a distinct focus on New Zealand. Students investigate the processes that have shaped the New Zealand landmass and its biota. Impact of human settlement on New Zealand's ecosystems is explored in-depth. Methods and techniques of scientific research are incorporated in this course. Field exercises focus on topical case studies in a variety of ecosystems and are designed to strengthen students' conceptual knowledge, enable students to apply this knowledge, as well as develop field skills including classification systems, mapping, habitat assessment, field identification, and sampling techniques.

Co-requisite: INCO 588, NR 661, NR 662, NR 663**Equivalent(s):** EC 660**Grade Mode:** Letter Grading**Special Fee:** Yes**NR 661 - Restoration Ecology and Ecosystem Management in New Zealand****Credits:** 4

Current restoration projects and strategies for management of natural resources in New Zealand form the framework for this course. Solving problems related to introduced species, changes in habitat, the preservation of ecological processes and watershed management are the major foci of this course. Management of resources for multiple uses, as well as primary and extractive industries is included. Field exercises focus on topical case studies in a variety of terrestrial and coastal-marine ecosystems and include the identification of habitats and communities, stresses on the environment, and risk analysis.

Co-requisite: NR 660, NR 662, NR 663**Equivalent(s):** EC 661**Grade Mode:** Letter Grading**Special Fee:** Yes

NR 662 - Environmental Policy, Planning and Sustainability in New Zealand**Credits:** 3

Introduces students to politics in New Zealand. Investigating policy pathways and planning forms part of the curriculum. Students assess scope of legislation, including the Resource Management Act (1991), for the economic and socio-political environment in New Zealand. Government obligations to the Treaty of Waitangi, and customary uses of resources are included as part of this course. Students are exposed to diverse perspectives of local authority planners and policy makers, local iwi (tribes), the Department of Conservation, and community groups. Students examine case studies involving the resource consent process at several levels of decision-making. Case studies provide a comprehensive overview of the interactions between the environment and people and their cultural and socio-economic needs.

Co-requisite: NR 660, NR 661, NR 663

Equivalent(s): EC 662

Grade Mode: Letter Grading

Special Fee: Yes

NR 663 - Applied Directed Research in New Zealand**Credits:** 4

Working closely with faculty, student teams investigate selected ecological, resource management or policy issues. All projects have scientific and societal relevance, and contribute to ongoing/existing projects in the region. Students use the scientific method to design and carry out their projects. Development of rigorous field investigations, experimental design, data analysis, and scientific writing are emphasized. Students prepare a research report and present their findings in a seminar that includes stakeholders and people from the local community.

Co-requisite: NR 660, NR 661, NR 662

Attributes: Writing Intensive Course

Equivalent(s): EC 663

Grade Mode: Letter Grading

Special Fee: Yes

NR 664 - Conservation Genetics and Applied Evolution**Credits:** 4

This course provides an overview of key concepts of conservation genetics and the use of genetic tools and data to address them. It addresses how evolutionary theory underpins processes and solutions relevant to biodiversity conservation. Major topics include genetic diversity and variation in natural populations, inbreeding, captive management, genetic rescue, genetic monitoring, and evolutionary responses to anthropogenic impacts. Practical exercises and case studies explore the application of genetic techniques and the analysis of genetic data.

Prerequisite(s): (BIOL 411 with a minimum grade of D- or BIOL 411H with a minimum grade of D- or BIOL 413 with a minimum grade of D- or NR 439 with a minimum grade of D- or BIOL 412 with a minimum grade of D- or BIOL 412H with a minimum grade of D- or BIOL 414 with a minimum grade of D-) and (BIOL 541 with a minimum grade of D- or NR 527 with a minimum grade of D-).

Mutual Exclusion: No credit for students who have taken GEN 705.

Grade Mode: Letter Grading

NR 703 - Watershed Water Quality Management**Credits:** 4

Principles of land use as they relate to water quality and quantity. Lectures focus on biogeochemical cycles and the watershed approach to land and water resource management. Labs and field trips focus on methods of water sampling and analysis. One year of chemistry is recommended. Lab/field trips.

Prerequisite(s): NR 504 with a minimum grade of D-

Equivalent(s): WARM 703

Grade Mode: Letter Grading

Special Fee: Yes

NR 706 - Soil Ecology**Credits:** 4

Examines the ecological relationships between soil microorganisms and their biotic and abiotic environment, with emphasis on the role of soil microorganisms in biogeochemical cycling. Specific objectives are to examine the biodiversity present in soil systems, factors controlling microbial community composition and diversity, and linkages between soil microbial communities, soil physical properties, and soil organic matter and nutrient cycling dynamics. Lab.

Attributes: Writing Intensive Course

Prerequisite(s): (BIOL 412 with a minimum grade of D- or BIOL 412H with a minimum grade of D- or BIOL 414 with a minimum grade of D- or BIOL 409 with a minimum grade of D-) and CHEM 403 with a minimum grade of D-.

Equivalent(s): SOIL 706

Grade Mode: Letter Grading

Special Fee: Yes

NR 707 - Environmental Modeling**Credits:** 4

Environmental Modeling introduces students to a range of key mathematical and computer modeling concepts and the ways they can be used to address important scientific questions. The course is divided into four topical sections: Population and Community Ecology, Hydrology, Biogeochemistry, and Ecosystems. In each section, modeling concepts and skills are presented together with environmental information to emphasize the linkage between quantitative methods and relevant scientific results.

Prerequisite(s): MATH 425 with a minimum grade of D- or MATH 424B with a minimum grade of D-.

Grade Mode: Letter Grading

NR 708W - Environmental Economics**Credits:** 4

Environmental pollution, the market economy, and optimal resource allocation; alternative control procedures; levels of environmental protection and public policy; property right issues.

Attributes: Writing Intensive Course

Prerequisite(s): ECON 605 with a minimum grade of D-.

Equivalent(s): EREC 708, RECO 708

Grade Mode: Letter Grading

NR 712 - Mammalogy**Credits:** 4

Evolution, ecology, behavior, physiology and diversity of mammals. The focus of the course is on conceptual issues, such as the relation of structure, function, physiology and ecology of species; reproductive physiology and life history strategies; and the evolution of mating systems and social structure. Familiarity of mammalian groups to the family level and identification of local fauna to species will be required. Lab.

Prerequisite(s): (BIOL 411 with a minimum grade of D- or BIOL 411H with a minimum grade of D- or BIOL 413 with a minimum grade of D- or NR 439 with a minimum grade of D-) and (BIOL 412 with a minimum grade of D- or BIOL 412H with a minimum grade of D- or BIOL 414 with a minimum grade of D-).

Grade Mode: Letter Grading**Special Fee:** Yes**NR 713 - Quantitative Ecology****Credits:** 4

Basic quantitative concepts applied to ecological systems including: population and community dynamics, experimental design, spatial patterns, species abundance and diversity, community organization, metapopulations, and landscapes.

Prerequisite(s): (BIOL 528 with a minimum grade of D- or EREC 525 with a minimum grade of D-) and (NR 527 with a minimum grade of D- or BIOL 541 with a minimum grade of D-).

Equivalent(s): FORS 713**Grade Mode:** Letter Grading**NR 720 - International Environmental Politics and Policies for the 21st Century****Credits:** 4

Students examine policies for managing human activities to sustain the health of regional ecosystems and planetary life-support systems. Selected problems of the international commons (oceans, marine resources, atmosphere, migratory species); global and regional carrying capacity (population, resource consumption), internationally shared ecosystems (transboundary watersheds and waterbodies, tropical forests); and the relevant international institutions and politics for policy formation, conflict resolution, and implementation. Using a policy-analytic framework, students develop case studies to assess international policies and institutional arrangements to achieve the objectives of Agenda 21–Earth Summit Strategy to Save the Planet.

Attributes: Writing Intensive Course**Equivalent(s):** EC 720**Grade Mode:** Letter Grading**NR 724 - Resolving Environmental Conflicts****Credits:** 4

Theories and practices of environmental dispute settlement. Roles of public, non-governmental and governmental organizations. Effectiveness of public participation initiatives in influencing public policy decisions and/or resolving environmental conflicts. Alternative approaches to consensus (policy dialogues, joint problem solving; strategic planning; negotiation, mediation) as well as litigation. Specific cases are critiqued and evaluated; conflict resolution skills are developed. Students observe and/or participate in ongoing local decision processes. Lab.

Attributes: Writing Intensive Course**Equivalent(s):** EC 724**Grade Mode:** Letter Grading**Special Fee:** Yes**NR 729 - Silviculture****Credits:** 4

The science and art of establishing, growing, and tending forests to meet multiple objectives. Basics of forest stand dynamics applied to the problems of timber management, wildlife habitat, water quality, and carbon sequestration.

Prerequisite(s): NR 425 with a minimum grade of D- and NR 527 with a minimum grade of D-.

Grade Mode: Letter Grading**Special Fee:** Yes**NR 730 - Terrestrial Ecosystems****Credits:** 4

Processes controlling the energy, water, and nutrient dynamics of terrestrial ecosystems; concepts of study at the ecosystem level, controls on primary production, transpiration, decomposition, herbivory; links to earth-system science, acid deposition, agriculture. One semester each of biology, chemistry and ecology required prior to taking this course; possible courses include: BIOL 409, BIOL 411, BIOL 412 OR NR 439 AND CHEM 403, CHEM 405 OR CHEM 411 AND BIOL 541 OR NR 527.

Equivalent(s): EOS 730, FOR 730, FORS 730**Grade Mode:** Letter Grading**NR 731 - Agriculture and Environmental Change: Challenges and Solutions****Credits:** 4

Agriculture is the foundation of civilization, providing the food, fuel and fiber needed to sustain a growing human population. From the original land clearing to today, agriculture has profoundly impacted the environment and is now recognized as a major contributor to soil and water degradation and climate change. At the same time, climate change and other large-scale environmental changes are forcing adaptation of agricultural practices. This course examines interactions between agricultural systems and global environmental processes, including climate change, carbon cycling, nitrogen pollution and water resources. Students will develop an in-depth understanding of how agricultural practices contribute to environmental changes from local to global scales and the underlying biogeochemical drivers of change. We will evaluate frameworks like agroecology, regenerative agriculture, agroforestry, and climate-smart agriculture for their potential to mitigate environmental impacts. Students will learn to apply interdisciplinary thinking to develop solutions that balance crop productivity and environmental sustainability in a changing world. The course emphasizes biogeochemical understanding across spatial and temporal scales and couples to agroecosystem management frameworks to consider solutions.

Prerequisite(s): CHEM 403 with a minimum grade of D- or CHEM 411 with a minimum grade of D- or AGFS 502 with a minimum grade of D-.

Grade Mode: Letter Grading

NR 734 - Tropical Ecology**Credits:** 4

This course introduces students to the ecology of different tropical ecosystems, and involves students in analyzing and interpreting ecological field data and remotely sensed data. An important emphasis is to understand patterns and processes across scales - from individual plants to ecosystems and landscapes. The course also addresses important global issues in the tropics, including climate change, land use change, diverse ecosystem services, and sustainable resource management.

Prerequisite(s): NR 527 with a minimum grade of D- or BIOL 541 with a minimum grade of D- or BIOL 541W with a minimum grade of D-.

Equivalent(s): FOR 734

Grade Mode: Letter Grading

NR 740 - Inventory and Monitoring of Ecological Communities**Credits:** 4

Provides an introduction to the major concepts associated with monitoring change in ecological communities. Students develop an appreciation for such issues as: identification of appropriate baselines for comparison; use of indicator species; the tools used to inventory common, rare, and secretive species; how trend data are analyzed; and the implications of failing to detect an indicator species. Lab.

Attributes: Writing Intensive Course

Grade Mode: Letter Grading

Special Fee: Yes

NR 743 - Addressing Arctic Challenges**Credits:** 4

Students will gain knowledge on the effect of climate change on Arctic environmental, social, and built systems, and apply transdisciplinary approaches to addressing arctic challenges. This course employs inquiry-based, peer-to-peer, and self-driven approaches. Students will tackle a research project, including data analysis, with the aim of contributing new knowledge in the form of a proposal, publication, outreach product, or other.

Prerequisite(s): BIOL 528 with a minimum grade of D- or SOC 402 with a minimum grade of D- or MATH 539 with a minimum grade of D- or MATH 644 with a minimum grade of D-.

Grade Mode: Letter Grading

NR 744 - Biogeochemistry**Credits:** 4

Examines the influence of biological and physical processes on elemental cycling and geochemical transformations from the molecular to the global scale, involving microorganisms, higher plants and animals and whole ecosystems; factors that regulate element cycles including soils, climate, disturbance and human activities; interactions among the biosphere, hydrosphere, lithosphere, and atmosphere; transformations of C, N, S, and trace elements.

Prerequisite(s): (BIOL 409 with a minimum grade of D- or BIOL 411 with a minimum grade of D- or BIOL 411H with a minimum grade of D- or BIOL 413 with a minimum grade of D- or BIOL 412 with a minimum grade of D- or BIOL 412H with a minimum grade of D- or BIOL 414 with a minimum grade of D- or NR 439 with a minimum grade of D-) and (CHEM 403 with a minimum grade of D- or CHEM 405 with a minimum grade of D- or CHEM 411 with a minimum grade of D-) and (BIOL 541 with a minimum grade of D- or NR 527 with a minimum grade of D-).

Grade Mode: Letter Grading

NR 745 - Forest Management**Credits:** 4

Forest land ownership, management objectives, forest inventory regulation and policy, forest administration, professional responsibilities and opportunities. Lab.

Attributes: Writing Intensive Course

Equivalent(s): FOR 745

Grade Mode: Letter Grading

Special Fee: Yes

NR 746 - Maps and Environmental Equity**Credits:** 4

Environmental justice ensures the right to a safe, healthy, productive and sustainable environment for everyone, regardless of income, race, color, origin or income. Maps have become critical tools in environmental justice because maps bring visibility and definition to social-environmental problems. As diagrams – or representations of data – showing distributions over space and time, maps orient us, steer us, and make meaning of complex information. We trust them in depictions of, for example, cancer clusters or contaminated water. Yet maps are also capable of creating environmental injustice. Historical redlining, for example, used maps to limit financial services in certain neighborhoods in the 1930s-50s with long-term environmental impacts into the 2020s. Maps are not simply good or bad. This course thus explores environmental justice and injustice as depicted on maps, but also as embedded in the maps themselves. Who chooses their boundaries, for what purpose, and what consequence? How do maps make meaning and construct knowledge and to what social and political ends? What power dynamics do maps reflect and how do they become powerful themselves? Whose space and time do maps employ? Over the semester, we will make our own maps and bring awareness to the maps we create, including their values and assumptions, how they reflect and exercise power, and their potentials to create change. The goals of the course are to 1) bring a greater awareness to environmental justice and injustice in the maps we use and, 2) to create just maps.

Prerequisite(s): NR 658 with a minimum grade of D- or NR 760 with a minimum grade of D- or ESCI 777 with a minimum grade of D- or GEOG 591 with a minimum grade of D-.

Grade Mode: Letter Grading

NR 749 - Forest Inventory and Modeling**Credits:** 4

Applied sampling and statistical techniques for assessing current forest conditions and predicting future growth, yield, and structure. Topics include plot and point sampling, ecological inventory, and evaluation of site quality and stand density.

Prerequisite(s): NR 415 with a minimum grade of D- and BIOL 528 with a minimum grade of D-.

Grade Mode: Letter Grading

Special Fee: Yes

NR 750 - Sustaining Biological Diversity**Credits:** 4

This course examines the approaches to recover and restore declining populations and at-risk communities. Major concepts addressed include: population viability analysis; use of simulation models to explore conservation alternatives; integrating the political, economic, and social realities that affect natural resource management; the adaptive nature of any restoration of rare organisms and communities; and preparing for the challenges associated with invasive organisms and climate change.

Grade Mode: Letter Grading

Special Fee: Yes

NR 751 - Aquatic Ecosystems**Credits:** 4

Energy flow and nutrient cycling in streams, rivers and lakes, with an emphasis on understanding the control of primary productivity, decomposition and community structure by both hydrologic and biotic drivers. Role of aquatic ecosystems in carbon and nitrogen budgets at watershed, regional, and global scales. Impacts of environmental changes such as global climate change and suburbanization on aquatic ecosystems. Lab.

Prerequisite(s): NR 504 with a minimum grade of D-.**Grade Mode:** Letter Grading**NR 753 - Critical Issues in Sustainability: Sustainability as an Abundance Paradigm****Credits:** 2

After 30 years in common parlance, the success of "Sustainability" still seems far from its goal. In part, this is because sustainability is typically applied as another way to manage scarcity, a paradigm informing economic and social policy for well over a century. Underlying this dominant view of sustainability, an increasing number of approaches to sustainability projects, some of longstanding are entering the mainstream as pieces of an identifiable, and distinctly novel, paradigm based on the assumption of abundance, rather than scarcity. These include ideas of the Natural Step and Natural Capital, as well as Cradle to Cradle and Biomimicry. The goals of this seminar are (1) to survey and discuss this growing literature and its application to the solution of sustainability problems; and (2) research and analysis towards transforming scarcity-based to abundance-based solutions. To be considered as a capstone option for majors in Environmental and Conservation Sustainability, students must also register for NR 754 in the Spring semester.

Grade Mode: Letter Grading**Special Fee:** Yes**NR 754 - Critical Issues in Sustainability: Sense of Place****Credits:** 2

Costa Rica is the happiest country on Earth. Bhutan is a living laboratory for education. Bolivia has a Law of Mother Earth in its constitution. Cities and towns in the US create local solutions to problems of resource sustainability while the national dialogue stagnates. What drives some places to lay the foundations for sustainable futures, while others do not? Sense of Place is a powerful lens through which to view the relative achievements of places and organizations toward creating a sustainable future. The goals of this seminar are (1) to survey the Sense of Place literature and to analyze case studies of the role of Sense of Place in the success of sustainability efforts nationally and internationally; and (2) to research the role of Sense of Place in our local community environment and to relate it to stated goals in existing sustainability plans. To be considered as a capstone option for majors in Environmental and Conservation Sustainability, students must also register for NR 753 in the Fall semester.

Grade Mode: Letter Grading**NR 756W - Rural and Regional Economic Development****Credits:** 4

Concepts and methods of delineating regional economies, methods of measuring activity, regional development, and public policies. Emphasizes empirical research studies.

Attributes: Writing Intensive Course**Prerequisite(s):** ECON 605 with a minimum grade of D-.**Equivalent(s):** EREC 756, RECO 756**Grade Mode:** Letter Grading**NR 757 - Remote Sensing of the Environment****Credits:** 4

Practical and conceptual presentation of the use of remote sensing and other geospatial technologies for mapping and monitoring the environment. This course begins with the use of aerial photographs (photogrammetry, and photo interpretation) and includes measures of photo scale and area, parallax and stereo viewing, object heights, flight planning, photo geometry, the electromagnetic spectrum, camera systems and vegetation/land cover mapping. The course concludes with an introduction to other geospatial technologies including digital image analysis, global positioning (GPS), and geographic information systems (GIS). Conceptual lectures are augmented with practical homework assignments and hands-on lab exercises. Lab.

Equivalent(s): FOR 757, FORS 757, GEOG 757**Grade Mode:** Letter Grading**Special Fee:** Yes**NR 759 - Digital Image Processing for Natural Resources****Credits:** 4

Introduces digital remote sensing including multispectral scanners (Landsat and SPOT) radar, and thermal imagery. Hands-on image processing including filtering, image display, ratios, classification, registration, and accuracy assessment. GIS as it applies to image processing. Discussion of practical applications. Use of ERDAS image-processing software. Knowledge of PCs required.

Prerequisite(s): NR 757 with a minimum grade of D-.**Equivalent(s):** FOR 759, FORS 759, GEOG 759**Grade Mode:** Letter Grading**NR 760 - Geographic Information Systems in Natural Resources****Credits:** 4

This course in geographic information systems (GIS), covers advanced theory, concepts, and applications of GIS for natural resource and related disciplines. Discussion of database structures, data sources, spatial data manipulation/analysis/modeling, data quality and assessment. Students conduct a project of their design exploring aspects of GIS most useful to them. Lecture emphasizes concepts and applications through a text and selected peer-reviewed articles. Lab uses the latest version of ArcGIS software and provides hands-on experience.

Prerequisite(s): NR 658 with a minimum grade of D-.**Equivalent(s):** FOR 760, FORS 760, GEOG 760**Grade Mode:** Letter Grading**NR 761 - Environmental Soil Chemistry****Credits:** 4

Chemical transformations in soils are the basis for soil fertility and plant productivity in natural and managed ecosystems, and also influence key ecosystem processes including soil organic matter turnover and soil-atmosphere exchange of trace gases. This class will explore soil chemistry processes and transformations related to soil nutrient cycling, plant nutrient acquisition, and other critical environmental services.

Grade Mode: Letter Grading**NR 765 - Community Ecology****Credits:** 4

Properties of biotic communities, especially biodiversity. Effects of physical stress, disturbance, competition, predation, positive interactions, and dispersal on community properties. Community dynamics, including succession and stability. Lecture and discussion.

Prerequisite(s): BIOL 528 with a minimum grade of D- and (BIOL 541 with a minimum grade of D- or NR 527 with a minimum grade of D- or FORT 527 with a minimum grade of D-).**Grade Mode:** Letter Grading

NR 767W - Social Impact Assessment**Credits:** 4

Provides a cross-disciplinary perspective on the issues, problems, and methods of Social Impact Assessment (SIA). Provides analytic approach and theoretical framework for the assessment of diverse events, including changes in the natural environment, the local economy, or dominant technology. SIA is required of most U.S. and Canadian federal- and state-sponsored projects that come under the National Environmental Protection Act, as well as all projects funded by international donor agencies.

Attributes: Writing Intensive Course**Equivalent(s):** TOUR 767**Grade Mode:** Letter Grading**NR 781 - Agroforestry****Credits:** 4

This course introduces students to the principles and practice of agroforestry—the integration of trees with crops and/or livestock to provide multiple benefits. Students gain knowledge of Indigenous and modern agroforestry systems, their global distribution and characteristics, the scientific principles underlying interactions between trees, crops, and livestock, and their management to optimize benefits. Students explore the potential for agroforestry to serve as a climate-smart, sustainable strategy for enhancing food production and ecosystem services, and gain practical field experience in designing agroforestry systems appropriate for New England.

Prerequisite(s): NR 527 with a minimum grade of D- or AGFS 502 with a minimum grade of D-.**Grade Mode:** Letter Grading**Special Fee:** Yes**NR 782 - Forest Health in a Changing World****Credits:** 4

Forests cover over 30% of the land surface of the Earth and are incredibly important ecologically, economically, and to the health of the planet. While forests show great capacity to withstand disturbance, these ecosystems are increasingly threatened worldwide by climate change, native and introduced insects and disease, poor management practices, land clearing, drought, fire, and pollution. This course offers an overview of the dominant threats to forests, their causes and consequences, and options for monitoring, management, and mitigation.

Grade Mode: Letter Grading**Special Fee:** Yes**NR 784 - Sustainable Living - Global Perspectives****Credits:** 4

The pursuit of sustainable solutions to living in our contemporary world is a global endeavor. In this course, the concept of living sustainably is explored from a broad international perspective. Global scale issues impacting sustainable resource use are considered, including population growth, economic globalization and development, social equity, and cultural values. We will expand our awareness of alternatives to those current practices that impede the sustainability of human societies as part of the earth's natural systems. We will also pursue an understanding of the interrelated socio-economic conditions, combined with social and personal ethics and values necessary to move toward a more sustainable future. And each of us will come to value what sustainable living means for our own lives.

Prerequisite(s): NR 437 with a minimum grade of D- or NR 435 with a minimum grade of D-.**Equivalent(s):** EC 784**Grade Mode:** Letter Grading**NR 785 - Systems Thinking for Sustainable Solutions****Credits:** 4

This course applies systems thinking as a problem-solving approach aimed at exploring possibilities for creating a future based on sustainable relationships between healthy human societies and their natural environments. Types of systems and systems tools are utilized to describe human-environment relationships and to emphasize their resiliency or vulnerability to future unsustainable events and/or practices. We explore how systems may be restructured to create more sustainable outcomes.

Prerequisite(s): NR 437 (may be taken concurrently) with a minimum grade of D- or NR 435 (may be taken concurrently) with a minimum grade of D-.**Equivalent(s):** EC 785**Grade Mode:** Letter Grading**NR 786 - Leadership for Sustainability****Credits:** 4

In this course we review and evaluate current knowledge and practice regarding the attainment of sustainability in social and environmental relations. We particularly focus on the meaning and qualities of leadership for achieving a sustainable future. Along the way, we also reflect on our own leadership styles and qualities. Topics include the role of leaders and leadership practices in government, business, academia etc; concepts and theories for achieving social change; and case studies exemplifying a range of leaders and approaches toward sustainability.

Attributes: Writing Intensive Course**Prerequisite(s):** NR 437 with a minimum grade of D- or NR 435 with a minimum grade of D-.**Grade Mode:** Letter Grading**Special Fee:** Yes**NR 787 - Advanced Topics in Sustainable Energy****Credits:** 4

This course engages students in advanced topics in sustainable energy. Course reviews basic structures of our energy system, energy markets and economics, and the environmental, economic and technological of energy landscape. Focus is on electricity and building use with introductions to the transportation system. Students gain the knowledge to evaluate innovations in technology, policy and financing necessary to implement sustainable energy goals from conservation and efficiency to renewables and energy storage.

Grade Mode: Letter Grading**Special Fee:** Yes**NR 795 - Investigations****Credits:** 1-4

Investigations in Natural Resources may include topics in environmental conservation, forestry, soil and watershed management, ecosystems, and wildlife management. Special fee on some topics.

Grade Mode: Letter Grading**Special Fee:** Yes**NR 795W - Investigations****Credits:** 1-4

Investigations in Natural Resources may include topics in environmental conservation, forestry, soil and watershed management, ecosystems, and wildlife management.

Attributes: Writing Intensive Course**Grade Mode:** Letter Grading

NR 799 - Honors Senior Thesis

Credits: 1-4

Honor/thesis students conduct an independent research project, relevant to the student's area of specialization in the major, under the direction of a faculty sponsor. Students submit a research proposal, write a final report, and provide an oral presentation. One or two semester sequence.

Attributes: Honors course; Writing Intensive Course

Repeat Rule: May be repeated for a maximum of 8 credits.

Equivalent(s): EC 799, FOR 799, WARM 795, WILD 799

Grade Mode: Letter Grading