**NATURAL RESOURCES (NRES)**

**NRES 800 Sampling, Data Management and Visualization**

**Prerequisites:** Graduate standing is required.

**Description:** Implement best practices for scientific computing. Practice with a scientific workflow from the design of the sampling scheme, through generation of the data in the field or lab, up to the point of analysis. Understand cognitive constraints on visualization. Use modern software tools to produce publication quality data visualizations.

**Credit Hours:** 3

**Max credits per semester:** 3

**Max credits per degree:** 3

**Format:** LAB

**NRES 801 Topics in Applied Ecology**

**Description:** A survey of ecological and sociological frameworks used in the applied ecological research. Emphasis on fisheries and wildlife, grasslands, forests, aquatic habitats, and human dimensions of natural resources.

**Credit Hours:** 2

**Max credits per semester:** 2

**Max credits per degree:** 2

**Format:** LEC

**Offered:** FALL

**NRES 802 Aquatic Insects**

**Crosslisted with:** BIOS 485, BIOS 885, ENTO 402, ENTO 802, NRES 402

**Prerequisites:** 12 hrs biological sciences.

**Description:** Biology and ecology of aquatic insects.

**Credit Hours:** 2

**Max credits per semester:** 2

**Max credits per degree:** 2

**Format:** LEC

**NRES 802L Identification of Aquatic Insects**

**Crosslisted with:** BIOS 485L, BIOS 885L, ENTO 402L, ENTO 802L, NRES 402L

**Prerequisites:** Parallel ENTO 802, NRES 402/802, BIOS 485/885.

**Description:** Identification of aquatic insects to the family level.

**Credit Hours:** 1

**Max credits per semester:** 1

**Max credits per degree:** 1

**Format:** LAB

**NRES 803 Ecological Statistics**

**Crosslisted with:** STAT 803

**Prerequisites:** STAT 801 or equivalent; prior experience with "R" software

**Notes:** Available online.

**Description:** Model-based inference for ecological data, generalized linear and additive models, mixed models, survival analysis, multi-model inference and information theoretic model selection, and study design.

**Credit Hours:** 4

**Max credits per semester:** 4

**Max credits per degree:** 4

**Format:** LEC

**NRES 806 Plant Ecophysiology: Theory and Practice**

**Crosslisted with:** AGRO 806, HORT 806, NRES 406, AGRO 406

**Prerequisites:** Junior standing, 4 hrs ecology, and 4 hrs botany or plant physiology.

**Description:** Principles of plant physiology which underlie the relationship between plants and their physical, chemical and biotic environments. An introduction to the ecological niche, limiting factors and adaptation. An overview of the seed germination and ecology, plant and soil water relations, nutrients, plant energy budgets, photosynthesis, carbon balance and plant-animal interactions. An introduction to various field equipment used in ecophysiological studies.

**Credit Hours:** 4

**Max credits per semester:** 4

**Max credits per degree:** 4

**Format:** LEC

**NRES 807 Plant-Water Relations**

**Crosslisted with:** AGRO 807

**Prerequisites:** AGRO 325 or equivalent; MATH 106 recommended

**Description:** Quantitative study of water relations in the soil-plant-atmosphere system. Basic physical processes, which describe the movement of water in the soil and the atmosphere, and the physiological processes, which describe water movement inside of the plant. Stomata physiology and the effects of internal water deficits on photosynthesis, respiration, nitrogen metabolism, cell division and cell enlargement. Results from integrative models used to study the relative importance of environmental versus physiological factors for several plant-environment systems.

**Credit Hours:** 3

**Max credits per semester:** 3

**Max credits per degree:** 3

**Format:** LEC

**Offered:** FALL

**NRES 808 Microclimate: The Biological Environment**

**Crosslisted with:** AGRO 408, GEOG 408, HORT 408, METR 408, NRES 408, WATS 408, AGRO 808, GEOG 808, HORT 808, METR 808

**Prerequisites:** Junior standing, MATH 106 or equivalent, 5 hrs physics, major in any of the physical or biological sciences or engineering.

**Description:** Physical factors that create the biological environment. Radiation and energy balances of earth's surfaces, terrestrial and marine. Temperature, humidity, and wind regimes near the surface. Control of the physical environment through irrigation, windbreaks, frost protection, manipulation of light, and radiation. Applications to air pollution research. Instruments for measuring environmental conditions and remote sensing of the environment.

**Credit Hours:** 3

**Max credits per semester:** 3

**Max credits per degree:** 3

**Format:** LEC

**Prerequisite for:** AGRO 907, HORT 907, METR 907, NRES 907; BSEN 954, NRES 954

**Groups:** Physical Geography
NRES 809 Laboratory Earth: Earth and Its Systems
Description: The earth as a system and the "real world" applications of fundamental physical science processes in this system. Interaction of energy and matter in the geosphere, in the hydrosphere, and in the atmosphere. The earth's relationships to the sun, moon, and other astronomical objects in the solar system.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

NRES 810 Landscape Ecology
Crosslisted with: HORT 812
Prerequisites: 12 hrs biological sciences or related fields including BIOS 320
Description: Spatial arrangements of ecosystems, the interaction among component ecosystems through the flow of energy, materials and organisms, and alteration of this structure through natural or anthropogenic forces.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

NRES 811 Plant Tissue Culture
Crosslisted with: BIOS 811, HORT 811
Description: Survey of techniques used in plant cell, tissue and organ culture, including current research. Laboratory emphasizes practical manipulation of plant cells, tissues, and organs, including examples from woody and herbaceous plant species.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Format: LEC

NRES 812 Introduction to Geographic Information Systems
Crosslisted with: GEOG 412, GEOG 812, NRES 412
Description: Introduction to conceptual foundations and applications of computer-based geographic information systems (GIS). GIS database development, spatial data analysis, spatial modeling, GIS implementation and administration.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Format: LEC
Prerequisite for: GEOG 432, GEOG 832, GEOG 922, NRES 922
Groups: Techniques

NRES 813 Environmental Leadership
Crosslisted with: ALEC 410, ALEC 810, NRES 413
Prerequisites: Junior standing.
Notes: Offered on the World Wide Web (WWW) fall semester of odd numbered years and in the classroom fall semester of even numbered years.
Description: Major leaders in conservation and ecology that emphasizes agricultural and cultural issues and relationships with the environment.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

NRES 814 Laboratory Earth: Earth's Natural Resource Systems
Description: Fundamental concepts in the Earth and physical sciences in the understanding of Earth's natural resource systems. Rock and mineral, water, soil, and energy resources. Social factors, human dependence, and the impact of these on natural resource systems.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

NRES 817 Agroforestry Systems in Sustainable Agriculture
Crosslisted with: HORT 418, HORT 818, NRES 417
Prerequisites: 12 hours biological or agricultural sciences.
Description: The roles of woody plants in sustainable agricultural systems of temperate regions. Emphasis on the ecological and economic benefits of trees and shrubs in the agricultural landscape. Topics include: habitat diversity and biological control; shelterbelts structure, function, benefits and design; intercropping systems; silvopastoral systems; riparian systems; and production of timber and specialty crops. Comparison of temperate agroforestry systems to those of tropical areas.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

NRES 818 Introduction to Remote Sensing
Crosslisted with: GEOG 418, GEOG 818, NRES 418
Prerequisites: 9 hours of GEOL, NRES or GEOG.
Notes: Advanced standing in geography, natural resources, environmental sciences, engineering or agronomy recommended.
Description: Introduction to remote sensing of the earth from aerial and satellite platforms. Aerial photography, multispectral scanning, thermal imaging and microwave remote sensing techniques. Physical foundations of remote sensing using electromagnetic energy, energy-matter interactions, techniques employed in data acquisition and methods of image analysis. Weekly laboratory provides practical experience in visual and digital interpretation of aerial photography, satellite imagery, thermal and radar imagery. Applications in geographic, agricultural, environmental and natural resources analyses.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Format: LEC
Prerequisite for: GEOG 421, GEOG 821, NRES 421, NRES 821
Groups: Techniques

NRES 819 Chemistry of Natural Waters
Crosslisted with: GEOL 418, GEOL 818, NRES 419, WATS 418
Prerequisites: CHEM 109 and 110, 113 and 114, or CHEM 111.
Description: Principles of water chemistry and their use in precipitation, surface water, and groundwater studies. Groundwater applications used to determine the time and source of groundwater recharge, estimate groundwater residence time, identify aquifer mineralogy, examine the degree of mixing between waters of various sources and evaluate what types of biological and chemical processes have occurred during the water's journey through the aquifer system.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Prerequisite for: GEOL 418L, GEOL 818L, NRES 419L, NRES 819L, WATS 418L; GEOL 917, NRES 917
NRES 819L Chemistry of Natural Waters Laboratory
Crosslisted with: GEOL 418L, GEOL 818L, NRES 419L, WATS 418L
Prerequisites: CHEM 109 and 110 or CHEM 113 and 114; GEOL 418 or parallel.
Description: Basic laboratory techniques used to perform water analysis including various wet chemical techniques, instrument use (AA, IC, UV-Visible) and computer modeling. Techniques for sample collection and preservation, parameter estimation and chemical analysis.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Format: LAB

NRES 820 Applications of Remote Sensing in Agriculture and Natural Resources
Crosslisted with: AGRO 419, GEOG 419, GEOL 419, NRES 420, AGRO 819, GEOG 819, GEOL 819
Notes: GEOG 418/NRES 418 recommended
Description: Introduction to the practical uses of remote electromagnetic sensing in dealing with agricultural and water-resources issues.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Format: LEC
Groups: Techniques

NRES 821 Field Techniques in Remote Sensing
Crosslisted with: GEOG 421, GEOG 821, NRES 421
Prerequisites: NRES 418/818
Description: Field techniques as they relate to remote-sensing campaigns. Research methods, systematic approaches to data collection, field spectroscopy, collecting ancillary information linked with spectroscopic data sets as well as aircraft or satellite missions and subsequent analyses of acquired data.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Groups: Techniques

NRES 822 Laboratory Earth: Earth's Changing Systems
Crosslisted with: NRES 422
Description: Fundamental concepts related to understanding Earth's changing natural systems in the past, present, and the future. The cycling of matter and energy; the relationship between human activity and environmental change; and the consequence of these relationships.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

NRES 823 Integrated Resources Management
Crosslisted with: NRES 423
Prerequisites: Natural resource science or related major
Description: Integrated and multiple-use management. Economic, political, social, and physical impacts on natural resources management priorities.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

NRES 824 Forest Ecology
Crosslisted with: NRES 424
Prerequisites: NRES 220 or BIOS 207
Description: The structure and function of forest ecosystems including their response to global change; emphasis on forest succession and disturbance regimes in order to understand the dynamics of forested landscapes.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Offered: SPRING

NRES 825 Geostatistics
Crosslisted with: GEOL 825
Prerequisites: MATH 106 and STAT 218
Notes: Offered fall semester of odd-numbered calendar years.
Description: Practical methods for solving spatial interpolation and related estimation problems with emphasis on geostatistical methods. Introduction to applied statistical simulation and prediction in geology, hydrogeology and environmental studies.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

NRES 826 Invasive Plants
Crosslisted with: AGRO 426, AGRO 826, HORT 426, HORT 826, NRES 426
Prerequisites: AGRO/HORT/soil 153; BIOS 109.
Description: Identification, biology and ecology of weedy and invasive plants. Principles of invasive plant management by preventative, cultural, biological, mechanical and chemical means using an adaptive management framework. Herbicide terminology and classification, plant-herbicide and soil-herbicide interactions, equipment calibration and dosage calculations.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

NRES 827 Introduction to the Global Positioning System (GPS)
Crosslisted with: GEOG 427, GEOG 827, NRES 427
Prerequisites: Junior standing.
Notes: Familiarity with mapping and GIS recommended.
Description: Integrated lectures, lab exercises and field experience provide an understanding of GPS technology and applications. Students will learn to collect, correct and use GPS data in a geographic information system (GIS) environment.
Credit Hours: 2
Max credits per semester: 2
Max credits per degree: 2
Format: LEC

NRES 828 Leadership in Public Organizations
Crosslisted with: ALEC 428, ALEC 828, NRES 428
Prerequisites: Junior standing.
Description: Leadership in theories, research, and practices in public organizations and natural resource agencies.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
NRES 829 Human Dimensions of Natural Resource Management
Description: Introduction to, and understanding of, human dimensions of natural resource management. Interdisciplinary theories and frameworks for understanding and addressing natural resources management will be examined. Historical, psychological, cultural, and social influences will be reviewed. Integrative approaches to sustainable ecosystem management will also be explored.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

NRES 829A Food Security: A Global Perspective
Prerequisites: Junior standing.
Description: Overview of the technical and sociocultural dimensions of global food insecurity.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

NRES 830 Laboratory Earth: Climate Research Applications
Description: Climate-change issues serve as a context to develop research questions and design a discrete, locally oriented research project through which they define a problem, analyze data, and develop conclusions to potentially impact decision-making in their community. Designed for science educators. NRES 830 is offered fall semesters.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

NRES 831 Waterfowl Ecology and Management
Crosslisted with: NRES 431
Prerequisites: NRES 311.
Description: Ecology and identification of North American waterfowl, management of habitats and populations, and current management issues.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

NRES 832 Laboratory Earth: Human Dimensions of Climate Change
Description: Examine science behind global climate change. Use primary data sets to understand the implications for climate change at global and regional/local scales. Focus on potential impacts on human systems including drought, sea level rise, severe weather and populations most likely to be impacted by climate change. Designed for science educators. NRES 832 is offered spring semesters.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
NRES 837 Adaptive Natural Resource Management
Description: From cultural taboos to the current socio-ecological framework, the art and science of natural resource management has and continues to evolve. The primary focus of this course is to introduce students to the concepts of structured decision making and adaptive management, but in doing so the course will explore the history of natural resource management and the various management paradigms that have and continue to dominate resource management. At the completion of this course students will have an understanding of the theory and practice of adaptive management as well as an understanding of why we continue to move toward a more transparent and scientific methodology of natural resource management.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LAB

NRES 838 Grassland Conservation: Planning and Management
Crosslisted with: NRES 438
Prerequisites: Introductory soils and introductory ecology.
Description: Apply fundamental grassland ecology principles to grassland conservation and identify grassland establishment and management practices appropriate for different environmental and cultural situations. Based on field study, critically analyze management options and outcomes for several grasslands and develop a management plan for a grassland resource.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

NRES 840 Great Plains Ecosystem
Crosslisted with: AGRO 440, AGRO 840, RNGE 440, NRES 440
Prerequisites: Introductory soils and introductory ecology.
Description: Characteristics of Great Plains ecosystems, interrelationships of ecological factors and processes, and their application in the management of grasslands. Interactions of fire, vegetation, grazing animals and wildlife.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

NRES 842 Wildland Plants
Crosslisted with: AGRO 442, AGRO 842, RNGE 442, NRES 442
Prerequisites: Junior standing.
Notes: BIOS 101 and 101L, or equivalent, recommended.
Description: Wildland plants that are important to grassland and shrubland ecosystem management and production. Distribution, utilization, classification, identification (including identification by vegetative parts), uses by Native Americans, and recognition of grasses, fords, shrubs, exotic and wetland plants.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

NRES 844 Ecosystem Monitoring and Assessment
Crosslisted with: AGRO 444, AGRO 844, RNGE 444, NRES 444
Prerequisites: Junior standing.
Notes: NRES 220 or equivalent, recommended.
Description: Measurement and monitoring of the important vegetation and environmental factors used to develop management guidelines in grasslands, savannas, woodlands, and wetlands. Emphasis on using ecosystem monitoring protocols for assessment of wildlife habitat, fuels management for wild-land fire, livestock production, and watershed function. Requires field sampling and travel to local field sites.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

NRES 845 Human Remains in Forensic Science
Crosslisted with: FORS 445, FORS 845, NRES 445
Prerequisites: LIFE 120/L and LIFE 121/L, CHEM 109, CHEM 110, and FORS 120/L.
Description: Forensic anthropology within the broader context of forensic sciences and physical anthropology. Decomposition and bone modification through artificial means. Determination of individual identity, diet, chronic pathology and cause of death from human remains.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Format: LEC
Offered: FALL

NRES 846 Pollen Analysis for Behavioral, Biological and Forensic Science
Crosslisted with: FORS 446, FORS 846, NRES 446
Prerequisites: BIOS 109 and FORS 120.
Description: Collection, processing, identification of common North American pollen types. Pollination ecology relating to scene reconstruction. Fundamental statistics and presentation requirements for a legal and scientific audience.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Format: LEC
Offered: FALL
NRES 847 Archaeoparasitology: The Archaeology of Disease
Crosslisted with: NRES 447
Description: Study of parasites, their hosts, and the relationship between them. Human parasitology is especially interesting due to the adaptation of human populations to a great variety of parasites over long periods of time in the global diversity of environments. Fundamental understanding of human-parasite relations and methods of recovery of parasites from a variety of archaeological remains.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Offered: FALL

NRES 848 Advanced Topics in Wildlife Damage Management
Crosslisted with: NRES 448
Prerequisites: NRES 348
Description: Economic, global, and public policy issues relative to situations in which wildlife damage personal property or natural resources, threaten human health and safety, or are a nuisance. Demonstration and discussion of technological advances in fertility control, damage resistance, toxicology, behavioral modification, and biological management.
Credit Hours: 2
Max credits per semester: 2
Max credits per degree: 2
Format: LEC

NRES 849 Woody Plant Growth and Development
Crosslisted with: BIOS 849, HORT 849
Prerequisites: CHEM 251 and AGRO 325
Description: Plant growth and development specifically of woody plants as viewed from an applied whole-plant physiological level. Plant growth regulators, structure and secondary growth characteristics of woody plants, juvenility, senescence, abscission and dormancy.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

NRES 850 Biology of Wildlife Populations
Crosslisted with: BIOS 450, BIOS 850, NRES 450
Prerequisites: NRES 311; MATH 104 or above; STAT 218 or equivalent
Description: Principles of population dynamics. Management strategies (for consumptive and nonconsumptive fish and wildlife species) presented utilizing principles developed.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Format: LEC
Offered: SPRING

NRES 851 Soils, Water, and Environmental Chemistry
Crosslisted with: ENVE 851, NRES 451
Prerequisites: NRES/WATS/SOIL/AGRO/GEOL 361 or graduate standing
Description: Environmental chemistry related to the fate and transport of organic contaminants in soil-water environments. Application of computer simulation models (i.e., MODFLOW) for predicting contaminant fate in aquifers. Basic chemical and biological principles of remediating contaminated soil and water.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Format: LEC
Offered: SPRING

NRES 852 Climate and Society
Crosslisted with: AGRO 450, GEOG 450, METR 450, NRES 452, AGRO 850, GEOG 850, METR 850
Prerequisites: Junior standing or above.
Notes: Offered spring semester of even-numbered calendar years.
Description: Impact of climate and extreme climatic events on society and societal responses to those events. Global in scope and interdisciplinary.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Offered: SPRING
Groups: Physical Geography

NRES 853 Hydrology
Crosslisted with: NRES 453
Prerequisites: MATH 106
Notes: Not available for credit for engineering students and not a substitute for CIVE 456.
Description: Introduction to the principles of hydrology, with emphasis on the components of the hydrologic cycle: precipitation, evaporation, groundwater flow, surface runoff, infiltration, precipitation runoff relationships.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Prerequisite for: AGEN 957, BSEN 957, CIVE 957, GEOL 957

NRES 854 Ecological Interactions
Crosslisted with: BIOS 454, BIOS 854, NRES 454
Prerequisites: LIFE 121; LIFE 121L; BIOS 207 or NRES 220; Senior Standing
Description: Nature and characteristics of populations and communities. Interactions within and between populations in community structure and dynamics. Direct and indirect interactions and ecological processes, competition, predation, parasitism, herbivory, and pollination. Structure, functioning and persistence of natural communities, foodweb dynamics, succession, and biodiversity.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
NRES 855 Soil Chemistry and Mineralogy
Crosslisted with: AGRO 455, AGRO 855, NRES 455, SOIL 455
Prerequisites: AGRO/HORT/SOIL 153 or GEOG 101; CHEM 109 and 110; CHEM 221 or 251; or equivalent.
Description: Chemical and mineralogical properties of soil components. Inorganic colloidal fraction. Structures of soil minerals as a means of understanding properties, such as ion exchange and equilibria; release and supply of nutrient and toxic materials; and soil acidity and alkalinity.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

NRES 856 Mathematical Models in Biology
Crosslisted with: BIOS 456, BIOS 856, NRES 456
Prerequisites: LIFE 120; LIFE 120L; LIFE 121; LIFE 121L; MATH 107
Description: Biological systems, from molecules to ecosystems, are analyzed using mathematical techniques. Strengths and weaknesses of mathematical approaches to biological questions. Brief review of college level math; introduction to modeling; oscillating systems in biology; randomness in biology; review of historically important and currently popular models in biology.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

NRES 857 Green Space and Urban Forestry Management
Crosslisted with: NRES 457, HORT 457
Prerequisites: Junior or senior standing, Graduate student.
Description: A focus on the management of trees, parks, and green infrastructure in rural and urban communities. Perspectives from community planning, landscape architecture, urban forestry, natural resources, horticulture, and environmental policy. Development and implementation of green space and forest management plans encompassing societal needs and biological limitations in rural and urban communities.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Offered: SPRING

NRES 858 Soil Physical Determinations
Crosslisted with: AGRO 458, AGRO 858, NRES 458, SOIL 458
Prerequisites: SOIL/AGRO/GEOL/WATS 361; PHYS 141 or equivalent; MATH 102 or 103.
Description: Survey of measurement techniques and principles used in characterizing the physical properties of soils. Includes analysis of experimental design and sources of experimental error. Techniques include: particle size analysis, soil water content, pore size analysis, field sampling techniques, soil strength, and saturated hydraulic conductivity.
Credit Hours: 2
Max credits per semester: 2
Max credits per degree: 2
Format: LAB

NRES 859 Limnology
Crosslisted with: BIOS 459, BIOS 859, NRES 459, WATS 459
Prerequisites: 12 hrs BIOS, including BIOS/NRES 220/BIOS220x; two semesters CHEM.
Description: Physical, chemical, and biological processes that occur in fresh water. Organisms occurring in fresh water and their ecology; biological productivity of water and its causative factors; eutrophication and its effects.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Format: LEC
Prerequisite for: BIOS 866, NRES 866

NRES 860 Soil Microbiology
Crosslisted with: AGRO 460, BIOS 460, NRES 460, SOIL 460, AGRO 860, BIOS 860
Prerequisites: One semester microbiology; one semester biochemistry or organic chemistry.
Description: Soil from a microbe's perspective-growth, activity and survival strategies; principles governing methods to study microorganisms and biochemical processes in soil; mechanisms controlling organic matter cycling and stabilization with reference to C, N, S, and P; microbial interactions with plants and animals; and agronomic and environmental applications of soil microorganisms.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

NRES 861 Soil Physics
Crosslisted with: AGRO 461, GEOL 461, NRES 461, SOIL 461, WATS 461, AGRO 861, GEOL 861
Prerequisites: AGRO/SOIL 153; PHYS 141 or equivalent, one semester of calculus.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Prerequisite for: AGEN 955, AGRO 955, CIVE 955, GEOL 985

NRES 862 Conservation Biology
Crosslisted with: NRES 462
Prerequisites: 12 hours of biological sciences, including NRES 220 and NRES 222 or equivalent.
Description: Current issues in conservation biology. Theoretical principles from the areas of ecology and genetics to effectively preserve and manage biological diversity and small populations.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
NRES 863 Fisheries Science
Crosslisted with: NRES 463
Description: Fisheries biology emphasizing the determination and evaluation of vital statistics for the management of fish populations. Basis of specific management techniques. May also be offered at Cedar Point Biological Station.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Prerequisite for: NRES 871; NRES 965

NRES 863L Fisheries Science Lab
Crosslisted with: NRES 463L
Description: Field and laboratory skills needed for fisheries biology emphasizing the determination and evaluation of vital statistics for the management of fish populations. Applied data collection and fish sampling techniques will be used. May also be offered at Cedar Point Biological Station.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Format: LAB

NRES 864 Fisheries Biology
Crosslisted with: BIOS 464, BIOS 864, NRES 464
Prerequisites: BIOS/NRES 489/889 or equivalent.
Description: Biology of fishes. Factors that affect fishes in the natural environment. Techniques used in the analysis and management of fish populations.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

NRES 865 Soil Geomorphology and Paleopedology
Crosslisted with: GEOL 465, GEOL 865, NRES 465
Prerequisites: GEOL 450/850 and NRES 477/877
Description: Soils and paleosols as evidence in reconstruction landscape evolution and paleoenvironments. Role of paleosols in stratigraphy.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

NRES 866 Advanced Limnology
Crosslisted with: BIOS 866
Prerequisites: NRES 859 or equivalent
Description: In-depth consideration of selected areas of limnology including stream limnology, primary production, secondary production, nutrient cycling, and eutrophication.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

NRES 867 Global Climate Change
Crosslisted with: METR 483, METR 883, NRES 467
Prerequisites: Junior standing; and METR 475/875.
Notes: Offered fall semester of even-numbered calendar years.
Description: Elements of climate systems, El Nino/LaNina cycle and monsoons, natural variability of climate on interannual and interdecadal scales. Paleoclimate, and future climate, developed climate change scenarios and climate change impacts on natural resources and the environment.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

NRES 868 Wetlands
Crosslisted with: BIOS 458, NRES 468, WATS 468, BSEN 468, BSEN 868
Prerequisites: 12 hrs biological sciences; BIOS 220; CHEM 109 and 110.
Notes: Offered even-numbered calendar years.
Description: Physical, chemical and biological processes that occur in wetlands; the hydrology and soils of wetland systems; organisms occurring in wetlands and their ecology wetland creation, delineation, management and ecotoxicology.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Format: LEC

NRES 869 Bio-Atmospheric Instrumentation
Crosslisted with: AGRO 469, GEOG 469, HORT 407, METR 469, MSYM 469, NRES 469, AGRO 869, GEOG 869, HORT 807, METR 869, MSYM 869
Prerequisites: Junior standing; MATH 106; 4 hrs physics; physical or biological science major.
Description: Discussion and practical application of principles and practices of measuring meteorological and related variables near the earth's surface including temperature, humidity, precipitation, pressure, radiation and wind. Performance characteristics of sensors and modern data collection methods are discussed and evaluated.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Groups: Physical Geography

NRES 870 Lake and Reservoir Restoration
Prerequisites: 12 hrs NRES or related fields
Description: Theory, processes, and mechanisms underlying lake and reservoir water quality degradation and/or pollution. Remediation of eutrophication and its effects. Current techniques used to restore and protect degraded lakes.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
NRES 871 Quantitative Fishery Assessment
Prerequisites: STAT 218 or equivalent; NRES 463/863 or equivalent; BIOS/NRES 489/889 or equivalent
Notes: Offered spring semester of even-numbered calendar years.
Description: Advanced quantitative techniques of fishery science required to support management practices targeted at populations (recruitment, growth and mortality), communities (e.g., predator-prey interactions) and ecosystems e.g., bio-stressors.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

NRES 872 Applied Soil Physics
Crosslisted with: AGRO 472, AGRO 872, NRES 472, SOIL 472, WATS 472
Prerequisites: AGRO/HORT/SOIL 153 or equivalent; MATH 104 or MATH 106 or equivalent.
Description: Emphasis on applied soil physics. Discussion of theoretical principles followed by field and laboratory exercises and applications. Fluxes of water, solutes, air, and heat through the soil. Emphasis on water infiltration, water retention, other soil hydraulic properties. Components of soil water balance. Management of soil water.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

NRES 873 Ecological Anthropology
Crosslisted with: ANTH 473, ANTH 873
Description: Human adaptive systems and their ecological contexts. The dynamic inter-relationships between subsistence, technology, social behavior, human demography, and ecological variability.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Groups: Cultural Anthropology

NRES 874 Herpetology
Crosslisted with: BIOS 474, BIOS 874, NRES 474
Prerequisites: BIOS/NRES 386 and permission.
Notes: BIOS 388 recommended.
Description: Fossil and living amphibians and reptiles. Anatomy, classification, ecology and evolution.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Format: LEC
Groups: Physical Geography

NRES 875 Water Quality Strategy
Crosslisted with: NRES 475, SOCI 475, SOCI 875, SOIL 475, WATS 475, AGRO 475, AGRO 875, CIVE 475, CIVE 875, CRPL 475, CRPL 875, GEOL 475, GEOL 875, MSYM 475, MSYM 875, POLS 475, POLS 875
Prerequisites: Senior standing.
Notes: Capstone course.
Description: Holistic approach to the selection and analysis of planning strategies for protecting water quality from nonpoint sources of contamination. Introduction to the use of methods of analyzing the impact of strategies on whole systems and subsystems; for selecting strategies; and for evaluating present strategies.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Groups: American Government & Public Pol

NRES 876 Mammalogy
Crosslisted with: BIOS 476, BIOS 876, NRES 476
Prerequisites: 8 hrs BIOS, BIOS/NRES 386 or NRES 311.
Notes: May also be offered at Cedar Point Biological Station. Field trips are required and may occur outside of scheduled class time. Lab and field time emphasize diversity of mammalian families and species identification of Nebraska mammals.
Description: Evolution, natural history, ecology, and functional morphology of planetary mammals and mammals of the Northern Great Plains.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Format: LEC

NRES 877 Great Plains Field Pedology
Crosslisted with: AGRO 477, GEOG 467, NRES 477, SOIL 477, GEOG 867
Prerequisites: AGRO/SOIL 153.
Description: Spatial relationship of soil properties on various parts of landscape typical of the Plains, causal factors, and predictions of such relationships on other landscapes. Grouping these properties into classes, naming the classes, and the taxonomy that results from this grouping. Application of a taxonomy to a real situation through making a field soil survey in a region representative of the Plains border; predicting land use response of various mapped units as it affects the ecosystem, and evaluating the effectiveness of the taxonomic system used in the region surveyed.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Format: LEC
Groups: Physical Geography

NRES 878 Regional Climatology
Crosslisted with: METR 478, METR 878, NRES 478
Prerequisites: NRES/METR 370.
Description: Regional differentiation of the climates of the earth on both a descriptive and dynamic basis. The chief systems of climatic classification.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
NRES 879 Hydroclimatology
Crosslisted with: NRES 479, METR 479, WATS 479, BSEN 479, METR 879, BSEN 879
Prerequisites: NRES 208 or METR 100 or METR/NRES 370.
Notes: Offered spring semester of even-numbered calendar years.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

NRES 880 Vertebrate Population Analysis
Prerequisites: 12 hrs. of biological sciences, MATH 104 or 106
Notes: NRES 880 is offered spring semester of even years.
Description: Introduction to the estimation of demographic parameters from surveys and mark-recapture data. Emphasizes analytical skills used to estimate population vital rates, such as abundance, density, population size, survival rates, home range size, and movement rates. Reinforces use of multiple hypotheses in scientific investigations, as well as model selection processes.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Format: LEC

NRES 881 Environmental Conflict Management
Description: This two-day short-course is designed to aid students development of theoretically grounded practical approaches to facilitate and manage environmental conflict. The course will provide students with skills to perform well in conflict situations and help students manage conflict in diverse environmental contexts. The program blends presentations, group discussions, conflict analysis, and strategy design exercises and simulations into a highly engaging learning environment. Participants learn from each other and develop personalized tools that can be applied immediately. wo-day short-course taught fall semester of even numbered years.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Format: LEC

NRES 882 Ecophysiology of Wildlife
Crosslisted with: NRES 482
Prerequisites: NRES 220 or BIOS 207; AGRO 215/BIOS 206; BIOS 386
Description: Evaluation of the conserved physiological principles that are broadly used across animal groups, as well as the many unique adaptations used by specific taxa. Focuses on all major vertebrate groups, including fish, birds, mammals, reptiles and amphibians, and links the physiological mechanisms that allow them to survive to the environments in which they live. Highlights methods scientists use to gather physiological information, and the ways in this information can be used by scientists in a variety of different fields.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

NRES 883 Ecological Economics
Crosslisted with: AECN 883, CDEV 883
Prerequisites: AECN 141 or ECON 212 or equivalent
Description: A synthesis across the notion of “utility” as represented in traditional environmental and natural resource economics, “ecology” in ecological economics, and “community” in behavioral economics. Ideas from thermodynamics with a focus on renewable resources. Development, organization, and enhancement of eco-business, eco-industry, eco-government and eco-communities.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

NRES 884 Water Resources Seminar
Crosslisted with: AGRO 484, GEOG 484, GEOL 484, NRES 484, WATS 484, AGRO 884, GEOG 884, GEOL 884, WATS 884
Prerequisites: Junior or above standing.
Description: Seminar on current water resources research and issues in Nebraska and the region.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Format: LEC

NRES 887 Hydrogeology
Crosslisted with: GEOL 889
Prerequisites: GEOL 888/NRES 488 and MATH 208
Description: Principles of flow through porous media with emphasis on basic classical solutions, flow-net analysis, and elementary modern numerical solutions that aid in the analysis and development of groundwater supplies.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Prerequisite for: NRES 918

NRES 888 Groundwater Geology
Crosslisted with: GEOL 488, GEOL 888, NRES 488
Prerequisites: GEOL 100-level course; MATH 106 or equivalent.
Description: Occurrence, movement, and development of water in the geologic environment.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Prerequisite for: AGEN 955, AGRO 955, CIVE 955, GEOL 985; GEOL 889, NRES 887; NRES 918

NRES 889 Ichthyology
Crosslisted with: BIOS 489, BIOS 889, NRES 489
Prerequisites: LIFE 120 and LIFE 121
Notes: May also be offered at Cedar Point Biological Station.
Description: Fishes, their taxonomy, physiology, behavior, and ecology. Dynamics of fish stocks and factors regulating their production.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Format: LEC
Prerequisite for: BIOS 464, BIOS 864, NRES 464, NRES 864; NRES 871; NRES 965
NRES 891 Seminar in Natural Resource Sciences
Description: Presentations of special non-thesis topics, and/or research plans, and/or thesis research results.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Format: LEC

NRES 891A Seminar: Writing in Science
Notes: The goal of this class is to make you a better writer through discussion and critique of published scientific papers.
Description: Writing is the core of how we communicate our scientific findings; fostering good writing skills now will help you throughout your career regardless of if you remain in academia. This class is suitable for all graduate students working on a proposal or a manuscript, or who want to focus on improving their academic reading and writing skills.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Format: LEC

NRES 891B Readings in Aquatic Ecology
Prerequisites: Admission to the Graduate Program in the School of Natural Resources
Description: Read classic (highly cited, generally 25-75 years old) papers and more recent follow-up (<10 years) papers on topics relevant to many areas of aquatic ecology. The goal is to read the basis of the concepts taught in modern Limnology courses and to see how these concepts are currently evolving in the literature. Students will be responsible for choosing a topic and classic paper from a list (see below) and finding (with help) a modern follow up to the issue, and then will lead the group discussion on that topic.
Credit Hours: 1-3
Min credits per semester: 1
Max credits per semester: 3
Max credits per degree: 3
Format: IND

NRES 892 International Study Tours in Natural Resource Management
Crosslisted with: NRES 492, NRES 492H
Prerequisites: Permission.
Notes: Off-campus travel may be required. Choice of subject matter and coordination of on- and off-campus study is at the discretion of the instructor.
Description: Group educational tours to sites that illustrate the diversity of approaches to natural resources management found around the world.
Credit Hours: 1-3
Min credits per semester: 1
Max credits per semester: 3
Max credits per degree: 6
Format: FLR

NRES 896 Independent Study
Prerequisites: 12 hrs natural resource sciences or closely-related fields, permission
Description: Individual or group projects in research, literature review or extension of course work under supervision and evaluation of a departmental faculty member.
Credit Hours: 1-5
Min credits per semester: 1
Max credits per semester: 5
Max credits per degree: 5
Format: IND

NRES 897 Master of Applied Science Project
Crosslisted with: AGRI 897, AGRO 897, HORT 897
Prerequisites: Admission to Master of Applied Science degree program
Notes: Project activity for the Master of Applied Science degree.
Description: Design, develop and complete a project that requires synthesis of the course topics covered in the primary area of emphasis.
Credit Hours: 1-6
Min credits per semester: 1
Max credits per semester: 6
Max credits per degree: 6
Format: IND

NRES 898 Special Topics in Natural Resources
Crosslisted with: NRES 498
Prerequisites: 6 hrs NRES or equivalent.
Description: Current issues in natural resource sciences.
Credit Hours: 1-6
Min credits per semester: 1
Max credits per semester: 6
Max credits per degree: 12
Format: LEC

NRES 899 Masters Thesis
Prerequisites: Admission to masters degree program and permission of major adviser
Credit Hours: 1-10
Min credits per semester: 1
Max credits per semester: 10
Max credits per degree: 99
Format: IND

NRES 906 Crop Growth and Yield Modeling
Crosslisted with: AGRO 906
Prerequisites: AGRO 325/HORT 325 Introductory Plant Physiology or equivalent
Notes: Recommended: AGRO 406/806 NRES 406/806 HORT 406/806 Plant Ecophysiology or equivalent.
Description: Understanding and use of crop simulation models and ability to build crop models. Studying principles and quantitative descriptions of crop production ecology. Offered fall semester of odd-numbered calendar years.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: FLR

NRES 907 Agricultural Climatology
Crosslisted with: AGRO 907, HORT 907, METR 907
Prerequisites: NRES 808; STAT 801A or equivalent
Description: Offered spring semester of odd-numbered calendar years. Analysis and use of climatological data as applied to agricultural activities and the use of climatological information to assist in decision making.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

AGRO 406/806 NRES 406/806 HORT 406/806
AGRO 906
AGRO 907, HORT 907, METR 907
NRES 916 Environmental Law and Water Resource Management Seminar
Crosslisted with: CIVE 916
Prerequisites: Permission
Description: An interdisciplinary seminar with the Department of Civil Engineering. Contemporary environmental issues and water resource management.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

NRES 917 Environmental Isotope Hydrology
Crosslisted with: GEOL 917
Prerequisites: NRES 819 or equivalent
Description: Theory and use of stable, radiogenic and radioactive isotopes in hydrologic studies. Abundance and variation of the stable isotopes of oxygen, hydrogen, carbon, sulphur, chlorine, nitrogen, and strontium. Application of the isotopes to determine water origin, movement, geochemical history, recharge age and residence time, and to delineate contaminant sources and solute migration.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

NRES 918 Applied Groundwater Modeling
Prerequisites: GEOL/NRES 488/888 or 889, MATH 208/208H, or equivalent
Notes: Offered fall semester of odd-numbered calendar years.
Description: Forward and backward numerical analysis of groundwater flow systems and their interactions with other hydrologic components. Groundwater model development and parameter estimation using MODFLOW, PEST, and other widely used modeling packages.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

NRES 920 Xenobiotics in the Environment
Crosslisted with: AGRO 920, ENTO 920, EOHT 920, HORT 920
Prerequisites: Recommend one course each in organic chemistry, soil science, biochemistry, plant physiology, microbiology and ecology
Description: Fate and ecotoxicological impacts of biologically foreign compounds in soil-water-plant environments; uptake, mechanisms of toxicity and metabolism in plants and other biota. Herbicides and other pesticides.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

NRES 922 Seminar in Geographic Information Systems (GIS)
Crosslisted with: GEOG 922
Prerequisites: GEOG/NRES 812 and 822; or equivalent
Description: Study of current research and trends in geographic information systems (GIS), GIScience, and GeoComputation. Advanced spatial analytical techniques and geospatial modeling emphasizing GIS applications in natural resources assessment, environmental analyses, agriculture, and land management.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

NRES 935 Seminar in Historical Geography
Crosslisted with: GEOG 935
Description: Discussion of current literature and research on selected aspects of historical geography. Specific theme of course varies according to instructor.
Credit Hours: 1-3
Min credits per semester: 1
Max credits per semester: 3
Max credits per degree: 6
Format: LEC

NRES 954 Turbulent Transfer in the Atmospheric Surface Layer
Crosslisted with: BSEN 954
Prerequisites: MATH 821; MECH 310 or NRES 808 or BIOS 857; or equivalent
Notes: Offered spring semester of odd-numbered calendar years.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

NRES 956 Managed Aquatic Systems
Prerequisites: NRES 463/863 or equivalent; BIOS/NRES 489/889 or equivalent; and permission.
Description: Theoretical aspects of structure and function in aquatic systems managed for human needs, ecological processes, river-reservoir interface, energy flow (including fate and transport), population dynamics, and multiple-use systems.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

NRES 965 General Seminar
Crosslisted with: AGRO 992, HORT 992
Notes: Agronomy and Horticulture PhD students should enroll in this course twice.
Description: Expected of all Agronomy and Horticulture graduate students. Presentation of thesis/dissertation or non-thesis topics in agronomy, horticulture or related subjects. Agronomy and Horticulture PhD students should enroll in this course twice.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 5
Format: LEC

NRES 992 Research Other Than Thesis
Prerequisites: Permission
Credit Hours: 1-6
Min credits per semester: 1
Max credits per semester: 6
Max credits per degree: 6
Format: IND

NRES 996A Research in Soils
Crosslisted with: AGRO 996A
Prerequisites: 12 hrs AGRO or closely related sciences, and permission
Credit Hours: 2-5
Min credits per semester: 2
Max credits per semester: 5
Max credits per degree: 5
Format: IND
NRES 999 Doctoral Dissertation

**Prerequisites:** Admission to doctoral degree program and permission of supervisory committee chair

**Credit Hours:** 1-24

**Min credits per semester:** 1

**Max credits per semester:** 24

**Max credits per degree:** 99

**Format:** IND