

# NATURAL RESOURCE ECOLOGY AND MANAGEMENT (NREM)

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*Any experimental courses offered by NREM can be found at:*

registrar.iastate.edu/faculty-staff/courses/explisting/ (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:**

## **NREM 104: Practical Work Experience**

Cr. R.

Three months of relevant work experience in natural resources, animal ecology, or forestry. Study at a summer biological station may be applicable. See advisor for specific requirements and approval process.

## **NREM 110: Orientation in Natural Resource Ecology and Management**

Cr. 1. F.

Orientation to the University and to the Department of Natural Resource Ecology and Management. Discussion of departmental learning outcomes, strategies for academic success and academic planning. Offered on a satisfactory-fail basis only.

## **NREM 111: NREM Transitions Learning Community Seminar**

(1-0) Cr. 1. Repeatable. F.S.

Enrollment limited to members of the NREM Transitions Learning Community. Designed to assist new transfer students and continuing sophomore students with their transition to the academic expectations and professional development aspects of the natural resource program. Offered on a satisfactory-fail basis only.

## **NREM 115: Explorations in Natural Resource Ecology & Management**

Cr. 1. S.

*Prereq: (Animal Ecology or Forestry major); Permission of Instructor*

Interact with faculty in the Department of Natural Resource Ecology and Management through lectures, discussions, and field experiences. Offered during the second half of Spring semester.

## **NREM 120: Introduction to Renewable Resources**

(Cross-listed with AGRON, ENV S). (3-0) Cr. 3. F.S.

Overview of soil, water, plants, and animals as renewable natural resources in an ecosystem context. History and organization of resource management. Concepts of integrated resource management.

## **NREM 130: Natural Resources and Agriculture**

(Cross-listed with ENV S). (3-0) Cr. 3. S.

Survey of the ecology and management of fish, forest, and wildlife resources in areas of intensive agriculture, with emphasis on Iowa. Conservation and management practices for private agricultural lands. Designed for nonmajors.

## **NREM 207: Natural Resource Management under the North American Model of Conservation**

(1-0) Cr. 1. F.

Introduction to North American model of conservation, current funding for natural resource management, role of hunting and angling in the North American model, critique and refinement of the model for the 21st century, and introduction to natural resource leadership, and outdoor skills and recreation. Offered on a satisfactory-fail basis only.

## **NREM 211: Careers in Natural Resources**

Cr. 1. F.S.

*Prereq: Sophomore classification*

Career planning exploration in natural resources. Discussion of the job application process, including techniques for successful interviewing and development of an effective resume. Offered on a satisfactory-fail basis only.

## **NREM 240: Quantitative Problem Solving in Natural Resources**

Cr. 3. S.

*Prereq: (STAT 101 or STAT 104) or Permission of Instructor*

Applied quantitative problem-solving skills for natural resource management. Focus on group and individual exercises, with practical problems in geography, hydrology, forestry and ecology. Laboratory includes field data collection and computer data processing and modeling.

## **NREM 250: Environmental Geography**

(Cross-listed with AGRON, ENSCI, ENV S). (3-0) Cr. 3. F.

The distribution, origins and functions of the earth's physical systems and the spatial relationship between human activity and the natural world.

## **NREM 270: Foundations in Natural Resource Policy and History**

(Cross-listed with ENV S, L A). (3-0) Cr. 3. F.

The development of natural resource conservation philosophy and policy from the Colonial Era to the present. North American wildlife, forestry, and environmental policy; national parks and other protected lands; federal and state agencies. Relationship to cultural contexts, including urban reform and American planning movement. Discussion of common pool resources, public and private lands.

**NREM 301: Natural Resource Ecology and Soils**

(Cross-listed with ENSCI). (3-3) Cr. 4. F.

*Prereq: BIOL 211; BIOL 211L; (FOR 201 or a second course in biology)*

Effects of environmental factors on ecosystem structure and function using forest, prairie and agricultural ecosystems as models. Special emphasis is given to soil-forming factors and the role of soil in nutrient and water cycling and ecosystem dynamics. Additional emphasis is given to human influences on natural ecosystems and the role of perennial plant communities in agricultural landscapes.

**NREM 303: Internship**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: Permission of Instructor; Sophomore classification*

Placement with county conservation boards, camps, zoos, parks, etc., for experience as interpreters, rangers, and technicians.

**NREM 305: Seminar**

(2-0) Cr. 1-3. Repeatable. F.S.

Current topics in natural resources or related issues.

**NREM 311: Field Ecology in Montana**

Cr. 4. SS.

*Prereq: (BIOL 211; BIOL 211L; BIOL 212; BIOL 212L); Permission of Instructor*

Fundamental concepts and principles of ecology dealing with organisms, populations, communities, and ecosystems. Taught at NREM's Rod and Connie French Conservation Education Camp in western Montana. Emphasizes hands-on learning of principles and methods in the field.

**NREM 313: Native Land, Water, and Resources**

(Cross-listed with AM IN). (3-0) Cr. 3. Alt. S., offered even-numbered years.

Examines Native land rights, water rights, and natural resources.

Topics may include Native relations to landscapes, cultural resources and infrastructure projects, land rights, water usage agreements, and resource policies as they apply to on- and off-reservation Native communities. AM IN 210 recommended.

**NREM 315: Genetics for Natural Resource Managers.**

(3-0) Cr. 3. F.

*Prereq: BIOL 211; BIOL 212*

Introduction into how genetic techniques and technologies can aid the management of the earth's biotic resources. Topics include an overview of DNA structure, function and inheritance; tools and techniques for measuring genetic diversity; genetic management of wild and captive populations: DNA forensics as management tool. The goal of this course is to prepare managers/biologists to interpret genetic data as they relate to natural resource conservation.

**NREM 318: Introduction to Ecosystems**

(Cross-listed with AGRON, BIOL, ENSCI). (3-0) Cr. 3. S.

*Prereq: 12 credits in A ECL, AGRON, BIOL, CHEM, FOR, GEOL, NREM*

Biological and physical processes affecting material and energy flows in natural and managed ecosystems. Understanding and predicting climate and management impacts on ecosystem services and sustainability.

**NREM 330: Principles of Interpretation**

(2-3) Cr. 3. S.

*Prereq: 6 credits in BIOL*

History, objectives, forms, and techniques of interpretation in the settings of county, state, national parks, and zoos. Principles of effective communication as they apply to natural resource fields including wildlife management, forestry, and wildlife rehabilitation. Planning and use of effective communications and outreach campaigns to manage and conserve natural resources.

**NREM 333: Fisheries Techniques**

(Cross-listed with A ECL). (1-3) Cr. 2. F.

*Prereq: BIOL 212*

Introduction to techniques used in the collection and interpretation of fish population data in the field and in the lab. Course objectives include an understanding of population survey methodology and improving student critical thinking and teamwork skills. Laboratory focuses on field trips and hands-on sampling experience.

**NREM 345: Natural Resource Photogrammetry and Geographic Information Systems**

(Cross-listed with ENSCI). (2-3) Cr. 3. S.

*Prereq: Junior classification*

Measurement and interpretation of aerial photos in resource management. Introduction to Geographic Information Systems (GIS) using ArcGIS including digitizing, development and query of attribute tables, georeferencing, and use of multiple GIS layers in simple spatial analyses.

**NREM 357: Midwestern Prairie Plants**

(1-2) Cr. 1. F.

Offered 1st half semester only. Survey of the major plant families, genera, and representative species of Midwestern prairies with emphasis on plant identification. Prairie management for multiple species of plants and wildlife.

**NREM 380: Field Ecology Research and Teaching**

Cr. 3. F.

*Prereq: Credit or concurrent enrollment in (A ECL 312 or BIOL 312 or ENSCI 312 or NREM 301) or Department Permission*

Students work in teams to conduct ecological research projects at a local field site, and develop related teaching modules/lesson plans. Research and teaching activity objectives, methods, and results are shared with diverse audiences as presentations, written reports, and web-based documents, and used to engage K-12 students and community members via field days and visits to schools and other institutions.

**NREM 385: Natural Resource Policy**

(Dual-listed with NREM 585). (3-0) Cr. 3. S.

Development, theory and practice of natural resource policy. Integrative approach with topical policy studies in North American wildlife, forestry, and water. Policy formation, the role of science, introduction to federal law compliance.

**NREM 390: Fire Ecology and Management**

(3-0) Cr. 3. F.

Characteristics and role of fire in forest ecosystems. Major topics covered include fuels, fire weather, fire behavior, fire danger rating systems, fire control, prescribed burning, and fire dynamics in major ecosystem types.

**NREM 402: Watershed Hydrology**

(Dual-listed with NREM 502). (Cross-listed with ENSCI, GEOL, MTEOR).

(2-3) Cr. 3. F.

Examination of watersheds as systems, emphasizing the surface components of the hydrologic cycle. Combines qualitative understanding of hydrological processes and uncertainty with quantitative representation. Laboratory emphasizes field investigation and measurement of watershed processes.

**NREM 407: Watershed Management**

(Dual-listed with NREM 507). (Cross-listed with NREM). (3-3) Cr. 4. S.

*Prereq: 1 course in BIOL*

Managing human impacts on the hydrologic cycle. Field and watershed level best management practices for modifying the impacts on water quality, quantity and timing are discussed. Field project includes developing a management plan using landscape buffers.

**NREM 446: Integrating GPS and GIS for Natural Resource Management**

(Dual-listed with NREM 546). (Cross-listed with ENSCI). (2-3) Cr. 3. F.

*Prereq: 12 credits in student's major at 300 level or above*

Emphasis on the use of GPS as a data collection tool for GIS. Basic theory of GPS. Use of Global Positioning System technology for spatial data collection and navigation. Post-processing and real-time correction of GPS data. GPS data transfer to GIS for mapping applications. Use of GIS to construct waypoints for use in GPS navigation.

**NREM 452: Ecosystem Management**

(Dual-listed with NREM 552). (Cross-listed with FOR). (2-3) Cr. 3. S.

*Prereq: Junior or Senior classification; (NREM 120 or BIOL 173)*

Principles of planning, regulating, and decision-making associated with public and private lands, with consideration of forest, grassland, wetland, and freshwater aquatic ecosystems. Integrated natural resources management within ecological, social, economic and policy constraints.

**NREM 455: Stream restoration**

(Dual-listed with NREM 555). Cr. 2. Alt. F., offered odd-numbered years.

*Prereq: A ECL 418 or A B E 431 or C E 372 or GEOL 402 or NREM 407*

Interdisciplinary introduction to the science and practice of stream restoration, with emphasis on restoring physical and biological integrity and ecosystem services to streams and riparian corridors. Lecture highlights philosophical, scientific, and engineering principles.

**NREM 455L: Stream Restoration Lab**

(Dual-listed with NREM 555L). Cr. 1. Alt. F., offered odd-numbered years.

*Prereq: A ECL 418 or A B E 431 or C E 372 or GEOL 402 or NREM 407*

Introduction to measurement and analysis of stream form and function for restoration and rehabilitation. Includes field data collection, map and image analysis, and computation for assessment of channel stability, biotic integrity, and recovery potential.

**NREM 460: Controversies in Natural Resource Management**

(Cross-listed with ENV S). (3-0) Cr. 3. F.S.

*Prereq: (A ECL 312 or NREM 301); NREM 120; Junior classification*

Analysis of controversial natural resource issues using a case approach that considers uncertainty and adequacy of information and scientific understanding. Ecological, social, political, economic, and ethical implications of issues will be analyzed.

**NREM 466: Ecosystem Services**

(Dual-listed with NREM 566). (Cross-listed with ENSCI). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: 15 credits in A ECL, AGRON, BIOL, CHEM, FOR, GEOL, NREM*

Ecosystem services are the societal benefits provided by natural and managed ecosystems. Benefits such as provision of food, purification of air and water, and regulation of climate are essential to human survival and prosperity, but rely upon maintenance of healthy ecosystems. This course will cover the science, policy, and practice of ecosystem services assessment and management, with a special focus on biodiversity, water quality, food production, and climate.

**NREM 471: Agroforestry Systems**

(Dual-listed with NREM 571). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq:* 6 credits in BIOL at 300 level or above

Concepts of sustainable land use, agroecological dynamics, and component interactions of agroforestry systems. Agroforestry systems in temperate and tropical regions. Design and evaluation techniques for agroforestry systems. Ecological, socioeconomic and political aspects of agroforestry.

Meets International Perspectives Requirement.

**NREM 483: Science + Design: Interpretation of Natural Resources in Montana**

(Dual-listed with NREM 583). (Cross-listed with ARTGR). Cr. 3. F.

*Prereq:* Enrollment in ARTGR major; ARTGR 271 or BIOL 211; Permission of Instructor.

Interdisciplinary service-learning. Design and production of natural resource related interpretive signs for Montana natural areas. Field-work experience followed by on-campus studio.

**NREM 485: Undergraduate Seminar**

Cr. 1. Repeatable, maximum of 2 times. F.S.

*Prereq:* Major in Animal Ecology or Forestry; Junior or Senior classification; Permission of Instructor

Weekly seminars on current research topics in natural resource ecology and management. Style and best practice in oral research communication. Skills and principles for evaluating research merit and quality of technical communication. Offered on a satisfactory-fail basis only.

**NREM 489: Survey of Remote Sensing Technologies**

(Dual-listed with NREM 589). (Cross-listed with E E, ENSCI, GEOL, MTEOR). (3-0) Cr. 3. F.

Electromagnetic-radiation principles, active and passive sensors, multispectral and hyperspectral sensors, imaging radar, SAR, thermal imaging, lidar. Examples of applications. Also offered online S.

**NREM 489L: Satellite Remote Sensing Laboratory**

(Dual-listed with NREM 589L). (Cross-listed with E E, GEOL, MTEOR). (0-3) Cr. 1. F.

*Prereq:* 489L: E E 489 or GEOL 489 or MTEOR 489 or NREM 489, 589L: E E 589 or GEOL 589 or MTEOR 589 or NREM 589

Processing and analysis of satellite sensor data (optical and radar). Provides practical applications in an environmental context.

**NREM 490: Independent Study**

Cr. 1-4. Repeatable, maximum of 4 credits.

*Prereq:* Junior or Senior classification; Permission of Instructor

**NREM 490A: Independent Study: Animal Ecology**

Cr. 1-4. Repeatable, maximum of 4 credits.

*Prereq:* Junior or Senior classification; Permission of Instructor

**NREM 490B: Independent Study: Forestry**

Cr. 1-4. Repeatable, maximum of 4 credits.

*Prereq:* Junior or Senior classification; Permission of Instructor

**NREM 490E: Independent Study: Entrepreneurship**

Cr. 1-4. Repeatable, maximum of 4 credits.

*Prereq:* Junior or Senior classification; Permission of Instructor

**NREM 490H: Independent Study: Honors Program**

Cr. 1-4. Repeatable, maximum of 4 credits.

*Prereq:* Junior or Senior classification; Permission of Instructor

**NREM 496: Travel Course**

(Dual-listed with NREM 596). Cr. 1-5. Repeatable, maximum of 3 times.

*Prereq:* Permission of Instructor

Limited enrollment. Extended field trips to study ecological and management topics in varied environments. Location and duration of trips will vary. Pre-trip sessions arranged. Trip expenses paid by students.

**NREM 496A: Travel Course: International**

(Dual-listed with NREM 596A). Cr. 1-5. Repeatable, maximum of 3 times.

*Prereq:* Permission of Instructor

Limited enrollment. Extended field trips to study ecological and management topics in varied environments. Location and duration of trips will vary. Pre-trip sessions arranged. Trip expenses paid by students. Meets International Perspectives Requirement.

**NREM 496B: Travel Course: Domestic**

(Dual-listed with NREM 596B). Cr. 1-5. Repeatable, maximum of 3 times.

*Prereq:* Permission of Instructor

Limited enrollment. Extended field trips to study ecological and management topics in varied environments. Location and duration of trips will vary. Pre-trip sessions arranged. Trip expenses paid by students.

**NREM 498: Cooperative Education**

Cr. 1-3. F.S.SS.

*Prereq:* Department Chair Permission

Required of all cooperative education students. Students must register prior to commencing each work period.

**Courses primarily for graduate students, open to qualified undergraduates:**

**NREM 502: Watershed Hydrology**

(Dual-listed with NREM 402). (Cross-listed with ENSCI, GEOL, MTEOR).

(2-3) Cr. 3. F.

Examination of watersheds as systems, emphasizing the surface components of the hydrologic cycle. Combines qualitative understanding of hydrological processes and uncertainty with quantitative representation. Laboratory emphasizes field investigation and measurement of watershed processes.

**NREM 504: Forest Landscapes, Wildlife, and Silviculture**

(2-3) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: Permission of instructor*

Desired forest habitat conditions for fish and wildlife. Silvicultural approaches to protecting/improving such habitats. Focus on key forest elements related to animal species, groups and overall diversity. The lab focuses on team observations and discussions of diverse habitats including one weekend field trip.

**NREM 505: Seminar**

(2-0) Cr. 1-3. Repeatable, maximum of 3 times. F.S.

*Prereq: Permission of instructor or graduate classification*

Current topics in natural resources research and management.

**NREM 533: Erosion and Sediment Transport**

(Cross-listed with A B E, ENSCI). (2-3) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: C E 372 or GEOL/ENSCI/MTEOR 402, MATH 166 or equivalent*

Soil erosion processes, soil loss equations and their application to conservation planning, sediment properties, initiation of sediment motion and over land flow, flow in alluvial channels and theory of sediment transport, channel stability, reservoir sedimentation, wind erosion, BMPs for controlling erosion.

**NREM 535: Restoration Ecology**

(Cross-listed with EEOB, ENSCI). (2-3) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: BIOL 366 or BIOL 474 or graduate standing*

Theory and practice of restoring animal and plant diversity, structure and function of disturbed ecosystems. Restored freshwater wetlands, forests, prairies and reintroduced species populations will be used as case studies.

**NREM 542: Introduction to Molecular Biology Techniques**

(Cross-listed with B M S, EEOB, FS HN, GDCB, HORT, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.S.SS.

Sessions in basic molecular biology techniques and related procedures.

Offered on a satisfactory-fail basis only.

**NREM 542A: Introduction to Molecular Biology Techniques: DNA Techniques**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.S.

Includes genetic engineering procedures, sequencing, PCR, and genotyping. Offered on a satisfactory-fail basis only.

**NREM 542B: Introduction to Molecular Biology Techniques: Protein**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NUTRS, VDPAM). Cr. 1. Repeatable. S.SS.

Techniques. Includes: fermentation, protein isolation, protein purification, SDS-PAGE, Western blotting, NMR, confocal microscopy and laser microdissection, Immunophenotyping, and monoclonal antibody production. Sessions in basic molecular biology techniques and related procedures. Offered on a satisfactory-fail basis only.

**NREM 542C: Introduction to Molecular Biology Techniques: Cell****Techniques**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.S.

Includes: immunophenotyping, ELISA, flow cytometry, microscopic techniques, image analysis, confocal, multiphoton and laser capture microdissection. Offered on a satisfactory-fail basis only.

**NREM 542D: Introduction to Molecular Biology Techniques: Plant****Transformation**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. S.

Includes: Agrobacterium and particle gun-mediated transformation of tobacco, Arabidopsis, and maize, and analysis of transformants. Offered on a satisfactory-fail basis only.

**NREM 542E: Introduction to Molecular Biology Techniques: Proteomics**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.

Includes: two-dimensional electrophoresis, laser scanning, mass spectrometry, and database searching. Offered on a satisfactory-fail basis only.

**NREM 542F: Introduction to Molecular Biology Techniques: Metabolomics**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.

Includes: metabolomics and the techniques involved in metabolite profiling. For non-chemistry majoring students who are seeking analytical aspects into their biological research projects. Offered on a satisfactory-fail basis only.

**NREM 542G: Introduction to Molecular Biology Techniques: Genomic**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. S.

Offered on a satisfactory-fail basis only.

**NREM 546: Integrating GPS and GIS for Natural Resource Management**

(Dual-listed with NREM 446). (Cross-listed with ENSCI). (2-3) Cr. 3. F.

*Prereq: 12 credits in student's major at 300 level or above*

Emphasis on the use of GPS as a data collection tool for GIS. Basic theory of GPS. Use of Global Positioning System technology for spatial data collection and navigation. Post-processing and real-time correction of GPS data. GPS data transfer to GIS for mapping applications. Use of GIS to construct waypoints for use in GPS navigation.

**NREM 552: Ecosystem Management**

(Dual-listed with NREM 452). (Cross-listed with FOR). (2-3) Cr. 3. S.

*Prereq: Junior or Senior classification; (NREM 120 or BIOL 173)*

Principles of planning, regulating, and decision-making associated with public and private lands, with consideration of forest, grassland, wetland, and freshwater aquatic ecosystems. Integrated natural resources management within ecological, social, economic and policy constraints.

**NREM 555: Stream restoration**

(Dual-listed with NREM 455). Cr. 2. Alt. F., offered odd-numbered years.

*Prereq: A ECL 418 or A B E 431 or C E 372 or GEOL 402 or NREM 407*

Interdisciplinary introduction to the science and practice of stream restoration, with emphasis on restoring physical and biological integrity and ecosystem services to streams and riparian corridors. Lecture highlights philosophical, scientific, and engineering principles.

**NREM 555L: Stream Restoration Lab**

(Dual-listed with NREM 455L). Cr. 1. Alt. F., offered odd-numbered years.

*Prereq: A ECL 418 or A B E 431 or C E 372 or GEOL 402 or NREM 407*

Introduction to measurement and analysis of stream form and function for restoration and rehabilitation. Includes field data collection, map and image analysis, and computation for assessment of channel stability, biotic integrity, and recovery potential.

**NREM 566: Ecosystem Services**

(Dual-listed with NREM 466). (Cross-listed with ENSCI). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: 15 credits in A ECL, AGRON, BIOL, CHEM, FOR, GEOL, NREM*

Ecosystem services are the societal benefits provided by natural and managed ecosystems. Benefits such as provision of food, purification of air and water, and regulation of climate are essential to human survival and prosperity, but rely upon maintenance of healthy ecosystems. This course will cover the science, policy, and practice of ecosystem services assessment and management, with a special focus on biodiversity, water quality, food production, and climate.

**NREM 570: Advanced Decision-making in Natural Resource Allocation**

(2-2) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: FOR 451 or two courses in economics*

Analytical approach to economic aspects of forest resource management problems. Theory and application of economic decision-making criteria to traditional and modern forest resource management issues. Current problems in the allocation of forest resources.

**NREM 571: Agroforestry Systems**

(Dual-listed with NREM 471). (Cross-listed with SUSAG). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: 6 credits in BIOL at 300 level or above*

Concepts of sustainable land use, agroecological dynamics, and component interactions of agroforestry systems. Agroforestry systems in temperate and tropical regions. Design and evaluation techniques for agroforestry systems. Ecological, socioeconomic and political aspects of agroforestry.

Meets International Perspectives Requirement.

**NREM 583: Science + Design: Interpretation of Natural Resources in Montana**

(Dual-listed with NREM 483). (Cross-listed with ARTGR). Cr. 3. F.

*Prereq: Enrollment in ARTGR major; ARTGR 271 or BIOL 211; Permission of Instructor.*

Interdisciplinary service-learning. Design and production of natural resource related interpretive signs for Montana natural areas. Field-work experience followed by on-campus studio.

**NREM 585: Natural Resource Policy**

(Dual-listed with NREM 385). (3-0) Cr. 3. S.

Development, theory and practice of natural resource policy. Integrative approach with topical policy studies in North American wildlife, forestry, and water. Policy formation, the role of science, introduction to federal law compliance.

**NREM 589: Survey of Remote Sensing Technologies**

(Dual-listed with NREM 489). (Cross-listed with E E, ENSCI, GEOL, MTEOR). (3-0) Cr. 3. F.

Electromagnetic-radiation principles, active and passive sensors, multispectral and hyperspectral sensors, imaging radar, SAR, thermal imaging, lidar. Examples of applications. Also offered online S.

**NREM 589L: Satellite Remote Sensing Laboratory**

(Dual-listed with NREM 489L). (Cross-listed with E E, GEOL, MTEOR). (0-3) Cr. 1. F.

*Prereq: 489L: E E 489 or GEOL 489 or MTEOR 489 or NREM 489, 589L: E E 589 or GEOL 589 or MTEOR 589 or NREM 589*

Processing and analysis of satellite sensor data (optical and radar). Provides practical applications in an environmental context.

**NREM 590: Special Topics**

Cr. 1-4. Repeatable, maximum of 4 credits.

*Prereq: Permission of instructor*

**NREM 590A: Special Topics: Animal Ecology**

Cr. 1-4. Repeatable, maximum of 4 credits.

*Prereq: Permission of instructor*

**NREM 590B: Special Topics: Forestry**

Cr. 1-4. Repeatable, maximum of 4 credits.

*Prereq: Permission of instructor*

**NREM 593: Workshop**

Cr. 1-3. Repeatable.

*Prereq: Graduate classification*

**NREM 596: Travel Course**

(Dual-listed with NREM 496). Cr. 1-5. Repeatable, maximum of 3 times.

*Prereq: Permission of Instructor*

Limited enrollment. Extended field trips to study ecological and management topics in varied environments. Location and duration of trips will vary. Pre-trip sessions arranged. Trip expenses paid by students.

**NREM 596A: Travel Course: International**

(Dual-listed with NREM 496A). Cr. 1-5. Repeatable, maximum of 3 times.

*Prereq: Permission of Instructor*

Limited enrollment. Extended field trips to study ecological and management topics in varied environments. Location and duration of trips will vary. Pre-trip sessions arranged. Trip expenses paid by students. Meets International Perspectives Requirement.

**NREM 596B: Travel Course: Domestic**

(Dual-listed with NREM 496B). Cr. 1-5. Repeatable, maximum of 3 times.

*Prereq: Permission of Instructor*

Limited enrollment. Extended field trips to study ecological and management topics in varied environments. Location and duration of trips will vary. Pre-trip sessions arranged. Trip expenses paid by students.

**NREM 598: Natural Resource Ecology and Management Teaching Practicum**

Cr. 1. F.S.SS.

*Prereq: Graduate classification as M.S. candidate in a NREM major and permission of instructor.*

Graduate student experience in teaching. Student must plan and present at least one unit of subject matter in a course or extension workshop. Teaching practicum must be documented by the student and approved by the student's POS committee. Offered on a satisfactory-fail basis only.

**NREM 599: Creative Component**

Cr. arr.

**Courses for graduate students:****NREM 600: Seminar**

Cr. 1. Repeatable. F.S.

Current topics in natural resources research and management.

**NREM 698: Natural Resource Ecology and Management Teaching Practicum**

Cr. 1. F.S.

*Prereq: Graduate classification as a Ph.D. candidate in a NREM major and permission of instructor.*

Graduate student experience in teaching. Student must plan and present substantive subject matter for a minimum of three weeks in lecture and/or laboratory formats, or a series of extension seminars/workshops. Teaching practicum must be documented by the student and approved by the student's POS committee. Offered on a satisfactory-fail basis only.

**NREM 699: Research**

Cr. 1-12. Repeatable, maximum of 12 credits.