

ESSM ECOSYSTEM SCIENCE & MGMT (ESSM)

ESSM 102 Introduction to Natural Resources and Ecosystem Management

Credit 1. 1 Lecture Hour.

Introduction to natural resources including range and forest and ecosystem system approach to wildland management; survey of the field of natural resources and related industries.

ESSM 201 Exploring Ecosystem Science and Management

Credit 1. 1 Lecture Hour.

Exploration of knowledge, skills and abilities required for varied careers within ecosystem science and management; development of a professional portfolio and résumé; exploration of career options through team approach; conduct one service project.

ESSM 203 Forest Trees of North America

Credits 3. 2 Lecture Hours. 2 Lab Hours.

Taxonomy, phylogeny, and identification of the important forest trees of North America and their ecological and social uses and benefits.

Prerequisites: BIOL 101, BIOL 107, BIOL 111 or BIOL 113 and BIOL 123 or equivalent.

ESSM 281 Seminar in Ecosystem Science and Management

Credit 1. 1 Other Hour.

Writing intensive, focused on writing and formatting technical documents relevant to ecosystem sciences and management; includes memos, short synthesis papers and one longer review paper.

Prerequisites: RENR, FORS, RLEM, ECOR and SPSA majors only.

ESSM 291 Research

Credits 0 to 4. 0 to 4 Other Hours.

Research conducted under the direction of faculty member in ecosystem science and management. May be repeated 2 times for credit.

Prerequisites: Freshman or sophomore classification and approval of instructor.

ESSM 300 Field Studies in Forest Ecosystems

Credits 3. 1 Lecture Hour. 6 Lab Hours.

Field-oriented focus on forest ecosystem science and management; problem-solve management questions through data collection and team-based research; investigate the relationships between landowner objectives, mensuration, silviculture, ecology, soils, and regeneration-focused harvesting systems; foster the development of student-faculty relationships; enhance professional knowledge and skills.

Prerequisite: Junior or senior classification or approval of instructor.

ESSM 301 Wildland Watershed Management

Credits 3. 2 Lecture Hours. 2 Lab Hours.

Elements of watershed management including range, forest and other natural resources and principles and practices of wildland management for protection, maintenance and improvement of water resource values.

Prerequisite: Junior or senior classification or approval of instructor.

ESSM 302 Wildland Plants of North America

Credits 3. 2 Lecture Hours. 2 Lab Hours.

Familiarization with the distribution and economic value of important wildland plants including range, forest and other natural resources in Texas and North America and fundamentals of sight identification of these plants; plant collection required.

Prerequisite: Junior or senior classification or approval of instructor.

ESSM 303 Agrostology

Credits 3. 1 Lecture Hour. 6 Lab Hours.

Classification and identification of grasses based on macro- and micromorphological variations of spikelets; interpretation of spikelet variation and use of diagnostic keys to identify important species of North America including range, forest and other natural resources; a grass collection required.

Prerequisites: Junior or senior classification or approval of instructor.

ESSM 304 Rangeland Plant Taxonomy

Credits 4. 2 Lecture Hours. 6 Lab Hours.

Interpretation of plant morphology for keying and identification of important flowering rangeland plants; vegetative and floral characters for important plant families including toxic compounds affecting domestic livestock. Plant collection required.

Prerequisites: Junior or senior classification or approval of instructor.

ESSM 305 Watershed Analysis and Planning

Credits 3. 3 Lecture Hours.

Provide an integrated framework for watershed planning that addresses the related biophysical, social and economic issues; comprehensive in scope and approach giving students the tools and techniques for developing sound watershed management policy and practice; water issues, problems and regulations for Texas.

Prerequisite: Junior or senior classification.

ESSM 306 Plant Functional Ecology and Adaptation

Credits 3. 3 Lecture Hours.

Investigation of physiological mechanisms influencing ecological patterns and processes, including plant acclimation and adaptation in contrasting habitats; abiotic controls on species productivity and distribution; underlying genetic and evolutionary mechanisms contributing to the occurrence of specific genotypes and phenotypes in unique environments.

Prerequisites: RENR 205, any BIOL course, junior or senior classification or approval of instructor.

ESSM 307 Forest Protection

Credits 3. 2 Lecture Hours. 3 Lab Hours.

Destructive agents in forestry as related to importance, identification, cause, extent of losses and protective measures.

Prerequisites: RENR 205, or equivalent, junior or senior classification or approval of instructor.

ESSM 308 Fundamentals of Environmental Decision-Making

Credits 3. 3 Lecture Hours.

Introduction to environmental issues in natural resources management; fundamental principles and methods for understanding biosocial interdependencies in complex environmental issues; use of computer-aided group decision-making techniques to develop cooperative strategies for resolving local or global environmental issues.

Prerequisite: Junior or senior classification or approval of instructor.

ESSM 309 Forest Ecology

Credits 3. 3 Lecture Hours.

Life history and general characteristics of trees; structure and function of forest ecosystems; fundamental principles of forest tree physiology and ecology applied to an analysis of tree growth in relation to environmental factors and present day forest management; global changes and forests.

Prerequisite: Junior or senior classification or approval of instructor.

ESSM 310 Forest Tree Improvement and Regeneration

Credits 3. 3 Lecture Hours.

Genetic improvement or manipulation of forest trees through breeding or transformation; regeneration of forests including reproduction, nursery production, stand establishment, natural regeneration and problems affecting regeneration.

Prerequisites: BIOL 101, BIOL 113 or equivalent; junior or senior classification.

ESSM 311 Biogeochemistry and Global Change

Credits 3. 3 Lecture Hours.

Framework for understanding biogeochemical cycles, their significance at both global and ecosystem levels of organization, and their contemporary relevance to ecosystem science and management.

Prerequisites: RENR 205, RENR 215, any BIOL and/or CHEM course, junior or senior classification or approval of instructor.

ESSM 313 Vegetation Sampling Methods and Designs in Ecosystems

Credits 3. 2 Lecture Hours. 2 Lab Hours.

Basis for vegetation sampling in ecosystems including range, forest and other natural resources; methods for conducting sampling; selection of sampling unit appropriate for vegetation type; sampling statistics; mean comparisons; regression analysis; sampling design principles; development of sampling plan; presentation and interpretation of sampling data.

Prerequisites: Any MATH course satisfying university core curriculum, junior or senior classification or approval of instructor.

ESSM 314 Principles of Rangeland Management Around the World

Credits 3. 3 Lecture Hours.

Basic knowledge of world rangeland ecosystems, how these systems are managed in diverse cultural settings; principles of underlying ecological processes influenced by various land management practices; foster understanding of the values that people in different countries place on rangeland resources; use of these values to enhance geologically sustainable and socially acceptable rangeland management practices.

Prerequisite: Junior or senior classification or approval of instructor.

ESSM 315 Rangeland Inventory and Monitoring

Credit 1. 2 Lab Hours.

Theory and methods to inventory rangeland vegetation; sampling design; analysis of inventory data; interpretation of sampling data; preparation of a technical report; presentation of inventory data in text, tables, and graphs using the style of the Rangeland Ecology and Management discipline.

Prerequisites: ESSM 313, junior or senior classification or approval of instructor.

ESSM 316 Range Ecology

Credits 3. 2 Lecture Hours. 2 Lab Hours.

Organization and distribution of rangeland ecosystems of the world, with emphasis on North America; community dynamics and functions stressed including biotic history, succession, disturbance regimes, competitive interactions, herbivory, energy flow and nutrient cycling; conservation of rangeland resources.

Prerequisites: RENR 205, RENR 215, ESSM 302, and ESSM 314, junior or senior classification or approval of instructor.

ESSM 317 Vegetation Management

Credits 3. 3 Lecture Hours.

Familiarization with practices that cause changes in rangeland vegetation composition for multiple uses; understanding of criteria for range improvement practices; comparison of expected responses of livestock forage production, watershed parameters and wildlife to vegetation changes following range improvements; systems concept for planning, analysis and implementation of range improvement practices.

Prerequisites: ESSM 314, junior or senior classification or approval of instructor.

ESSM 318 Coupled Social and Ecological Systems

Credits 3. 3 Lecture Hours.

Resilience-based stewardship of social-ecological systems including range, forest and other natural resources; ecological concepts of resilience, sustainability, ecosystem services and vulnerability; investigation of linkages among social and ecological system components; contribution to sustainability and provisioning of ecosystem services; evaluation of multiple knowledge sources as the basis for adaptive ecosystem management.

Prerequisites: RENR 205, AGECE 105 or equivalent, junior or senior classification or approval of instructor.

ESSM 319 Principles of Forestry

Credits 4. 3 Lecture Hours. 3 Lab Hours.

Theory and practice of forestry in controlling forest establishment, composition, structure and growth; principles of natural and artificial regeneration; intermediate cultural operations; silvicultural systems; use and control of fire in forests; principles of sustainable stand management.

Prerequisite: Junior or senior classification or approval of instructor.

ESSM 320 Ecosystem Restoration and Management

Credits 3. 3 Lecture Hours.

A basic conceptual framework for restoration ecology and ecological restoration including range, forest and other natural resources; major principles of ecology related to practical problems confronting humankind, such as, environmental pollution and degradation, exotic species invasions, land use and management trade-offs and consequences; importance of biological diversity.

Prerequisite: RENR 205, RENR 215 or equivalent, junior or senior classification or approval of instructor.

ESSM 324 Forest Measurements

Credits 2. 4 Lab Hours.

Measures and measurement of the dimensions and attributes of forested areas including the diameters, heights, volume and biomass of trees within a well-defined area; tools used for forest measurement; the conduct of forest inventories; summary measures and reports of inventory results; remote sensing and related technologies that assist forest measurements.

Prerequisites: ESSM 313 and ESSM 319 or concurrent enrollment; junior or senior classification.

ESSM 351/RENR 405 Geographic Information Systems for Resource Management**Credits 3. 2 Lecture Hours. 2 Lab Hours.**

Geographic Information Systems (GIS) approach to solving spatial problems and managing natural resources, including the acquisition, management, manipulation, analysis, and mapping of spatial and non-spatial databases; identification of natural and relevant features from various data sources; integration of relevant technologies and data; extensive use of GIS software to solve real-world problems. Only one of the following will satisfy the requirements for a degree: ESSM 351/RENR 405, RENR 405/ESSM 351, ESSM 651, BAEN 651 and RENR 651.

Prerequisite: Junior or senior classification or approval of instructor.**Cross Listing:** RENR 405/ESSM 351.**ESSM 398 Interpretation of Aerial Photographs****Credits 3. 2 Lecture Hours. 3 Lab Hours.**

Identification and evaluation of natural and cultural features on aerial photographs; methods for extracting information concerning land use, vegetative cover, surface and structural features, urban/industrial patterns and archaeological sites.

Prerequisite: Junior or senior classification or approval of instructor.**ESSM 404 Changing Natural Resource Policy****Credits 3. 3 Lecture Hours.**

Process through which environmental policies are changed; study theories of social and political change; teams use theories with their original research on environmental policy problems to create and implement plans for changing environmental policies in their own communities.

Prerequisite: Junior or senior classification or approval of instructor.**ESSM 405 Forest Resource Assessment and Management****Credits 3. 1 Lecture Hour. 4 Lab Hours.**

Integration of biophysical, economic and social factors in forest resource analysis, management planning and decision making; applications of interdisciplinary knowledge and multiple-use principles to practical forest management problems.

Prerequisite: Senior classification or approval of instructor.**ESSM 406 Natural Resources Policy****Credits 3. 3 Lecture Hours.**

Natural resources and forest policy development in the United States and review of current issues in forest and related natural resource policy.

Prerequisite: Junior or senior classification or approval of instructor.**ESSM 415 Range Analysis and Management Planning****Credits 4. 3 Lecture Hours. 2 Lab Hours.**

Basic concepts and theories of range management systems. Resource inventory, analysis and management planning.

Prerequisites: AGEC 105 or ECON 202, ESSM 314, ESSM 317; junior or senior classification or approval of instructor.**ESSM 416 Fire Ecology and Natural Resource Management****Credits 3. 3 Lecture Hours.**

Behavior and use of fire in the management of natural resources including range, forest and other natural resources; principles underlying the role of weather, fuel characteristics and physical features of the environment related to the development and implementation of fire management plans.

Prerequisite: RENR 205 or equivalent, junior or senior classification or approval of instructor.**ESSM 417 Prescribed Fire****Credits 3. 2 Lecture Hours. 2 Lab Hours.**

Use of prescribed fire to achieve ecosystem management objectives; understanding of how to plan and implement prescribed fires; coursework on fire behavior, fuel properties and the social aspects of prescribed fire and wildfire; how to safely use fire to achieve multiple outcomes including biodiversity conservation, reduced hazardous fire risk, livestock production and timber management.

Prerequisites: ESSM 416.**ESSM 420 Ecological Restoration of Wetland and Riparian Systems****Credits 3. 2 Lecture Hours. 2 Lab Hours.**

How wetland and riparian areas link terrestrial and aquatic systems and function hydrologically and ecologically within watersheds; integrated approaches for restoration of degraded wetland and riparian systems; improving water resources through vegetation management with a special interest in rangelands.

Prerequisites: RENR 205, junior or senior classification or approval of instructor.**ESSM 430 Advanced Restoration Ecology****Credits 3. 3 Lecture Hours.**

A dynamic discipline relying heavily on the fundamentals of ecology; practice translating and communicating key ecological concepts to advanced case studies in ecological restoration; enhance skills for professional applications.

Prerequisites: RENR 205, ESSM 320, ESSM 420; junior or senior classification.**ESSM 440 Wetland Delineation****Credits 3. 2 Lecture Hours. 2 Lab Hours.**

Covers the application of the 1987 Wetland Delineation Manual in use by the Army Corps of Engineers (CORPS); field indicators of hydrophytic vegetation; hydric soils, wetland hydrology, methods for making jurisdictional determinations in non-disturbed and disturbed areas, recognition of problem wetlands and technical guidelines for wetlands.

Prerequisite: Junior or senior classification.**ESSM 444 Remote Sensing of the Environment****Credits 3. 2 Lecture Hours. 3 Lab Hours.**

Principles and techniques necessary for applying remote sensing to diverse issues in studying and mapping land uses and land covers of the terrestrial environment; emphasizes a hands-on learning approach with theoretical foundations and applications in both aerial and satellite remote sensing, using optical and lidar datasets.

Prerequisite: Junior or senior classification or approval of instructor.**ESSM 446 Unmanned Aerial Systems (UAS) for Remote Sensing****Credits 3. 2 Lecture Hours. 2 Lab Hours.**

Fundamental components of small unmanned aerial systems (sUAS), sensors and platforms, UAS operational concepts, the principles of UAS data collection, legal framework within which UAS should be operated and applied, data processing software and the generation of orthomosaics and 3D point clouds, emphasizes the use of UAS in a broad spatial sciences, technology and applications context, including vegetated ecosystems.

Prerequisites: ESSM 444 or approval of instructor; junior or senior classification.

ESSM 459 Programming for Spatial Data Applications

Credits 3. 2 Lecture Hours. 3 Lab Hours.

Programming for spatial data applications in general and for natural resources application in particular; basic programming concepts and constructs for the creation and manipulation of spatial data; automating of processes; programming behind spreadsheet and GIS applications.

Prerequisites: ESSM 351/RENr 405 or equivalent, junior or senior classification or approval of instructor.

ESSM 461 Spatial Databases for Data Storage, Manipulation and Analysis

Credits 3. 1 Lecture Hour. 4 Lab Hours.

Relational databases and advanced geodatabase capabilities; types of geodatabases; Structured Query Language including join-types and subqueries; ArcGIS Desktop Advanced.

Prerequisites: ESSM 459; junior or senior classification or approval of instructor.

ESSM 462/GEOG 462 Advanced GIS Analysis for Natural Resources Management

Credits 3. 2 Lecture Hours. 2 Lab Hours.

Advanced topics in geographic information systems (GIS) to solve natural resource problems; manipulation of raster data types; three-dimensional modeling; emphasis on geoprocessing as it relates to applied projects particularly with habitat suitability models; field and lab use of global positioning systems (GPS); internet-based GIS modeling.

Prerequisites: ESSM 351/RENr 405 or AGSM 461 or equivalent or approval of instructor; junior or senior classification.

Cross Listing: GEOG 462/ESSM 462.

ESSM 464 Spatial Project Management

Credits 3. 2 Lecture Hours. 2 Lab Hours.

Integration of key components of spatial project management to ensure a successful project implementation using life-cycle methodology and spatial project management; strategy and planning, requirements analysis, design, development, deployment, and operations and maintenance; term project working with real world data to develop and manage a spatial project for practical applications.

Prerequisites: ESSM 351/RENr 405 and ESSM 444, junior or senior classification or approval of instructor.

ESSM 480 Plant Identification and Undergraduate Range Management Exam Team Competitions

Credits 0 to 3. 0 to 3 Other Hours.

Knowledge of plants morphology, identification and distribution for the profession of range management; knowledge of range management across the world; weekly tests to train on plant and range management knowledge. May be repeated for credit.

Prerequisites: Junior or senior classification or approval of instructor.

ESSM 481 Senior Seminar

Credit 1. 1 Lecture Hour.

Completion of professional e-portfolio, résumé and job application; exploration of job search, application, and interview; discipline competency exams; program evaluation.

Prerequisite: Senior classification in ESSM degree program.

ESSM 484 Internship

Credits 0 to 4. 0 to 4 Other Hours.

Supervised experience program conducted in the student's area of specialization.

Prerequisite: Approval of student's advisor.

ESSM 485 Directed Studies

Credits 0 to 3. 0 to 3 Other Hours.

Individual study and research upon a selected range problem.

Prerequisite: Approval of student's advisor.

ESSM 489 Special Topics in...

Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours.

Selected topics in an identified area of rangeland ecology and management. May be repeated for credit.

Prerequisite: Approval of instructor.

ESSM 491 Research

Credits 0 to 4. 0 to 4 Other Hours.

Research conducted under the direction of faculty member in ecosystem science and management. May be repeated for credit.

Prerequisites: Junior or senior classification and approval of instructor.