### ENSC - Environmental Science

**ENSC 110. Land Resources and Environmental Sciences. 3 Credits.** (3 Lec) Introduction to environmental science associated with managed and natural ecosystems. Students will learn how to identify scientific questions from issues, and how to develop scientifically-based objective information for answering environmental and land management questions. The class is a survey of the department's majors in agroecology, environmental biology, geospatial sciences, land rehabilitation, and soil and water science. Students must be proficient in basic algebra and have an understanding of biological principles. Participation in field trips is expected as part of the course.

**ENSC 210. Role of Plants in the Environment. 3 Credits.** (3 Lec) PREREQUISITE: BIOC 160 and Sophomore standing. Applying the fundamentals of the scientific method to gain a basic understanding of plant ecology and physiology with an emphasis on how plants respond and adapt to abiotic and biotic factors and the consequences for community dynamics and ecosystem feedbacks.

**ENSC 245IN. Soils. 3 Credits.** (2 Lec, 1 Lab) PREREQUISITE: M 096 or M 097 or equivalent. Soils and their properties as components of landscapes and ecosystems. Application of soils knowledge to problems in environmental sciences and management of agricultural, wildland, and urban landscapes. COMMON FINAL ONLY.

**ENSC 260. Evolution for Env Scientists. 3 Credits.** (3 Lec) PREREQUISITE: BIOC 160 Overview of the mechanisms and patterns of evolution, focusing methods in the field the role of evolutionary biology in understanding issues in environmental science.

**ENSC 272CS. Water Resources. 3 Credits.** (3 Lec) F 3 cr. LEC 3 An introduction to the science, uses, policy, and management of fresh water resources, including hydrologic and ecological processes, and related historic, policy, law and socioeconomic aspects. The course is intended for majors in the sciences, social sciences, and other disciplines.

**ENSC 290R. Undergraduate Research. 1-4 Credits.** (1 Ind; 12 cr max) F.S.Su 1 - 4 cr. IND May be repeated. Maximum 12 cr. PREREQUISITE: Freshman or sophomore standing and approval of instructor. Course will address responsible conduct of research. Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or other creative project.

**ENSC 291. Special Topics. 1-4 Credits.** (1 Lec; 12 cr max) On Demand 1 - 4 cr. Maximum 12 cr. PREREQUISITE: None required, but some may be determined necessary by each offering department. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

**ENSC 292. Independent Study. 1-3 Credits.** (1 Ind; 6 cr max) On Demand 1-3 cr. IND Maximum 6 cr. PREREQUISITE: Consent of instructor and approval of department head. Directed research and study on an individual basis.

**ENSC 298. Internship. 2-4 Credits.** (2-4 Int; 12 cr max) On Demand 2 - 12 cr. IND Maximum 12 cr. PREREQUISITE: Consent of instructor and approval of department head. An individualized assignment arranged with an agency, business, or other organization to provide guided experience within the field.

**ENSC 353. Environmental Biogeochemistry. 3 Credits.** (3 Lec) F PREREQUISITE: CHMY 143, ENSC 245IN. Foundational course will cover mechanisms controlling the behavior of inorganic and organic constituents in soil and water systems. Applications will focus on integrating biological and chemical processes to understand biogeochemical cycling, nutrient bioavailability, and the fate and transport of chemicals.

**ENSC 407. Environmental Risk Assessment. 3 Credits.** (3 Lec) F Alternate Even Years. PREREQUISITE: BIOC 170IN. Principles of risk analysis, including risk assessment, perception, communication, and management. Emphasis on human toxicology, ecotoxicology, dose-response relationships, exposure analysis, environmental fate, and deterministic and probabilistic risk assessment.

**ENSC 410R. Biodiversity Survey and Monitoring Methods. 3 Credits.** (2 Lec, 1 Lab) PREREQUISITE: NRSM 240 or BIOC 370; BIOC 318 or STAT 216Q. Biodiversity survey and monitoring designs, sampling methods, and data evaluation techniques are introduced. Emphasis is on plants but other taxa are addressed for agricultural, rehabilitation and wildland systems. One week of fieldwork required prior to semester; course completion 3rd week of October. Co-convened with LRES 510.

**ENSC 443. Weed Ecology and Management. 3 Credits.** (2 Lec, 1 Lab) F PREREQUISITE: M 121Q, STAT 216Q or BIOC 318. The principles of weed ecology including plant population demographics, biotic and abiotic regulating mechanisms, and plant community temporal and spatial dynamics in managed ecosystems. Weed population model construction, spreadsheet calculations and thorough assessment of pest threshold theory. The study of ecologically-based weed management approaches including cultural, mechanical, biological, and chemical control practices.

**ENSC 444. Watershed Hydrology. 3 Credits.** (2 Lec, 1 Lab) F PREREQUISITES: ENSC 245IN; M 151Q or M 161Q or M 165Q or M 166Q or M 171Q or M 181Q or M 182Q; PHSX 205 or PHSX 220 or PHSX 240; or consent of instructor (students who do not have these pre-reqs must see instructor); RECOMMENDED PREREQUISITE: STAT 216Q. This course provides a conceptual and quantitative introduction to the physical fundamentals of environmental and watershed hydrology. Focus is on the hydrologic processes that determine how rainfall and snowmelt ultimately become stream flow and evapotranspiration. Topics include the basics of: stream flow analysis, water balances, thermal energy balances, climate and weather, soil physics, ecohydrology, groundwater hydrology, groundwater-surface water interactions, stream flow generation, and water quality. Incoming students are advised to be proficient in algebraic and spreadsheet analyses and to be familiar with the basics of probability analysis and descriptive statistics.

**ENSC 445. Watershed Analysis. 3 Credits.** (3 Lec) S PREREQUISITES: ENSC 444 and STAT 216Q or BIOC 318 or permission of instructor. Conceptual and quantitative analysis of watershed processes with an emphasis on modeling surface water hydrology and water resources management. Watershed modeling concepts including analysis of time series, spatially variable data, model calibration, and uncertainty analysis will be studied and demonstrated.

**ENSC 448. Stream Restoration Ecology. 3 Credits.** (2 Lec, 1 Lab) F PREREQUISITE: BIOC 170IN, and either NRSM 240 or BIOC 370 or consent of instructor. Students will critically assess the definitions, assumptions, goals, appropriate, and outcomes implicit in stream restoration projects in relation to ecosystem processes and dynamics in rivers and streams. Based on this information, students will critique an array of real-world stream restoration plans to identify implicit assumptions, goals, biases, and assess implementation strategies in the context of tenets of the conceptual underpinnings of stream ecology as a discipline.

**ENSC 454. Landscape Pedology. 3 Credits.** (2 Lec, 1 Lab) F PREREQUISITE: ENSC 245IN. Processes leading to the formation and spatial distribution of soils on the landscape. Describing, classifying, and mapping soils. We explore classical approaches to evaluating soil development using concepts of soil age and residence time, and variation of soil properties with climate, geomorphic and hydrologic context, plant communities, and parent material. The course includes a substantial hands-on field component. Land use and soil management for agriculture/range are considered in the context of larger scale controls on soil development and distribution.

**ENSC 458. Teaching Applications in LRES. 1-3 Credits.** (1-2 Lab; 3 cr max) F.S Application of teaching philosophies and methods through classroom, laboratory, and field teaching experiences.

**ENSC 460. Soil Remediation. 3 Credits.** (3 Lec) S PREREQUISITE: ENSC 245IN. Principles of soil remediation in impacted landscapes. Soil reconstruction practices are presented for drastically disturbed lands. Treatment science is presented to repair soil systems contaminated by metals and salt as a result of resource extraction and landscape disturbance by humans. Protection of water resources are examined as related to sediment loss control, acid rock drainage science and treatment, and selective handling of geologic stratum. A field trip to a contaminated landscape will demonstrate ongoing soil remediation practices.

**ENSC 461. Restoration Ecology. 3 Credits.** (3 Lec) PREREQUISITE: BIOC 170IN, and either NRSM 240 or BIOC 370. Review of ecosystem structure and function, and community and population processes in intact systems, along with the effects of major disturbances on natural systems. Restoration amendments will be discussed in terms of their effects on ecosystem structure and function. The course includes case studies, and focuses on plant and soil systems. Co-convened with LRES 563.

**ENSC 464. Computational Techniques Environmental Science. 1 Credit.** (1 cr, LAB 1 PREREQUISITE: BIOC 170IN. Computational skills are increasingly important in the Environmental Sciences. This course will focus on basic computer programming using R. No prior expertise is required and exercises will begin at a basic level.
ENSC 465. Environmental Biophysics. 3 Credits. (2 Lec, 1 Lab)
PREREQUISITE: BIOB 170IN. The study of physical relationships between organisms, ecosystems, and their environment. Basic principles of Micrometeorology, Biometeorology, Ecological Climatology, and Biophysical Ecology as applied to contemporary ecological challenges. Laboratory sessions will focus on computer exercises using ecosystem models and field observations. Co-convened with LRES 565.

ENSC 466. Chemical Ecology. 3 Credits. (3 Lec) F
PREREQUISITE: BIOE 370 and CHMY 121IN. How organismal interactions are shaped through plant secondary metabolites—emphasizing the impacts on ecosystems across multiple scales and in response to a rapidly changing climate. This course combines lectures with student led discussions on contemporary issues and developments in the field and is designed to improve critical readings of the primary literature and effective communication in science. Cross-listed with LRES 566.

ENSC 468. Ecosystem Biogeochem and Global Change. 3 Credits. (3 Lec)
PREREQUISITE: ENSC 353. Introduction to the study of biogeochemistry and ecosystem dynamics from an Earth-systems perspective. Discussion will emphasize factors governing the "grand elemental cycles" of carbon, nitrogen, and phosphorus of Earth's major ecosystems and how modern human activities are affecting these cycles. Co-convened with LRES 568.

ENSC 490R. Undergraduate Research. 1-6 Credits. (1 Ind; 12 cr max) F,S 1 - 4 cr. IND May be repeated. Maximum 12 cr. PREREQUISITE: Junior or Senior standing and approval of instructor. Directed undergraduate research/creative activity which may culminate in a research paper, journal article, or undergraduate thesis. USP scholarships or project support grants are available in many cases. Course will address responsible conduct of research. May be repeated.

ENSC 491. Special Topics. 1-4 Credits. (1-4 Lec; 12 cr max) On Demand 1 - 4 cr. Maximum 12 cr. PREREQUISITE: Course prerequisites as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

ENSC 492. Independent Study. 1-3 Credits. (1 Ind; 6 cr max) On Demand 1 - 3 cr. IND Maximum 6 cr. PREREQUISITE: Junior standing, consent of instructor, and approval of department head. Directed research and study on an individual basis.

ENSC 498. Internship. 2-4 Credits. (2 Ind; 12 cr max) F S, Su 2 - 4 cr. IND Maximum 12 cr. PREREQUISITE: Junior standing, consent of instructor and approval of department head. An individualized assignment arranged with an agency, business, or other organization to provide guided experience in the field.

ENSC 499R. LRES Capstone. 3 Credits. (3 Lec) F 3 cr. LEC 3 Prerequisite: LRES major; Senior standing only. Senior capstone course. Provides disciplinary and interdisciplinary knowledge requiring integration and application of environmental science knowledge to natural resource management issues. Topic of course will change. Students will work both independently and in groups to research and critique the current literature related to science application. Course emphasizes writing and presentation skills, scientific methods, review of primary literature and critique of information from varied sources.
Font Notice

This document should contain certain fonts with restrictive licenses. For this draft, substitutions were made using less legally restrictive fonts. Specifically:

Times was used instead of Adobe Garamond Pro.

The editor may contact Leepfrog for a draft with the correct fonts in place.