

Environmental Science and Biology Graduate Courses: November 2008

ENV 500 Plant Diversity (A). *Prerequisites: One general biology and one 400-level ecology course.* In-depth study of the diversity of plants from an evolutionary perspective to taxonomic and botanical characteristics. Laboratory and field work surveys plant structures and principles of plant classifications and identification from the cellular to organismal level. Projects include plant collection and preservation, plant propagation, plant reproduction, and review and presentation of botanical literature. 4 Cr. Even Fall

ENV 505 Plant Ecology (A). *Prerequisites: One general biology and one 400-level ecology course.* In-depth study of the relationships between plants as well as with the environment including: physiological ecology and describing the plant environment; population ecology and interactions between plants and other organisms; and community ecology including plant diversity and temporal dynamics. Field exercises explore local plant communities using experimental and quantitative techniques. Students analyze and discuss current readings in plant ecology. 4 Cr. Odd Fall

ENV 506 Wildlife Ecology (A). *Prerequisites: One general biology and one 400-level ecology course.* In-depth study of wildlife ecology. Lecture topics include population ecology, behavior, nutrition, disease, habitat management, predator prey systems, economics and the human dimensions of wildlife management. Laboratories and field work include radio telemetry, census methods, aging white-tailed deer and computer modeling. 4 Cr. Even Fall

ENV 513 Topics in Plant Biology (A). *Prerequisite: ENV 400 or 405.* In-depth discussion of recent scientific literature and experimental data in plant biology, ecology and systematics. Students critically analyze current scientific literature and write a research paper. 3 Cr.

ENV 519 Principles of Limnology (A). *Prerequisite: ENV 303.* In-depth study of the physical, chemical and biological properties of lakes and streams. Topics include top-down: bottom-up control of food webs, eutrophication, nutrient cycling, acid precipitation effects on lakes, paleolimnology, etc. Students critically analyze classical and current limnological literature and write two research papers. Recommended for students interested in oceanography and marine biology. ENV 521 is the complementary laboratory. 3 Cr. Fall

ENV 521 Limnology Laboratory (A). *Prerequisite: ENV 303.* In-depth study of laboratory and field methods of limnology. Topics include sampling and identification of selected aquatic organisms, chemical analysis of water, and operation of physical and chemical sampling gear. Includes field exercises on lakes, using department vessels, and streams. Recommended for students interested in oceanography and marine biology. ENV 519 is the complementary lecture course. 2 Cr. Fall

ENV 523 Biology of Pollution (A). *Prerequisites: One college biology and one college chemistry course.* In-depth study of chemistry and biology of pollution. Primary focus on

water pollution problems and effects of pollutants on organisms at the molecular, cellular, physiological and behavioral levels, plus effects on populations, communities and ecosystems. Overview of toxicity testing techniques and data analysis. *3 Cr. Odd Spring*

ENV 530 Ornithology (A). *Prerequisites: One general biology and one 400-level ecology course.* In-depth study of birds. Explores their form, function, ecology and evolution. Topics includes anatomy, physiology, origins and biophysics of flight, migration and annual cycle, mating systems, and population and community ecology of birds. Includes lab and field study of anatomy and flight, identification techniques, census methods, and trapping and banding. *4 Cr. Even Spring*

ENV 535 Restoration Ecology (A). *Prerequisites: One general biology and one 400-level ecology course.* In-depth approach to restoration of terrestrial, wetland, and aquatic ecosystems to be addressed by focusing on regulatory constraints, site characterization/evaluation, conceiving and designing restoration projects that fit within the surrounding landscape, monitoring requirements, control of invasives, and adaptive management. Students working in groups will develop conceptual restoration projects of their own choosing in terrestrial, wetland, or aquatic ecosystems. Case studies will be assigned for further analysis of restoration options. *3 Cr. Odd Spring*

ENV 539 Conservation Biology (A). *Prerequisites: One general biology and one 400-level ecology course.* In-depth study of conservation biology. Examines current theories and data from evolutionary biology, ecology and genetics as they relate to the conservation of biological diversity. Topics include causes of extinction, habitat loss and fragmentation, design of nature reserves, landscape ecology, application of basic principles of population biology to species conservation, and restoration ecology. *3 Cr. Even Fall*

ENV 540 Herpetology (A). *Prerequisites: One general biology and one 400-level ecology course.* In-depth study of reptiles and amphibians. Explores their form, function, ecology and evolution. Topics include anatomy, physiology, mating systems, population and community ecology of herpefauna, and their conservation biology. Includes lab and field study of identification techniques and capture and census methods. *4 Cr. Odd Spring*

ENV 544 Terrestrial Ecosystem Ecology (A). *Prerequisites: One general biology and one 400-level ecology course.* In-depth study of the major terrestrial ecosystems of the world and the stresses they face due to global environmental change such as rising atmospheric carbon dioxide levels, global warming, declining biodiversity, invasive species and elevated nitrogen deposition. Compares and contrasts systems with respect to their major characteristics, including vegetation, energy flow, and nutrient cycling and inputs. *3 Cr. Even Spring*

ENV 546 Wetland Ecology (A). *Prerequisites: One general biology and one 400-level ecology course.* In-depth study of wetland science, from wetland types and functions and values to hydrology, biogeochemistry, development and succession, and plant and animal

communities. Laboratory exercises consist of field trips to local wetlands of different types, field sampling experiences, practice in wetland delineation, and lab experiments. The course is directed toward practical application of knowledge gained and concludes with problems related to wetland management and restoration. *4 Cr. Fall*

ENV 548 Northern Wetlands (A). *Prerequisites: One general biology and one 400-level ecology course.* In-depth study of wetlands of the northern United States – peatlands and Great Lakes coastal marshes. Wetland development will be addressed starting with underlying geology and hydrology, then proceeding to biogeochemistry and development of plant communities and faunal habitats. Human impacts on these wetland types will be assessed, along with potential means for preventing degradation and restoring wetland functions. *3 Cr. Even Spring*

ENV 552 Environmental Laws and Regulations (A). In-depth discussion of key federal and state environmental laws, how branches of government interact to enforce environmental laws and regulations, and the roles scientists and lawyers play in resolving environmental issues. *3 Cr. Every Semester*

ENV 559 Mammalogy (A). *Prerequisites: One general biology and one 400-level ecology course.* In-depth study of mammals. Explores their form, function, ecology and evolution. Topics include origins, anatomy, physiology, diet and feeding strategies, population and community ecology, and social systems. Laboratory and field activities emphasize mammalian classification, habitat selection and population biology. *4 Cr. Odd Fall*

ENV 562 Aquatic Toxicology. *Prerequisites: One general biology and one 400-level ecology course.* In-depth study of toxicity testing equipment, procedures and organisms. Students design toxicity tests, analyze test results and culture test organisms. *4 Cr. Even Spring*

ENV 564 Aquaculture I (A). *Prerequisites: One general biology and one 400-level ecology course.* In-depth study of the principles and practices of intensive and extensive aquaculture. Topics include system design and operation; water quality maintenance; diet and nutrition; reproduction, selective breeding and genetics; disease identification and treatment; and the biology of cultured organisms. *4 Cr. Odd Fall*

ENV 574 Aquaculture II (A). *Prerequisite: ENV 303.* In-depth study of the business aspects of aquaculture. Topics include aquaculture inputs, aquaculture production, farm management, processing, distribution, marketing, consumer behavior, pricing, government policy, modeling, international trade, transfer of technology, international cooperation, and environmental impacts. *4 Cr. Even Fall*

ENV 576 Animal Ecophysiology (A). *Prerequisites: One general biology and one 400-level ecology course.* In-depth study of physiological adaptations of animals to their physical environment and the influence of these adaptations on animal distributions. Topics include temperature and energy metabolism, water and ion balance, oxygen

availability, sensory and reproductive adaptations. Examines biochemical, cellular and organism responses to these factors using an integrative and comparative approach. 3 Cr. *Odd Fall*

ENV 577 Field Biology. *Prerequisites: One general biology and one 400-level ecology course.* Explores flora and fauna of various habitats in Western New York. Topics include structure and function of communities, species identification, qualitative and quantitative assessment of communities and ecosystems, and general conservation theory and practice. 4 Cr. *Summer*

ENV 583 Aquatic Invertebrates. *Prerequisites: One general biology and one 400-level ecology course.* In-depth study of aquatic invertebrates and their importance in stream and lake ecosystems. Topics include invertebrate biology and ecology, classification and identification (insects, crustaceans, mites, annelids, mollusks, etc.), use of dichotomous keys and sampling equipment, and preparation techniques. Prepares students to predict habitat or water quality conditions based on the invertebrate fauna present. 4 Cr. *Odd Spring*

ENV 584 Fish Ecology (A). *Prerequisites: One general biology and one 400-level ecology course.* In-depth study of fish and fisheries. Topics include fish anatomy and physiology in relation to fish behavior and ecology, classification to the ordinal level, population dynamics (recruitment, growth, mortality, environment) and fishery management. ENV 590 is the complementary laboratory. 3 Cr. *Even Spring*

ENV 588 Environmental Impact Analysis (A). *Prerequisite: ENV 303.* Students prepare an environmental impact statement (EIS) for a realistic local development project. Topics include the National Environmental Policy Act, the NY State Environmental Quality Review Act, relevant regulations and permit requirements (federal, state, local), and analysis of environmental impacts and alternatives. Depending on the number of credits and session offered, may include field work. 4-6 Cr. *Summer*

ENV 590 Fishery Techniques and Identification (A). *Prerequisite: ENV 303.* In-depth study of laboratory and field techniques used by fisheries scientists. Hands-on activities include fish collection methods (electrofishing, nets) fish anatomy, fish identification and quantitative analysis of fisheries data. ENV 584 is the complementary lecture course. 2 Cr. *Fall*

ENV 614 Experimental Design and Data Interpretation (A). *Prerequisite: MTH 122 or higher.* In-depth study of experimental design, hypothesis formulation and testing, data manipulation and analysis, and interpretation of biological data. Topics include descriptive statistics, exploratory data analysis, and parametric and non-parametric two- and multi-sample tests using analysis of variance, regression and other techniques. 3 Cr. *Fall*

ENV 616 Multivariate Statistics (A). *Prerequisite: ENV 614.* Overview of common multivariate methods used for analysis of sophisticated data and evaluation of scientific

literature in ecological and environmental research. Topics include multivariate regression techniques, cluster analysis, principal components analysis, canonical and correspondence analyses, multivariate analysis of variance, and discriminant function analysis. Emphasis on applications, not theory. *3 Cr. Spring*

ENV 621 Water Chemistry (A). *Prerequisites: Two college chemistry courses.* In-depth study of the theory and operation of analytical environmental chemistry instruments. Hands-on activities include flame and graphite furnace atomic absorption spectrophotometry, enzyme-linked immunosorbent assays (ELISA), gas chromatography by micro-ECD, and autoanalyser techniques for nutrients. Covers extraction techniques for tissue (soxhletic) and water (C-18 empore filters) analysis. Each student develops a water quality profile for a body of water. *4 Cr. Spring*

ENV 692 Graduate Internship (A). Designed for the student who wishes to gain experience working with an environmental organization in the public or private sector (e.g. industry, government, environmental organizations). Can be taken only once for credit. *3 Cr. Every Semester*

ENV 695 Topics in Environmental Science (A). Designed for the student who wishes to gain experience in a special field of study. Details reflect student demand, needs, topics of interest and instructor availability. *3-4 Cr. By Arrangement*

ENV 699 Independent Study in Environmental Science (A). Designed individually through consultation between student and instructor to suit the student's needs and interests and the special competence of the instructor. *1-3 Cr. By Arrangement*

ENV 704 Research Thesis (A). Individual investigation of an original research problem to be submitted in a format acceptable to satisfy the requirements for the master's degree as determined by department rules and regulations. *1-6 Cr. Every Semester*

ENV 705 Research Seminar (A). Develops critical thinking skills through weekly discussion of key scientific literature on topics in environmental science, ecology, or plant and animal biology. Taken as two semester-long, one-credit seminars during the first two semesters of the graduate program. *1 Cr. Every Semester*

BIO 515 Molecular Biology (A). *Prerequisite: Instructor's permission.* Covers the biosynthesis and function of macromolecules, especially nucleic acids. Includes topics in regulation, molecular virology, transposition and transformation, as well as recombinant DNA methods. *3 Cr. Spring. BIO 526 Recombinant DN*

BIO 526 Recombinant DNA (A). Considers theory and techniques in the recombinant DNA field. Includes topics such as cloning vectors, restriction analysis, PCR methods, and expression of cloned genes in both prokaryotes and eukaryotes. Also considers examples and implications of recombinant DNA methodology in plants and agriculture, as well as in medicine, human genetics and disease. *3 Cr. Fall*

BIO 567 Biochemistry I (A). Covers proteins, lipids, carbohydrates, nucleic acids and other biomolecules with an emphasis on buffers, structures, experimental methods, main energy production pathways and biosynthesis. Requires application of concepts and information to experimental data and deduction of structures, functional roles and mechanisms. *3 Cr. Fall*

BIO 568 Biochemistry II (A). Emphasizes topics such as metabolic pathways, human nutrition, chromosomes and genes, protein biosynthesis, cell walls, immunoglobulins, muscle contraction, cell motility, membrane transport, and excitable membranes and sensory systems. Investigates the experimental evidence for the structure and functions of biomolecules. *3 Cr. Spring*

ESC 512 Hydrology with Lab (A). *Prerequisite: MTH 201.* Explores the water cycle, including precipitation, runoff, streams and lakes, groundwater, snow and other hydrologic topics. Covers water storage and processes, analytical skills dealing with hydrologic events, and the utilization and conservation of water resources in terms of its distribution, quality and flow. *4 Cr.*

ESC 518 Watershed Sciences (A). *Prerequisite: ESC 412 or instructor's permission.* Explores the art and science of evaluating water, air and land resources in a watershed to provide scientific information for management policy decisions. Covers utilization of maps and other physical resources information, sampling, data processing and analysis. *3 Cr.*

ESC 521 Air Pollution Meteorology (A). *Prerequisites: ESC 350 and ESC 391 or instructor's permission.* For students, engineers and professional people training to measure air pollution levels or measure and evaluate meteorological parameters which affect the diffusion and concentration of pollutants in the atmosphere. Provides knowledge of the effects of meteorology in air pollution. Covers factors related to site selection, control programs and interpretation of surveys. Also studies diffusion using mathematical models. *3 Cr.*

ESC 531 GIS Applications in Earth and Environmental Science (A). *Prerequisite: ESC 230.* Introduces students to spatial analysis theories, techniques, and issues associated with ecological and environmental applications. Provides hands-on training in the use of spatial tools while addressing a real problem. Allows students to experience linking GIS analyses to field assessments and monitoring activities. *3 Cr.*

ESC 555 Soils Science (A). *Prerequisites: GEL 201, CHM 205, ESC 350 and ESC 391 or instructor's permission.* Explores the formation, properties and characterization of soils, especially those of New York state; measurement of physical and chemical properties in field and classroom; and management, conservation and applications of Soil Survey. *3 Cr.*

ESC 557 Marine Geology-Bahamas (A). Involves preparation in the fall semester for a 2-week January intersession field experience in coral reef biology and geology on San

Salvador island in the Bahamas. Covers identification, behavior and ecology of marine organisms in five habitats associated with coral reefs. Teaches students to prepare a scientific field notebook and to design, conduct and write a paper on a personal research project. 3 Cr.

GEL 557 Geochemistry (A). *Course fee. Prerequisites: CHM 205, CHM 206 and GEL 201.* Applies basic chemical principles of thermodynamics, kinetics and equilibrium to the investigation of common geologic problems ranging from the crystallization of silicate melts to surface reactions on soil minerals. Focuses on application of good laboratory practices to wet chemical and instrumental techniques involving geologic materials. 4 Cr.

GEL 562 Groundwater (A). *Prerequisite: GEL 201.* Studies groundwater, its occurrence, movement and use, and its place in the hydrologic cycle. Examines the origin of aquifers, use and effects of wells, and water quality and groundwater problems. Laboratory focuses on practical application of principles to solving hydrogeologic problems. 4 Cr.

PAD 679 Grant Writing and Management (B). Provides students with a “hands-on” experience of developing and writing competitive grant proposals for nonprofit and governmental agencies in order to increase their effectiveness in planning for, submitting, obtaining and managing grants. Enables students to: create a competitive grant proposal, identify the strengths and shortcomings of grant funding for program and agency purposes, identify sources of grant funding, and analyze the strengths and shortcomings of agency support for grant writing. 3 Cr.

PAD 680 Public Policy (A). Introduces students to the study of public policy and the practice of policy analysis. Examines the various methods of identifying and structuring public policy problems and issues, formulating and analyzing alternative responses, recommending policy actions for decision making, and designing and evaluating implementation plans and the means to monitor and evaluate the resulting policy outcomes. Focuses attention on understanding public policy and conducting analysis in a political/administrative environment in order to develop an understanding and capacity to use systematic analytic tools and concepts to improve the quality of decision making in the public sector. 3 Cr.