

M.S. in Environmental Science and Policy Course Catalog

ESP 5670 Advanced Environmental Analytical Instrumentation

1-4 credits

This course will provide hands-on experience and background in a variety of laboratory instrumentation used in environmental research and regulation. The goal is to provide students with an understanding of how data are derived and the potential problems that can exist in reported data. An overview of the theories of instrumentation will be provided, but the main emphasis will be on applied methods, data quality assurance, and data problem identification. Students will acquire a background applicable to careers in state and federal agencies, cooperative extension, environmental or government organizations, environmental consulting, private industry, laboratories, and academia. Students will work directly with laboratory staff on one or more individual projects, and may have the opportunity to participate in practica with agencies or other laboratories.

ESP 5010 Advanced Environmental Planning

3 credits

The purpose of this course is to instill in students a reverence for planning that promotes understanding and appropriate use of the natural environment. The course work will help students gain the capability to envision a future that encompasses the needs of society and reflects the principles of sustainability. This is a very hands on course which will involve two site design projects. By the end of the semester students will be equipped with an understanding of the tools and methodologies that can be used at the site and community level to plan for the future, while respecting the living landscape.

ESP 5340 Advanced Topics in Water Resources

1-2 credits

This course covers advanced topics beyond general watershed resources and hydrology. It is designed to allow for flexible course content in current issues in the science and management of watersheds. The format is reading and conference to encourage student interaction and participation. Sample topics include GIS in hydrology; stream analysis; tracers in hydrology; groundwater fundamentals; hillslope hydrology: processes and theory; hydrometeorology; water resources planning; riparian processes and management

ESP 5130 Applied Environmental Geology and Public Policy

3 credits

Environmental geology is the study of the human interaction with the geological environment. The goal of this course is to introduce the student to the link between environmental geological processes and scientific principles with public policies which have resulted in local ordinances, state laws and regulations, federal laws and international treaties impacting our everyday life. Through the use of case studies, the student will learn that understanding the social, economic, and political 'web' is as important as mastering scientific principles in successfully minimizing the impact of man's activities on the environment.

ESP 5520 Chemical Limnology

3 credits

Chemical Limnology is the second course in the limnology series, providing students with an expanded understanding of the physico-chemical processes that control surface water chemistry. Students will work with the substantial databases available for New England lakes, evaluating current scientific and regulatory issues, and data validation methods. Lakes will be studied as *systems* that are chemically integrated with their watersheds. The focus will be on major

analytes and how lakes function, although the course content may include topical issues such as trace metal mercury biogeochemistry, depending in the interests of the students. The course will be a combination of lecture, seminar, and data exercises, intended for advanced undergraduate and graduate students. Each graduate student will lead a class session on a topic of their choice in the second half of the course. Students are expected to have a general understanding of how lakes function, familiarity with chemical principles, experience with spreadsheets or database software. Permission of the instructor is required.

ESP 5400 Conservation in the Internet Age

2 credits

Conservation in the Internet Age will explore innovative ways in which the internet is shaping environmental education and conservation of natural resources. Areas of emphasis will include: environmental interpretation/education using the internet; natural resource conservation/management using networked databases; stewardship curriculum design and evaluation using the internet; collaborative, public/private, eco-regional approaches to education; developing 21st century field trips that integrate virtual technology with forest and/or lake field experiences; and alignment with national education technology and environmental education literacy standards.

ESP 5100 Conservation Lands in New Hampshire

3 credits

Protection and Management of Conservation Lands in New Hampshire explores the role of conservation lands in the state's landscape. As New Hampshire's fields and forests give way to commercial and residential developments, conservation lands become increasingly important. This course will explore the history of land conservation in New Hampshire and compare the management goals and policies of government agencies and non-governmental organizations that hold conservation lands in the state. We will evaluate tools, criteria, and policies commonly used in land protection, and visit forests and reserves under a variety of ownerships to observe management in action and interact with management staff.

ESP 5590 Data Presentation and Communication

2 credits

Visualizing data and communicating their meaning is an important part of science and translating science to laypersons. This course will explore communicating data effectively to technical and non-technical audiences. Students will learn how to display different types of environmentally-related data and communicate study results successfully in presentations and written formats. This course contributes to the communication requirement of the M.S. in ES&P program.

ESP 5030 Ecological Resource Risk Assessment

3 credits

This course will be in seminar format and will introduce students to the philosophy and methodology of ecological risk assessment. Topics to be covered include: ecosystem health and management; ecosystem disturbance, stability and diversity; environmental stressors (chemical, physical and biological); ECOLOGICAL RISK ASSESSMENT (U. S. Environmental Protection Agency paradigm) including conceptual models, endpoints, exposure, effects, uncertainty; and ecological status and trends. Students will carry out an "ecological risk assessment".

ESP 5120 Ecology and History of the White Mountains

3 credits

This course will be a survey of the history and workings the forests of the White Mountain region. The course will focus on the northern hardwood forest, but also include the spruce-fir zone and tundra. Class periods will emphasize the reading and discussion of the primary literature, texts, and popular writings, such as the multitude of good logging era books. Field trips will be a key component of the course.

ESP 5610 Environment and Society

3 credits

This course will to introduce students to the study of environmental sociology and to develop critical thinking skills facilitated by the application of sociological perspectives. Environmental issues and problems are often viewed as technical ones, to be resolved by the application of scientific and technical means alone. This common perception will be critically examined in this class, and we will see that environmental problems, their solutions, and even ideas of what the environment is are grounded in social systems and cultures. Environmental problems are problems *for* society that challenge and threaten our current system of organization, and are also problems *of* society – it is our systems that produced these problems and must adapt to address them. The class will examine material, ideal, and practical elements of environmental issues. Current environmental problems and policy issues will be debated, and their connections with society and culture will be the focus of the course. The meanings of nature and wilderness will be discussed. Other topics include: environmental justice, the history and workings of the environmental movement, greenwashing, public attitudes towards the environment, and the idea of sustainability.

ESP 5040 Environmental Consulting

3 credits

The demand for qualified environmental consultants in has grown rapidly since the mid 1980's as businesses and industries have responded to state laws and regulations promulgated as the result of environmental laws at the federal level. A major focus of the environmental consulting industry is to work with the business community and the government regulators to create solutions for effective management of environmental issues arising from these laws. This course is designed to train students on scientific degree tracks in becoming valuable employees in the environmental consulting industry by introducing students to the technical skills, project planning, and business management skills in demand by environmental consulting firms. The course focuses on the technical aspects in areas such as brownfield redevelopment, natural resources and environmental permitting, environmental compliance, sustainable development planning, etc. Course elements stress the use of industry standard procedures and state regulations, data and information management, report preparation, development of findings and opinions, and verbal presentations.

ESP 5620 Environmental Law and Policy

3 credits

This course reflects the legal and political aspects of major environmental issues as embodied in major environmental laws. The intent of the course is to teach about the law and the policies that are embodied by and form the basis for these laws at the same time. Concurrent examination is proposed in order to drive home the linkage between policy and law and use one to feed off the other in the discussion of real world events and issues. The course will be presented in a form to convey a robust understanding of the bigger procedural and theoretical “picture” in the formation, implementation, and facets for each topic. Topics include the legal process, the policy

process, ownership and property rights, and how these relate to major environmental issues; water, air, waste, wildlife, and forestry. Emerging new issues will also be discussed.

ESP 5000 Environmental Science 3 credit

Students in this course will be introduced to the sciences fundamental to the understanding of major environmental issues. The adverse impacts being imposed on our air, water and land resources will be explored. Students will gain a better understanding of aspects of the physical, chemical and biological sciences that define environmental issues; the role of sound science in contemporary environmental policy; and experience in researching and presenting a contemporary environmental science topic.

ESP 5300 Field Methods in Water Resources 1 credit

Hydrologic and climatic field measurements and computations useful in watershed management and hydrology. Involves the collection, compilation, and interpretation of data and assessing error, and learning about fundamental hydrologic properties. Course complements Watershed Hydrology.

ESP 5220 Forest Ecology 3 credits

New Hampshire's current landscape is predominantly forested. This resource is managed for both recreational and economical purposes. In this course we will examine the ecology of forests in New Hampshire and of the world. We will explore forests at the organismic, community, and ecosystem level. We will discuss the current health of today's forests and current management plans used to protect and sustain them. This course is designed to build on a basic understanding of ecology. Current ecological theory and methods will be applied to gain an in depth knowledge forest habitats.

ESP 5210 Forest Science 3 credits

This course will provide an introduction to the fundamentals of forest science and the environmental issues central to contemporary forest management. Topics to be covered include forest values, forest ecology, forest soils, forest stressors, biodiversity, monitoring, and management. A field trip to the Hubbard Brook Experimental Forest and another location in the White Mountain National Forest is included.

ESP 5150 Glacial and Periglacial Geology 3 credits

Glaciation has strongly shaped the New England landscape and blanketed it with diverse sediments that influence its hydrology, biology, and human development. The ice sheets of Greenland and Antarctica, themselves of significant societal concern, are remnants of ice sheets that formerly covered 30% of the earth's land surface. The course will introduce glaciers and the processes and products of glacier and cold-region erosion and deposition. The course will emphasize the development, form, and properties of New England glacial sediments but cover the global record. The glacial-geologic methods learned will be applied to on-going investigations of glacier and climate history around the planet.

ESP 5700 Graduate Seminar in Ecology and Environment 3 credits

This graduate seminar is focuses on how ecological concepts and studies inform scientists about the nature of and solutions to environmental problems. Specific topics vary from year to year depending upon the interests of the faculty and the students enrolled. Regardless of the specific topics, each will clearly demonstrate the central role of ecology in understanding ecosystem function and how ecosystems respond to disturbances at multiple scales. Through readings and discussion, students become versed in ecological theory and practice. The concepts are fleshed out through case studies taken directly from peer-reviewed literature.

ESP 5570 Humboldt Field Courses 2-3 credits
The Humboldt Field Research Institute is based in Downeast coastal Maine and is known for an extensive series of advanced and professional-level natural history field seminars offered since 1987. HFRI is east of the Schoodic section of Acadia National Park and west of the Petit Manan National Wildlife Refuge and provides an excellent site for teaching field techniques. Week-long summer field course and seminars are taught by recognized international experts and cover a broad range of specialized subjects, including many that are not typically taught at academic institutions. These courses will give students an opportunity to learn field research techniques on a variety of topics. Specific courses are listed at www.eaglehill.us/index.html.

ESP 5920 Independent Environmental Research 1-4 credits
Students select a topic and project in consultation with their advisor and committee. Collaboration with external organizations and partners is encouraged. A timeline, goals, deliverables, credits, and expected outcomes are outlined for each project.

ESP 5910 Independent Study in Environmental Science and Policy 1-3 credits
Independent study provides enrichment of the background of students through the pursuit of a special topic pertinent to their interests and abilities. It is an opportunity for an in-depth study of a problem in environmental science or policy. Consent of a faculty supervisor and the student's advisor is required.

ESP 5720 Land Use Planning Seminar 1-3 credits
Land use planning is a dynamic field that involves the integration of a variety of components to improve communities and places. This graduate seminar will focus on furthering knowledge on specific topics related to planning and explore interrelationships between topics. Topics might include smart growth, low impact design, transportation, energy, sustainable design, drinking water protection, housing, economic development, and community involvement.

ESP 5510 Limnology 3 credits
This course will examine the structure and function of freshwater ecosystems. Topics to be covered will include the geology, chemistry, physics and biology of such systems. Special emphasis will be given to biogeochemical cycles, energy flow and productivity, and relationships of freshwater systems to human existence. Lab work will include studies of both lotic and lentic systems

ESP 5110 Long Term Environmental Reconstruction (Paleoclimatology) 3 credits
Lake sediments, marine sediments, corals, tree rings, snow, and cave deposits all contain information that can be used to reconstruct the long-term history of environmental change. This

history has sufficient resolution to influence society's assessment of numerous important environmental issues, such as global warming. This course introduces the use of these natural archives to reconstruct diverse aspects of environmental change such as pollution history, development impacts, hurricane history, and climate change. The course will focus on lake-records, given their regional significance, and cover the last few centuries of record. The material will emphasize the regional scale while covering local and global scales. This course introduces the wide variety of paleo-environment fields in the Earth Sciences such as paleoclimatology, paleolimnology, paleoceanography, dendroclimatology, and paleoglaciology.

ESP 5900 Master's Thesis Research

1-8 credits

Students select a topic in consultation with their advisor and committee. A timeline, proposal, and defense are outlined. A final thesis is prepared in accordance with program thesis guidelines.

ESP 5640 Methods of Social Research

3 credits

We encounter information about cultures and society in many ways throughout our lives. This course will enable students to become more astute and critical consumers of social research studies through exploring the thinking behind social research and the methods used to collect, analyze, and report the findings of the social sciences. Students will gain knowledge in research design and implement an actual study of social phenomena. Skills to be presented include theory application and construction, operationalizing variables, evaluating strengths and weaknesses of research methodologies, determining causality, sampling, hypothesis formulation and testing, data collection, analysis and depiction, and proposal writing.

ESP 5600 Natural Resource Policy and Communications

3 credits

Public and private decisions for determining how a nation allocates natural resources reveals much about the character of its people. Such governmental, institutional, quasi-public and private sector decisions -- inextricably intertwined -- have become all the more critical as the finite nature of the earth's carrying capacity becomes evident. Yet too often such decisions are made based upon badly outdated models. This course will take a closer look at how decisions impacting the environment are made, or not made, within the context of historical, political and economic factors. Students are encouraged to strike out on their own into areas of personal interest becoming "experts" in one or more related discipline -- scientific, social, legal or economic.

ESP 5660 Principles of Interpretation

3 credits

This course introduces students to the basic principles and practices of the art and profession of interpretation. After completing this course students will be able to: understand and relate a working definition of interpretation; discuss the history, principles, and philosophy of interpretation as it is practiced in natural resource settings; describe the basics of visitor evaluation; illustrate basic skills in interpretive research, oral presentation development and exhibit development; demonstrate development of interpretive themes, goals, and objectives; and demonstrate competency in making thematic oral presentations and producing interpretive exhibits. For an additional fee to the National Association for Interpretation, students will have an opportunity to become a Certified Interpretive Guide (CIG). This option will be explained in class at the beginning of the semester and students can visit www.interpnet.com for more information.

ESP 5710 Science Colloquium Series

1 credit per year

This graduate seminar is designed to be a core course in the Environmental Science and Policy program. It will focus on the analysis on contemporary issues in environmental science. Specific topics will vary from year to year and will be tailored to the interests of the students enrolled and faculty interests. The course will create a foundation of knowledge of contemporary issues. It is also expected that it will help students refine their research interests as well as be exposed to new ideas through interaction with others in the course.

ESP 5020 Science Ethics

3 credits

This course is designed to offer a wide range of cases that deal with some of today's issues in biology and environmental science. Though these cases may provoke many personal opinions, it is the ethical implications that make these issues important to the scientific community. We will examine the differences between what is thought to be "moral" and what is considered "ethical", read and discuss case studies, and gain an understanding of how the Science of Ethics governs what is determined to be "right" or "wrong" in the world of biology and environmental studies. Current and historical cases will be discussed.

ESP 5310 Snow Hydrology

2 credits

The role of snow in the hydrologic cycle with emphasize on measurements, atmospheric formation, snow distribution and metamorphosis, snowmelt & accumulation, runoff prediction, snow chemistry, and forest and land-use interaction effects. This is a field and lecture based course taught over an intensive period in the winter. Prerequisites: a physical geography, hydrology, or equivalent course or permission of the instructor.

ESP 5680 Social Marketing in Environmental Education

3 credits

The course will examine effective stewardship or environmental education outreach programs which apply strategic communications, marketing, branding, and evaluation processes which foster sustainable behavioral change toward stewarding natural resources. The course will focus on research studies on effective programs and how the best practices can inform design of new initiatives. Participants will: examine prevailing public environmental attitudes & knowledge; explore the issue of motivating people beyond knowledge to action; and review the role of Social Marketing in behavior change and environmental education.

ESP 5650 Social Movements and Environmental Justice

3 credits

Sociological examinations of social movements attempt to address one of the most important questions in sociology -- how does social and cultural change actually happen? Many of the characteristics of modern society that we take for granted, such as environmental awareness, voting rights, and organized labor, have their origins in the struggles of organized social movements. This course will examine the ways different social theorists and researchers analyze social movements through a focus on the environmental justice movement. The environmental justice movement asserts that throughout the world there are marked and increasing disparities between those who have access to clean and safe resources and those who do not. In this and other aspects, the environmental justice perspective differs from traditional environmental philosophies in that it seeks to combine a concern for the natural world with a consciousness of ethnic, class, and gender discrimination.

ESP 5500 Special Topics in Environmental Science and Policy 1-4 credits
Special topics will address an in-depth study of a particular topic, contemporary issue or concern. The course will be taught by a specialist within the field being studied or, as an alternative methodology, a faculty member will coordinate a series of guest speakers who will meaningfully address the topic. Since topics vary, the course may be repeated with permission of the instructor.

ESP 5390 Travel Study in Environmental Science and Policy 2-3 credits
Periodically, travel study courses will be offered that explore environmental science and policy topics and methods in different environments. These courses are designed to enhance students' skills and understanding with an emphasis on the transferability of these skills to other regions.

ESP 5320 Watershed Hydrology 3 credits
A qualitative and quantitative understanding of concepts and physical principles governing the occurrence, distribution, and circulation of water near the Earth's surface. Emphasis will be on the physical understanding and parameterization of hydrologic processes such as how rainfall and snowmelt become streamflow, evapotranspiration, and groundwater. Course expected to serve as prerequisite to Watershed Management and Snow Hydrology, and co- or pre-requisite to Field Methods in Water Resources.

ESP 5330 Watershed Management and Planning 3 credits
Managing human impacts on watersheds and water resources and understanding the interrelationships among land-use, soil, and water will be addressed. Watershed management will focus on controlling the amount and timing of water yield, stormflow, water quality, and sedimentation with socio-economic considerations. Human uses of and impacts on water are examined with an emphasis on principles of water resource and watershed planning. (prereq.: A prior hydrology course or permission from the instructor)

ESP 5630 Wetland Science and Policy 3 credits
Within the last 35 years, the emerging field of wetland science has become an integral part of mainstream America. The protection of freshwater and coastal wetlands from the impacts of commercial, industrial and residential development has been of paramount importance since the passage of the Clean Water Act in 1972. Since that time, most states in the U.S. have inculcated federal regulations into their water resource protection laws and mandates. Since 1969, the New Hampshire Wetlands Bureau has adhered to laws and promulgated rules that protect the vital functions that wetlands serve in society. This course will introduce students to the regulatory background of wetlands protection, the scientific criteria for identifying freshwater wetlands, field delineation methods, and wetland assessment protocols. It will help prepare students to become certified wetland scientists at the state level, and professional wetland scientists at the national level.

ESP 5140 Winter Ecology 3 credits
Winter Ecology examines the natural processes and stresses of cold environments and how plants and animals adapt to winter and cold climates. The ecologically important aspects of

wintertime physical and biological conditions are explored. Causes of winter & the dynamics of cold temperatures, snow & ice are investigated.