ESP 1500 Introduction to Field Techniques (3 Credits)
Introductory course for ESP majors; involves weekday lectures and weekend fieldwork during the first 3 weeks of fall semester. Students learn field and technology-based skills essential in environmental coursework and careers. On-campus lectures explore field applications for environmental issues and create opportunities for practice with computer databases, spreadsheets, and graphing. Additional course fee required. Falls.
Prerequisite(s): Environmental Science and Policy major, or permission of the instructor.
Corequisite(s): ESP 2100.

ESP 1999 1000 Level Transfer Course (1-20 Credits)

ESP 2100 Introduction to Environmental Science and Policy I (4 Credits)
Engages in a scientific approach to the physical, ecological, social, and political principles of environmental science; uses a scientific method to analyze and understand the relation between humans and the natural environment. Focuses on how ecological realities and human desires to increase their material standard of living often clash, leading to environmental degradation. Provides an analytical framework and a set of concepts that can be used to analyze environmental issues, to guide one's life, and to clarify our responsibility to future generations; accomplished through lectures and exams, discussions, and laboratory experiences that include field trips and original data collection. Teaching environmental activism is not the purpose of the course. Laboratory/field studies. Not open to students who have earned credit for ESP 2000. Additional course fee required. Falls.
Prerequisite(s): Environmental Science and Policy majors or permission of Department Chair.
Corequisite(s): ESP 1500.

ESP 2110 Introduction to Environmental Science and Policy II (4 Credits)
Complements Introduction to Environmental Science and Policy I themes to provide background information and skills about global environmental topics. Additional course fee required. Springs.
Prerequisite(s): Environmental Science and Policy majors.

ESP 2150 Introduction to Geological Sciences (4 Credits)
Prepares participants in accepted theories, hypotheses, and methods regarding geological processes affecting our past and present environments. Lectures, labs, and field excursions train students to investigate, observe, and measure earth's geosystems, including use of microscopes for identification of minerals, sample collections for keying out different rock types and fossils, and basic geological instruments for measuring. Additional course fee required. Falls.

ESP 2300 Foundations of Environmental Policy (4 Credits)
Provides students with an introduction to domestic (US and New Hampshire) and global environmental history, issues, policies, and politics. Students learn the processes by which environmental policy is created and become familiar with common policy tools for addressing environmental issues and conflict. Explores interdisciplinary linkages between economical and environmental policies and examines the role of science and society in policy-making. Springs.
Prerequisite(s): (ESP 2100 and ESP 2110) or permission of the instructor.

ESP 2999 2000 Level Transfer Credit (1-20 Credits)

ESP 3000 Environmental Field Studies (3 Credits)
An off-campus field-oriented course that studies a specific ecosystem in detail. The study area varies from year-to-year with the focus shifting between marine coastal (Maine or NH) environments, freshwater lakes or rivers (Lakes Region of NH), forests (White Mountain National Forest), and alpine environments (Mt. Washington region). Uses field research techniques appropriate for the study location. Requires a short-term field-based research project; includes a paper and presentation on-campus following the study. Additional costs for living accommodations and travel; the exact amount depends on the study site. May be repeated once with a different field site.
Prerequisite(s): Environmental Science and Policy majors; permission of the Department Chair.

ESP 3200 Energy and Society (3 Credits)
Investigates the different forms of energy and the natural laws that govern their use, transformation, and conservation. Examines different sources of energy available to modern societies. Discusses the development of each as a resource, extraction methods, and associate environmental and societal consequence. Additional course fee required. Falls.
Prerequisite(s): Environmental Science and Policy majors or permission of the instructor.

ESP 3270 Sustainable Structures (4 Credits)
Introduces students to the built environment through the lens of sustainability. Sustainable building is the use of locally available, minimally processed materials for human use. Investigates many methods and materials associated with natural building. Students have opportunities to explore design processes through both an individual project and a collective group design/build project. Additional course fee required. Springs.
Prerequisite(s): Environmental Science and Policy or Environmental Planning major, or permission of instructor.

ESP 3300 Soils and Environmental Change (4 Credits)
Introduces soil science to environmental science, geology, geography, and biology majors and minors. Its multidisciplinary coverage teaches the relevance of soil studies across a broad spectrum of modern issues. Students learn the geologic, geographic, and climatologic aspects of soil formation, the structural components of soil that impact diverse aspects of soil fertility, drought, and tendency to landslide or erode, the dynamical aspects of soil hydrology and geochemistry, and the biological aspects of soil nutrient available, nitrification, carbon cycling, and biodiversity. Laboratory and field exercises. Additional course fee required. Falls.
Prerequisite(s): (CH 2330 or CH 2335) and CH 2340.

ESP 3310 Hydrology (4 Credits)
Combines physical hydrology concepts and theory with laboratory and field measurements, demonstrations, and observations. Provides integrated training in hydrologic sciences and hands-on experience with instruments and analytical methods such as stream gaging, indirect discharge measurements, and surveys of channel morphology. Students learn hydrologic aspects of fluvial lake, wetland and groundwater systems in interdisciplinary, biogeochemical contexts. Falls.
Prerequisite(s): ESP 2110 or GE 2001 or MT 2110.
ESP 3320 Climate, Risk, and Adaptation (3 Credits)
Introductory course on Earth’s climate; examines evidence about climate change, both past and present, and predicted future effects on environmental and societal systems. Topics include global, regional, and local approaches to climate risks, mitigation, and adaptations. Springs. Prerequisite(s): BI 1120 or ESP 2110 or GE 2001 or MT 2110 or permission of the instructor.

ESP 3330 Environmental Geology (4 Credits)
Covers Earth’s geosystems and the geologic aspects of environmental hazards concerns like heavy methods, asbestos and radioactive elements; sea level change, acid-mine drainages and hydrofracturing earthquakes. Provides hands-on opportunities to investigate, observe and document geological aspects of Earth’s environmental systems including soils and sediments; minerals, rock and land formations; various types of fossils, oceanography, and geochemical cycles. Additional course fee required. Falls. Prerequisite(s): ESP 2110 or GE 2001.

ESP 3340 Introduction to Ecological Economics (3 Credits)
Science of sustainability. Implementing sustainable practices must consider what is ethical, practical, efficient, and logical, and economics is a key component. Topics include: ecosystem services, resource management, supply and demand, market failures, economic growth and human well-being, policy instruments, resource allocation efficiencies, pricing and valuation of non-market goods, and ecological economics case studies. Fall of even years.

ESP 3400 Life in the Universe (3 Credits)
Are we alone in the universe? Astrobiologists use their understanding of diverse concepts in biology, earth science, physics, chemistry, engineering, and technology to search for answers to this question. The science of astrobiology is an integrated study centered on the search for life in the universe. Builds on our understanding of earth and life systems to investigate the habitability of other worlds. Students participate in inquiry based activities and discussions to investigate the limitations of life, the habitability of other planets, and model robotic explorations in other worlds. Culminates with student designed space missions. Springs. (INCO) Prerequisite(s): Junior status.

ESP 3502 Geo-cultural Education on the Colorado Plateau (3 Credits)
Students join a PSU science education faculty member and Four Corners Outdoor School staff during spring break in March to learn about bio, geo-regional outdoor education on the Colorado Plateau, originally funded by the National Science Foundation. Spend 3 days rafting on the San Juan River in southeastern Utah, learning the concepts behind, skills needed and techniques to train teachers and students in bio, geo-regional outdoor education. Explore the middle section of the San Juan River, from Bluff to Mexican Hat, which has unique geologic formations and a rich cultural history with Ancestral Puebloan ruins and rock art. The next 3 days students are assigned to intern with 1 of the Regional Coordinators for the Bioregional Outdoor Education Program (BOEP) in Utah, Colorado, New Mexico or Arizona. Students visit diverse, cross-cultural elementary schools (with Hopi, Navajo, Ute, Mormon and/or Spanish students) to observe and assist with implementing the BOEP project. The final day and a half is spent visiting regional southwest National Parks focusing on unique geological and management issues. PSU students peer teach and assist in classrooms on implementing bio-regional outdoor education curricular initiatives. PSU students also publish reflections, following a structured rubric, about their experiences on a travel blog site created for the course at http://fourcorners.blogs.plymouth. Additional costs for travel, lodging, meals, fees, and supplies. Spring of odd years.

ESP 3550 Environment and Health (3 Credits)
Highlights the connection between Healthy Places and Healthy People. Humans interact with the environment constantly. These interactions affect our quality of life and the surrounding environment. Students explore how human-altered environments can influence human health and disease. Discusses the natural environment, and the social and building environment. Falls and Springs. (WEC) Prerequisite(s): Sophomore standing.

ESP 3600 Special Topics in Environmental Policy (3 Credits)
An in-depth study of a particular environmental science oriented topic or contemporary issue. Since topics vary the course may be repeated with permission of the instructor. Additional course fee required. Prerequisite(s): Environmental Science and Policy majors.

ESP 3610 Special Topics in Environmental Science (3 Credits)
An in-depth study of a particular environmental science oriented topic or contemporary issue. Since topics vary, the course may be repeated with permission of the instructor. Additional course fee required. Prerequisite(s): Environmental Science and Policy majors.

ESP 3999 3000 Level Transfer Course (1-20 Credits)

ESP 4200 Natural Hazards: Science and Policy (4 Credits)
Upper-level lecture with lab course dealing with regional to global scale environmental geology, including hazards and risk assessment. Students learn inter-relationships between population growth, development, and environmental risk which occur from urbanization in coastal areas, in earthquake and landslide zones, along the flanks of active and dormant volcanoes, and flood and wildfire prone regions. Additional course fee required. Fall of odd years. Prerequisite(s): upper-level Environmental Science and Policy majors.

ESP 4300 Land Conservation Techniques (3 Credits)
Conserving land is a common societal goal. Explores the numerous, diverse reasons for conserving land and various mechanisms for conserving land. Students learn techniques and methods for land conservation and associated management needs. Numerous case studies in land conservation and field trips to those sites enrich the course. Additional course fee required. Fall of odd years. Prerequisite(s): Junior or senior status.

ESP 4310 Advanced Conservation Ecology (3 Credits)
Provides students an in-depth understanding of ecological principles at the foundation of environmental problems and conservation actions. Blends qualitative and quantitative assessment of environmental integrity of landscape, ecosystem, community species, and genetic levels. Students discuss peer-reviewed literature and use Excel formula, GIS, and online tools to achieve learning outcomes. Fall of even years. Prerequisite(s): ESP 2100 and BI 3240.

ESP 4320 Decision Making in Natural Resource Management (3 Credits)
Sustainably managing natural resources for multiple objectives creates challenges for practitioners and researchers in today’s complex socio-political environment. Presents decision-making theories, applications and tools related to natural resource management, including life cycle assessment and multi-criteria decision analysis. Students work through local and regional decision making scenarios, comparing different tools and theories to real-life issues. Additional course fee required. Fall of odd years. Prerequisite(s): ESP 2110 or GE 2001.
ESP 4400 Environmental Outreach and Communication (3 Credits)
Communicating about environmental science is an important skill that helps link environmental science to policy. Introduces environmental science communication concepts, explores its historical and theoretical aspects, and develops communication and outreach skills through a variety of activities and projects. Fall of even years.
Prerequisite(s): junior or senior status.

ESP 4440 Climate Change (3 Credits)
Overview of the methods for examining climate change. Included are time series analysis and climate proxies such as tree-ring analysis, δ18O/δ16O ratios, pollen and carbon-14 dating. Also covered are a variety of possible causal factors such as orbital variations, plate tectonics, volcanic eruptions, CO2 variations and El Niño. The results of paleoclimatic modeling are also discussed. May be taken as MT 4440. Springs. (INCO)
Prerequisite(s): MT 2110, (PH 2130 or PH 2410), and (MA 2490 or MA 2550); Junior status.

ESP 4550 Environmental Science and Policy Seminar (4 Credits)
A central theme in the Environmental Science and Policy program is the need to use interdisciplinary approaches to effectively address environmental issues. The Seminar is the culmination of the coursework in the program, and engages students in experiential learning about the challenges of working in interdisciplinary teams and perspectives. Provides students with opportunities to research significant issues of local or regional scale using multiple perspectives in a collaborative. Each spring one or more research teams are formed to conduct a project often developed in cooperation with an NGO or government agency to meet the needs of that organization and/or a community in the region. The projects are not theoretical or broad in scope, but rather focused on the kinds of problems that graduates might expect to face. Springs. (WRCO)
Prerequisite(s): Senior level Environmental Science and Policy majors or permission of Department Chair.

ESP 4630 Environmental Science and Policy Internship (1-6 Credits)
Under the supervision of a faculty sponsor, Department Chair and supervising agency representative, students engage in a work program to apply, in a practical manner, knowledge gained in major and minor coursework. The internship addresses a department goal of being involved in a community-based or service learning project through a state, federal or local environmental organization. Students must obtain a faculty sponsor and submit a detailed written proposal prior to undertaking the internship. Students must also submit a written report to their faculty sponsor when the internship is complete. Final approval of the internship comes from the Department Chair. Repeatable for a maximum of 6 credits.
Prerequisite(s): Environmental Science and Policy majors and permission of the Department Chair.

ESP 4710 Science Colloquium Series (1 Credit)
The Boyd Science Colloquium Series is the department seminar intended to focus on the analysis of contemporary issues in environmental science and policy. Specific topics vary from year to year and are tailored to the interests of the students enrolled and the faculty. Creates a foundation of knowledge and methods for studying environmental issues. Helps students identify research interests as well as be exposed to new ideas through interaction with others. May be repeated with a different topic for a maximum of 4 credits. Falls and Springs.
Prerequisite(s): Environmental Science and Policy majors or permission of the Department Chair.

ESP 4910 Independent Study (1-4 Credits)
Offers students the opportunity to gain an in-depth understanding of an environmental science or policy topic that is not covered extensively in other courses. Working with guidance from a faculty member with relevant expertise, students select a specialized topic in environmental science and/or policy for exploration and prepare an in-depth research paper or project pertaining to that topic. Scheduled conferences with the faculty members are required and a possible presentation to a class or seminar group is suggested. Permission of the student's advisor, the supervising faculty member and the Department Chair is required.

ESP 4915 Undergraduate Research (1-4 Credits)
Provides opportunity for students to conduct authentic science/social science environmental research in collaboration with 1 or more PSU faculty member. Expected outcomes include publication and outreach of work. The number of credits corresponds to the level of effort and scope of work at 60 hours per credit. Repeatable for a maximum of 8 credits. Pass/No Pass. Falls and Springs.
Prerequisite(s): permission of the instructor and ESP Department Chair.

ESP 4999 4000 Level Transfer Course (1-20 Credits)