

Course Includes Sustainability

Applied Mathematics

APM	391	-	Introduction to Probability and Statistics	Introduction to concepts and methods of statistics as applied to problems in environmental science and forestry.
APM	-	510	Statistical Analysis	Applications of descriptive and inferential statistics to natural resource problems.
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Bioprocess Engineering

BPE	230	-	China Experience	History of China from ancient societies through the current time, with attention to cultural, ecological and natural resource issues.
BPE	300	-	Introduction to Industrial Bioprocessing	Applications of biotechnology and bioprocessing to the food, water and wastewater treatment, industrial biotechnology, biopharmaceutical, biochemical and biofuel industries.
BPE	310	-	Colloid and Interface Science	This course will cover the basic principles of colloidal and interfacial science as applied to bioprocesses. It will provide a foundation and theoretical understanding that will be applied in bio separations, transport phenomena, biochemical/bioprocess engineering and other advanced courses in the bioprocess engineering curriculum.
BPE	420	620	Bioseparations	Major unit operations used for the separation, purification and recovery of products from complex mixtures. Separation processes including sedimentation, filtration, centrifugation, membrane ultra-filtration, nanofiltration, ion exchange processes, chromatographic separations.
BPE	438	638	Introduction to Biorefinery Processes	Chemical and physical properties of biomass feedstocks; sustainable biomass production/utilization, chemical and biological processes of converting plant biomass to chemicals, liquid fuels, and materials. Focus on green chemistry and/or environmentally benign processes, with some discussions on political and social aspects of sustainability and renewability.
BPE	440	-	Bioprocess and Systems Laboratory	Measurement and analysis of bioprocess systems, including steady-state and dynamic modeling of systems. Investigation of various bioprocesses including fermentation, enzymatic reactions, and reactive processes involving lignocellulosic materials.
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Biotechnology

BTC	420	-	Internship in Biotechnology	Full- or part-time employment or volunteer work with an agency, institution, clinic, professional group, business, or individual involved in activities consistent with the student's educational and professional goals.
BTC	425	-	Plant Biotechnology	The use of transgenic plants to improve the human condition and remediate environmental problems is a rapidly growing field of study. Students are taught the principles of gene structure and regulation, gene cloning, transformation of plant species, and current applications.
BTC	496	-	Topics in Biotechnology	Experimental, interdisciplinary, or special topic coursework in biotechnology for undergraduate students. Subject matter and method of presentation varies from semester to semester.
BTC	498	-	Resrch Prob/Biotechnology	Laboratory research experience with research time agreed upon by student and instructor. Independent research experience covering biotechnological topics.
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Construction Management Engineering

CME	132	-	Orientation Seminar: Sustainable Construction Management and Engineering	One hour of lecture and discussion per week. Introduction to campus resources available to ensure academic success in the area of Sustainable Construction Management and Engineering.
CME	404	-	Applied Structures	Applications of statics/mechanics to common engineering structures. Analysis and design of wood, concrete and steel systems considering sustainability and life-cycle analysis.
CME	-	643	Estimating for Construction in a Green Global Economy	How to price multi-year projects addressing the previous issues and how to construct an estimate that will convey the information relative to green construction costs to the client in a proper manner.
CME	-	798	Research in Sustainable Construction Management	Independent research topics in Sustainable Construction Management and Wood Science
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Communications

CMN	493	-	Environmental Communication Workshop	A workshop format on a specified environmental program or issue introduces the theories and skills of alternative dispute resolution approaches, public participation structures and dynamics, public policy decision making and implementation, risk communication, leadership styles, and small group dynamics.
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Environmental and Forest Biology

EFB	202	-	Ecological Monitoring and Biodiversity Assessment	An introduction to the biodiversity of northeastern North American terrestrial, wetland, and aquatic communities with a focus on vascular plants and invertebrate and vertebrate animals. Incorporates practical field exercises designed to acquaint the student with problem solving.
EFB	217	-	Peoples, Plagues, and Pests	Impacts of selected diseases and pests on the development and course of human civilizations. Emphasis is on the impacts of plagues and pests on non-western civilizations.
EFB	307	-	Principles of Genetics	A general course covering concepts of genetics and evolution basic to upper-division biology and biochemistry courses. Includes the inheritance and analysis of Mendelian and quantitative traits, the chemical nature of the gene and its action, genetic engineering, the genetic structure of populations and their evolution. Numerical methods for characterizing and analyzing genetic data are introduced.
EFB	308	-	Principles of Genetics Laboratory	Experiments with plants and animals and computer simulation exercises demonstrate the basic principles of inheritance of Mendelian traits and changes in populations caused by major forces in evolution or by breeding procedures. Numerical methods for characterizing quantitative traits and for testing hypotheses are introduced.
EFB	312	512	Introduction to Personal Environmental Interpretation Methods	Personal interpretation teaches a variety of face-to-face techniques used to connect the public with environmental science by providing an introduction to history of interpretation, popular interpretive and environmental education activities and curriculum, evaluation of programs, and lesson plans. Explores and illustrates the research and philosophy of environmental interpretation.
EFB	320	-	General Ecology	Three hours of lecture and one three-hour field trip/laboratory per week. An introduction to plant and animal ecology, including concepts and techniques in population ecology, community dynamics, physiological and behavioral ecology, biogeography, ecosystem ecology, nutrient cycling and energy flow. Ecological management applications, human ecological impacts and problems are considered.
EFB	326	-	Diversity of Plants	An evolutionary survey of plants from unicellular prokaryotes to multicellular eukaryotes. Coverage includes the algae, fungi, bryophytes, lower vascular plants, ferns, gymnosperms and angiosperms.
EFB	336	-	Dendrology	Field study, identification and major characteristics of important forest trees of North America.
EFB	337	-	Field Ethnobotany	A field-based introduction to the identification and traditional cultural uses of plants in the Adirondack region for food, medicine and fiber. Topics include plant identification, traditional ecological knowledge and use of ecological and ethnobotanical methods.
EFB	390	-	Wildlife Ecology and Management	A study of the ecological principles governing wild animal populations and their habitats, and the relationship of these principles to management programs and decisions. Directed primarily toward students majoring in wildlife science, conservation biology, and forest resources management.
EFB	415	-	Ecological Biogeochemistry	Investigation of the principles of biogeochemistry in ecosystems. The transformations and fluxes of elements in terrestrial and aquatic ecosystems including global cycles are emphasized.
EFB	435	635	Flowering Plants: Diversity, Evolution, and Systematics	Diversity, evolution, and systematics of flowering plants with emphasis on flower structures and reproductive strategies. Flowering plant identification skills are built from examination of a broad diversity of species from major globally distributed families with particular focus on flora of the Northeastern U.S.
EFB	444	644	Biodiversity and Geography of Nature	Earth history (plate tectonics, etc.), topography and geographic variation in environmental conditions influence species and communities. Major geographic patterns in biological diversity and strategies for conserving native species are presented. Fall, even years.

EFB	487	687	Fisheries Science and Management	Introduction to biology, ecology, quantitative assessments, conservation, and management of fish species targeted in fisheries.
EFB	-	502	Ecology and Management of Invasive Species	Explores the growing problem of invasive species as a leading threat to global biodiversity. Topics include: invasion pathways and mechanisms, community resistance, biological control, effects on ecosystems, law and policy as management tools, prediction and risk assessment, and interactions with anthropogenic environmental change.
EFB	-	504	Plant-Herbivore Interactions	Plant-herbivore interactions and anthropogenic global change.
EFB	-	516	Ecosystems	Ecosystems emphasize the integration of biological, chemical and physical aspects of the environment applied in an integrative fashion to units of landscape and water. Major topics covered include a survey of ecosystem types, energy flow, nutrient cycles and the relation of ecosystem processes to plant and animal populations.
EFB	-	518	Systems Ecology	Survey of history, literature and techniques of systems ecology, including, especially, the teaching of intellectual, basic mathematical and computer skills that allow the student to take an environmental problem of his or her choosing and simulate it on a computer.
EFB	-	523	Tropical Ecology	Principles of tropical ecology, resource management and island biogeography are presented. Field trips to a variety of tropical ecosystems including: rain forest, coral reefs, crater lakes and montane rain forest. Comparisons with north temperate ecosystems are made
EFB	-	610	Ecological Biogeochemistry	Investigation of the principles of biogeochemistry in ecosystems. The transformations and fluxes of elements in terrestrial and aquatic ecosystems including global cycles are emphasized.
EFB	-	625	Plant Biotechnology	Transgenic plants are currently being produced to improve agriculture, pharmaceuticals, and remediate environmental problems. Students are taught the principles of gene structure and regulation, gene cloning, transformation of plant species, and current applications.
EFB	-	650	Landscape Ecology	Landscape Ecology focuses on spatial patterning – its development and relevance to ecological processes. Course introduces the foundations, issues, and analytical tools in Landscape Ecology through discussion of literature, GIS exercises, and an independent research project.
EFB	-	681	Aquatic Ecosystem Restoration and Enhancement	Guiding principles for ecological restoration of freshwater aquatic ecosystems focusing on effects of nutrient loading, sedimentation, flow alteration, and habitat loss. Factors leading to loss of aquatic resources and effectiveness of techniques to restore habitat and fauna are analyzed.

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Environmental Science

ENS	250	-	Foundations of Environmental Health	Introduction to environmental health. Foundations in environmental risk, epidemiology, toxicology, policy, and regulation. Agents of disease include vector-borne pathogens, toxic metals, pesticides, and radiation. Applications of environmental health focus on water and air quality, food safety, waste management and occupational health.
ENS	260	-	Environmental Sampling Methods	Principles of water, soil, and air sampling to detect and quantify environmental contaminants, including sampling techniques, statistical considerations, and data analysis, interpretation, and reporting.
ENS	296	-	Special Topics in Environmental Science	Special Topics in Environmental Science
ENS	350	-	Environmental Health Management	Principles of communicable disease and contamination control, food protection, vector control, water supply safety, wastewater and solid and hazardous waste renovation, air pollution control, and controlling environmental hazards in special environments
ENS	422	622	Energy Markets and Regulation	Topics include: the economics of energy markets, industry restructuring, and the development of markets for energy efficiency and renewable power.
ENS	470	-	Environmental Risk Assessment	Identification of environmental hazards to human and other life forms; application of statistical tools and methods required for quantifying risk and their applicability and limitations; regulatory requirements governing risk assessment reporting; and effective public communication of environmental risks.
ENS	480	-	Hazardous Materials Management	In-depth examination of hazardous wastes from source to disposal and chemical fate; covers medical, nuclear, agricultural, industrial sources and reduction, prevention, containment, transportation, remediation. History, risk assessment, regulation and safety are included.
ENS	490	-	Environmental Science Capstone	Support and instruction for completion and presentation of the senior synthesis project for Environmental Science. Topics include research skills and literature review, data analysis, scientific writing including editing, and oral presentation.
ENS	498	-	Research Problems in Environmental Science	Independent research in topics in environmental science for undergraduate students. Selection of subject area determined by the student in conjunction with an appropriate faculty member. Tutorial conferences, discussions and critiques scheduled as necessary. Final written report required for departmental record.
ENS	-	519	Spatial Ecology	Geographical modeling is the simulation of natural systems in a spatial context, interfacing the traditional tools of ecological modeling with those of Geographic Information Systems. Students in this course learn the fundamentals of ecological modeling and develop a spatial model using GIS tools to address their own research questions.
ENS	-	596	Special Topics in Environmental Science	Experimental or special coursework in Environmental Science for beginning graduate students, fifth year, and seniors with appropriate academic background. Subject matter and methods will vary.
ENS	-	607	Wetland Practicum	Provides students with a working knowledge of wetland management, emphasizing wetland delineation, functional assessment and mitigation with module problems with reports required for each module.
ENS	-	696	Special Topics in Environmental Science and Policy	Experimental and developmental courses in new areas of interest to environmental studies faculty and graduate students not covered in regularly scheduled courses.
ENS	-	796	Advanced Topics in Environmental Science and Policy	Lectures and discussions, seminars, conferences and group research on advanced topics of special or current interest, in fields of interest to environmental studies faculty and graduate students.
ENS	-	797	Environmental Science Seminar	Discussion of current topics and research related to environmental science.
ENS	-	798	Problems in Environmental Science and Policy	Individualized, special study of environmental science and policy subjects and issues. Comprehensive oral or written report required for some problems.
ENS	-	898	Professional Experience	Professional experience which applies, enriches and/or complements formal coursework.
ENS	-	899	Master's Thesis Research	Research and independent study for the master's degree and thesis.
ENS	-	999	Doctoral Thesis Research	Research and independent study for the doctoral degree and dissertation.

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Environmental Resources Engineering

ERE	351	-	Basic Engineering Thermodynamics	Principles of energy conservation and conversion: first and second laws. Relation to PVT behavior, property functions, equilibria and heat and mass transfer, and applications to energy and power systems.
ERE	425	625	Ecosystem Restoration Design	A summer field course followed by a weekly seminar and workshop during the Fall. Travel in a less developed country, examine degraded and restored ecosystems, use contemporary problems as source material for course projects, consider restoration needs in less developed countries, and how that shapes design and evaluation.
ERE	440	640	Water and Wastewater Treatment	Introduction to physical, chemical and biological parameters of water and wastewater quality as well as principles of unit operations and processes for water and wastewater treatment. Study of design parameters and design procedures for water and wastewater treatment
ERE	480	-	Fate & Transport of Contaminants in Env. Systems	Covers the movement and reactions associated with contaminants released into environmental systems. The concepts will be applied in a field trip and review of the design, construction and operation of a constructed wetland used in the tertiary treatment of municipal wastewater
ERE	489	-	Env. Resources Engineering Planning and Design	A capstone course to integrate engineering coursework with the engineering design process to solve interdisciplinary environmental problems. Semester-long project provides experience in problem analysis, teamwork, project management, engineering ethics, and professional communication.
ERE	496	-	Special Topics in Env. Resources Engineering	Topics in environmental or resource engineering.

ERE	498	-	Research Problem in Env. Resources Engineering	Independent research in topics in environmental resources engineering, selection of subject area determined by the student in conference with appropriate faculty member.
ERE	-	506	Hazardous Waste Management	Systematic control of generation, storage, transport, treatment and disposal of hazardous waste. Applicable hazardous waste regulations. Pollutant transport mechanisms. Technology design to investigate, control emissions and remediate sites. Urban economic redevelopment impacts
ERE	-	570	Hydrology in a Changing Climate	Drawing on a growing body of academic literature focused on better understanding the degree of uncertainty in future climate, this class provides the technical background to interpret and apply predictions of future climate changes (as primarily related to hydrology) in different locales and at different scales.
ERE	-	621	Spatial Analysis	Spatial statistics and modeling as applied to various data formats: single point data, continuous data and area data. First and second order effects, complete spatial randomness, tessellation, kernel, covariograms and variograms, kriging, distance measures, correlation/correllogram.
ERE	-	622	Digital Image Analysis	Elements of digital image processing and analysis systems: Digital image representation, visual perception, sampling and quantization, pixel connectivity, Fourier transforms, image enhancement, filtering, image segmentation, edge detection, thresholding, representation schemes, descriptors, morphology, recognition and interpretation.
ERE	-	644	Hydro-Meteorology	Atmospheric physics, moisture dynamics, and thermodynamics emphasizing feedback loops with precipitation. Quantitative descriptions of stability and dynamics and the development of fronts, cyclones, and thunderstorms. Weather station sensors and data-logger programming. Testing of analysis products, numerical weather models, quantitative precipitation forecasts, and radar precipitation data.
ERE	-	674	Methods in Ecological Treatment Analysis	Introduction to the components and design principles of engineered ecosystems for water quality improvement. Common lab exercises for a comprehensive analysis of an engineered ecosystem, including water quality, reaction kinetics, hydraulic characteristics, vegetation, soil and gravel, and microbial community.
ERE	-	692	Remote Sensing of the Environment	Geographical, temporal, environmental modeling concepts using GIS-based modeling languages and techniques. Various modeling concepts and techniques including spatial interpolation, suitability/capability modeling, hydrologic modeling, diffusion modeling, calibration, optimization, accessibility modeling, and rainfall-runoff modeling.
ERE	-	693	GIS-Based Modeling	Geographical, temporal, environmental modeling concepts using GIS-based modeling languages and techniques. Various modeling concepts and techniques including spatial interpolation, suitability/capability modeling, hydrologic modeling, diffusion modeling, calibration, optimization, accessibility modeling, and rainfall-runoff modeling.
ERE	-	797	Research Methods in Env. Resources Engineering	Introduction to research facilities, opportunities, and responsibilities of graduate scholarship. Discussion of ERE research topics, including journal reading, proposal formulation, funding, and engineering tools. Use of scholarly resources including e-journals, web, proposal development, and presentations
ERE	-	798	Research in Environmental and Resource Engineering	Independent research topics in Environmental Resources Engineering
ERE	-	898	Professional Experience/Synthesis	A supervised, documented professional work experience in the Master of Professional Studies degree program
ERE	-	899	Master's Thesis Research	Research and independent study for the master's degree and thesis in Environmental Resources Engineering.
ERE	-	999	Doctoral Thesis Research	Research and independent study for the doctoral degree and dissertation in Environmental Resources Engineering.

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College Wide

ESF	109	-	Honors Seminar in Environmental Science and Forestry	Sequential presentations by ESF faculty and staff members. Exploration of science, engineering, design, management and social science applied to regional, national and global issues.
ESF	300	-	Introduction to Geospatial Information Technologies	A theoretical and practical course providing an introduction to the uses and limitations of geospatial information technologies, including geographic information systems (GIS), global positioning systems (GPS) and remote sensing, for environmental science and natural resources management applications.

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Environmental Studies

EST	255	-	Research Methods for Environmental Studies	An introductory methods course focused on research techniques used in environmental and natural resources social science research. This course reviews quantitative and qualitative methodologies for environmental studies research including but not limited to questionnaires, in-depth interviews, rhetorical critiques and content analyses.
EST	353	-	Environmental Psychology	Overview of theory, research, and methods in environmental psychology and sustainable behavior. Explores the role of human behavior as a root cause of environmental degradation and examines the contribution of individual and societal processes.
EST	388	-	Psychological Principles of Risk Communication	Presents socio-psychological principles and theoretical underpinnings guiding the applied social science approach to environmental risk communication issues. Three overlapping themes will be considered and linked: how communities cope with environmental hazards, how risk information is cognitively processed and evaluated and how risk communication influences perception, evaluation and behavior.
EST	423	-	Rhetorical Practices in Env. Communication	An advanced methods course focused on the research of rhetorical appeals and practices used in environmental and natural resources discourse and decision-making.
EST	460	660	Land Use Law	Provides an understanding of U.S., state and local laws affecting land use in New York in the context of current environmental policy debates. Students learn to recognize and analyze legal issues involving land use in varying contexts.
EST	496	696	Special Topics in Environmental Studies	Special topics of current interest to undergraduate students in environmental studies and related fields.
EST	499	-	Environmental Studies Internship	Internships provide students with a supervised field experience to apply and extend their academic abilities in a professional working environment.
EST	-	603	Research Methods and Design	Comprehensive survey of research methods and design for Environmental Studies. Topics covered include the scientific method; research design; quantitative, qualitative, and mixed research methods; sampling; data collection techniques; data analysis and interpretation; research ethics; and research proposal development.
EST	-	604	Social Survey Research Methods for Env. Issues	Provides a critical overview of survey methods used to study human dimension of environmental problems. Explores fundamental theories, techniques, and applications of environmentally related social survey research processes.
EST	-	635	Public Particip. & Decision Making: Theory and App.	Provides a student with fundamental theories and techniques for developing and applying citizen participation strategies and conflict resolution as they relate to environmental science and planning decision making.
EST	-	898	Professional Experience	Variable number of hours of professional experience per week. Professional experience which applies, enriches and/or complements formal coursework

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Environmental Writing Program

EWP	190	-	Writing and the Environment	Introduction to academic writing, reading, and research, reflecting college-level literacy skills of analysis, argument, and critical thinking.
EWP	290	-	Research Writing and Humanities	Students will examine the views of nature and the environment as they are expressed by selected writers, poets, and essayists.
EWP	291	-	Research Writing and Humanities (Honors)	Students will examine the views of nature and the environment as they are expressed by selected writers, poets, and essayists.
EWP	300	-	Survey of Environmental Writing	Students will explore forms of environmental writing including but not limited to journalism, poetry, memoir, field notes, historical research, natural histories and polemics. Students will analyze these writings rhetorically and create a range of texts including creative pieces, factually-based reporting, nature writing, and writing about science.
EWP	311	-	Urban Environmental Literature	Development of reading, writing, and critical thinking skills that illustrate the flora, fauna, geology, and climate that shape urban life.
EWP	350	-	Eco-Cinema: Perspectives & Practices	Environmental films are interpreted from cultural, historical, and political perspectives. The artistic process in filmmaking is emphasized. Students produce a short film or slide show with an environmental theme.
EWP	390	-	Literature of Nature	Examination of views of nature and the environment as seen through works of 19th and 20th century writers, poets, and essayists. Readings, discussions, and written assignments explore aesthetics, socio-political climate, and prevailing attitudes toward the environment that formed the backdrop for readings.
EWP	401	-	Capstone Experience	Experiential learning for the Environmental Writing & Rhetoric (EWR) minor through a writing project based on a) a community-based internship b) tutoring or completing special project in the Writing Resource Center, or c) an independent creative writing project.

EWP	407	-	Writing for Environmental & Science Professionals	Focuses on principles and practice of writing skills required of environmental and science professionals. Emphasizes proficiency in determining purpose of a document; analyzing audience; selecting, developing and organizing information in an appropriate design; and writing clearly, precisely, and effectively.
EWP	410	-	Writing for Environmental Professionals	Includes principles and practices of writing and communication skills relevant to environmental professionals. Emphasizes proficiency in analyzing audience and purpose; selecting, developing and organizing information in an appropriate design; and writing clearly, precisely and effectively.
EWP	444	-	Professional Writing/Paper & Bioprocess Engineering	Emphasizes writing practices required of paper and bioprocess engineers, including proposals and technical reports. Develop proficiency in determining the purpose of a document; analyzing audience; selecting, developing and organizing information in an appropriate design; and writing clearly, precisely and effectively.
EWP	490	-	Contemporary Literature of Nature	This writing-intensive literature course takes an ecocritical approach to nature literature, both poetry and prose, written by contemporary authors. Coverage includes ecofeminism, science literature, and native American literature.
EWP	495	-	Environmental Journalism	This course covers a range of topics related to journalism: interviewing, writing the lead, style, writing and organizing the story, layout, editing and revising, writing features and follow-up stories, covering speeches, etc. In addition, students explore how the media covers scientific and environmental issues.
EWP	-	620	Advanced Public Presentation Skills for Environmental Professionals	Development of skills and fluency needed by environmental professionals in preparing, delivering and evaluating effectiveness of expository and persuasive oral presentations. Communication theory, rhetorical analysis, and visualizations of complex and technical data, self and peer evaluation, listening skills.

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Chemistry

FCH	440	-	Introduction to Chemical Ecology	Centers on chemical signals among organisms from microbes to man as they affect ecology, physiology and behavior; and as they can be utilized for agriculture, pest management and animal husbandry.
FCH	-	510	Environmental Chemistry I	Introduction to the processes that control chemical behavior in aquatic environments, including precipitation, dissolution, gas exchange, acid-base, oxidation-reduction, complexation and adsorption reactions. Emphasis will be on explanation and prediction of chemical behavior. Examples will be from the areas of fresh and marine waters, groundwater, wastewater, and geo-chemistry.
FCH	-	515	Methods of Environmental Chemical Analysis	An introduction to sampling, analytical and quality control procedures necessary to obtain reliable water quality data. All analyses will be performed on a single aquatic system with the purpose of developing a final report characterizing the water quality of that system.
FCH	-	524	Topics in Natural Products Chemistry	Three hours of lecture and discussion per week. A course intended to introduce the student to various types of secondary metabolites including several of past and current interest because of their pronounced biological activities.
FCH	-	525	Oceanography	The four main oceanographic disciplines will be covered including physical, chemical, biological and geological oceanography. This course will highlight the interdisciplinary nature of oceanography and its importance in earth system dynamics such as energy and climate
FCH	-	550	Polymer Science: Synthesis and Mechanisms	Introduction to the synthesis of polymers and the mechanism of polymerization processes. Fundamental principles of polymer chemistry. Step-growth polymerization and network formation (theory of gelation). Chain-growth homopolymerization and copolymerization by radical-, ionic-, and coordination type catalysts. Synthesis of block and graft copolymers.
FCH	-	551	Polymer Techniques	Twelve experiments covering the main topics of polymer synthesis (four weeks), molecular weight determination (four weeks), and characterization (four weeks) are selected.
FCH	-	630	Plant Biochemistry	includes the biochemistry of photosynthetic electron transport and phosphorylation, photosynthetic carbon fixation, photorespiration, nitrogen fixation, nitrate reduction, photochrome, and plant hormones. The economic, ecological and environmental aspects of plant biochemistry will also be discussed.

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Forestry Resources Management

FOR	132	-	Orientation Seminar	An introduction to forest and natural resource management and related career paths. Indoor and outdoor lectures expand student awareness of ESP's educational opportunities, properties, and faculty in FNRM. Fall.
FOR	202	-	Introduction to Sociology	General introductory principles and methods of sociology including group dynamics and development, different structural arrangement of social groups, community development and adjustment processes, relationships with the natural environment
FOR	203	-	Western Civilization and the Environment	General survey of the history of Western civilization from ancient societies through the seventeenth century, with attention to environmental and natural resource issues and perspectives.
FOR	296	-	Special Topics in Resource Management/Forestry	Experimental, interdisciplinary or special coursework at the freshman or sophomore levels. Subject matter and course format vary from semester to semester.
FOR	298	-	Research Internship in Forest and Natural Resources Mgmt	Students will participate in research projects consistent with their educational and professional goals. A faculty member in the Department of Forest and Natural Resources Management will serve as the student's faculty sponsor. The student in consultation with the faculty sponsor will prepare a study plan outlining the educational goals of the apprenticeship. The faculty sponsor will generate a performance assessment and record of activities at the end of the apprenticeship.
FOR	304	-	Adirondack Field Studies	Four-week field course with five hours of lecture and 30 hours of field laboratory per week. Introduction to silvics, forest ecology and natural and cultural history as a basis for understanding forest vegetation and other natural resources. Principles and methods for the measurement of spatial and vegetative attributes of forested landscapes. Course stresses development of field ability in common plant identification, overland navigation and timber, tree, forest and habitat measurements, and synthesis of field data.
FOR	322	-	Natural Resources Measurements and Sampling	Principles and methods used in the measurement and quantitative analysis of natural resources, including vegetation, water, soils, recreation and wildlife. The application of sampling designs for estimating populations and inventory planning, and statistical analysis for quantifying sampling error
FOR	340	540	Watershed Hydrology	Principles of physical hydrology, including the basic principles of watershed hydrology, from the relationship between watershed hydrology and the global water cycle, to the specifics of groundwater flow, stream flow generation, and water quality management at the watershed scale
FOR	345	545	Introduction to Soils	Introduction to the fundamentals of soil science in the context of soil as an ecosystem component.
FOR	360	-	Principles of Management	This course focuses on the basic theories, concepts, principles and functions of modern management and administration, with an emphasis on the four functions of management: leading, planning, organizing, controlling. Environmental management systems, corporate ethics and social responsibility and systematic problem solving are among the principal topics emphasized.
FOR	372	-	Fundamentals of Outdoor Recreation	Introduction to the programs and practices of federal, state and local agencies and private organizations involved in planning, administration and management of outdoor recreation areas. Emphasis is placed on common resource and social problems faced by area managers, and how they integrate solutions into their plans.
FOR	373	-	Forest Operations	Overview of forest roads and timber harvesting; planning, construction, and maintenance of forest roads; economic and environmental characteristics of harvesting systems; safety and health; wood procurement systems; and the role of forest operations in the broader context of forest management.
FOR	402	-	Professional Forestry Mentoring Program	Focus on contemporary issues in forestry including a historical perspective of the forestry profession, what it means to be a forester today, the role of certification and licensing, and professional ethics. It will serve to increase the professionalism of the forestry students.
FOR	442	-	Watershed Ecology and Management	Introduction to watershed ecology and stream ecosystems. Interactions and linkages among upland, riparian and stream processes. Management and restoration associated with multiple uses of forest and rangelands. Explore influences of spatial and temporal scale, watershed and network position, disturbance regimes, and global change
FOR	458	-	Advanced Topics in GIS	Lecture, demonstration, discussion, and lab exercises. Apply advanced geoprocessing techniques in resource analysis and modeling.
FOR	475	-	Recreation Behavior and Management	Applies sociological and psychological concepts to: 1) individual preferences for recreation activities and settings, 2) description of recreation visitor behavior, 3) sources of management problems, 4) developing direct and indirect visitor management strategies, and 5) recreation planning decisions necessary to manage recreation settings and experiences. Students have the opportunity to apply concepts to personal recreation experiences.
FOR	481	-	Introduction to Arboriculture	Two hours of lecture and one three-hour laboratory per week. Overview of the practice of arboriculture. Emphasis will be on site evaluation for species selection, planting, pruning, fertilization and removal of trees in an urban environment.
FOR	498	-	Special Topics in Resource Management/Forestry	Independent research or study in resource management/forestry for selected undergraduate students.
FOR	499	-	Internship in Forest and Natural Resources	Full- or part-time engagement as volunteer or employee working for off-campus resource management/forestry/renewable energy organization under guidance of external supervisor.

FOR	-	523	Tropical Ecology	Preparatory lectures(1.5 hr/wk) coupled with intensive spring break field study on a tropical island in the Caribbean. Principles of tropical ecology, resource management, and island biogeography are presented. Field trips to a variety of tropical ecosystems including rain forest, coral reefs, crater lakes, montane rain forest with comparison to north temperate ecosystems. Additional fee covers costs of travel, lodging.
FOR	-	535	Advanced Forest Soils	Three hours of lecture/discussion per week concerning the current state-of-the-art in forest soils. Effect of intensive forest management on soil, soil-site-species relationships, forest fertilization tree nutrition. Application of forest soils information to silviculture.
FOR	-	546	Forest Soil Genesis, Classification, and Mapping	Three hours of lecture per week during the first two-thirds of the semester. The last third of the semester is devoted to fieldwork and production of a soil map. Models of soil genesis, application of the U.S. system of soil taxonomy, and soil mapping.
FOR	-	557	Fundamentals of Geographic Information Systems	Fundamental concepts of Geographic Information Systems (GIS); raster and vector data models and geodatabase design; common raster and vector data analysis tools used in the fields of forest and natural resources management, environmental science, conservation biology, ecology, and landscape architecture; cartographic model construction; and map design.
FOR	-	570	Forest Management Decision Making and Planning	Introduction to the components of forest management decision making and planning. The topics include forest regulation, growth and yield, and harvest scheduling given that a landowner's goals may include more than just commercial timber production. Sensitivity analysis of parameters used in forest management planning.
FOR	-	573	Forest Operations	Overview of forest roads and timber harvesting; planning, construction, and maintenance of forest roads; economic and environmental characteristics of harvesting systems; safety and health; wood procurement systems; and the role of forest operations in the broader context of forest management. Emphasis on application of knowledge, requiring a written report with a problem-solving focus.
FOR	-	607	Restoration Ecology	Students investigate and apply major ecological concepts to ecosystem restoration, including abiotic and biotic resource limitation, ecophysiology, trophic webs, disturbance, climate change, and alternative ecosystem states. Diverse readings and interactive class discussions have broad relevance to restoration practitioners, conservation biologists, and environmental engineers.
FOR	-	610	Environmental Resources Business	This course introduces the student to the fundamentals of business accounting and finance and their application to environmental management. The course is small enterprise oriented with emphasis on practical applications and problem solving techniques. The primary objective is to provide the student with the tools to understand and solve the basic accounting and financial problems confronting businesses and organizations in the environmental management field. Topics covered include basic accounting techniques, financial analysis, time value of money, valuation of assets, capital budgeting techniques, capital structure theory.
FOR	-	620	Silvicultural Concepts and Applications	Advanced study of silviculture, including the conceptual basis for designing prescriptions to serve a variety of landowner objectives. Concurrent independent work on assigned projects enhances problem-solving skills related to stand analysis and prescription making. Reports articulate the conceptual basis for recommendations, and discuss likely outcomes based upon findings from research and computer simulations. Field exercises provide practical experience in implementing silvicultural prescriptions.
FOR	-	635	Forest Soils and Their Analyses	One hour of lecture, one hour of recitation, four hours of field and laboratory study of forest soils, emphasizing plant-soil relationships per week. Stress on quantification of plant-soil diagnostic techniques and their interpretation.
FOR	-	665	Natural Resources Policy	Analysis and application of political, policy formation, and policy administration theories to natural resources. Examination of drivers of U.S. natural resources policies. Analysis of private lands, public lands, forest, wildlife, endangered species, water, fire, and certification policies. Focus is on U.S. natural resources policies. Spring.
FOR	-	670	Resource and Environmental Economics	An introductory course in resource and environmental economics. Apply economic theories and models to analyze decisions concerning the use of forest, marine, and water resources and to analyze policy tools for mitigating pollution created as a result of production and consumption.
FOR	-	796	Special Topics in Forest Resources Management	Prerequisite: graduate standing.
FOR	-	797	Seminar	Individual presentation and group discussion concerning current topics of concern to natural resources or their management.
FOR	-	798	Research Problems in Forest & Nat. Resources Mgmt	Special investigation and analysis of forest and natural resources management topics.
FOR	-	898	Professional Experience/Internship	Professional experience/internship which applies, enriches, or complements formal coursework.
FOR	-	899	Master's Thesis Research	Investigation leading to the completion of a Master's thesis.
FOR	-	999	Doctoral Thesis Research	Investigation leading to the completion of the doctoral thesis.

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Forest Technology

FTC	105	-	Tree and Forest Biology	An introduction to the biology of trees and the diversity of animal life commonly found in forests. Field labs concentrate on biological relationships in Adirondack forests.
FTC	200	-	Dendrology	Characteristics, distribution, and uses of tree species in North America. Identifying plant species using common and scientific names, from leaf, twig, fruit, or bark samples. Habitats, species associates, and succession of plants, including some invasive species.
FTC	209	-	Timber Harvesting	Eighteen hours of lecture and thirty six hours of laboratory or field instruction. Student learns basic harvesting methods with northeastern United States emphasis and its relationship to other forest uses. Student understand the role of best management practices in timber harvesting.
FTC	210	-	Wildlife Techniques	Standard methods and techniques for measuring, monitoring, controlling and evaluating wildlife populations are discussed, demonstrated and/or practiced. Further practice in measuring and evaluating wildlife habitat. Identification of common birds, amphibians, reptiles and mammals by sight and sound.
FTC	213	-	Forest Inventory Practicum	A practical field problem requiring students to use professional methods of collecting, analyzing, and presenting forest inventory data. Inventory of the timber/biomass resource and the development of a forest type map are emphasized.
FTC	217	-	Wildland Firefighting and Ecology	An introduction to fire science. Learn basic principles of fire ecology, behavior, danger rating and control. Practical experience conducting a prescribed burn.
FTC	219	-	Introduction to Forest Recreation	A study of forest-recreation resources, their importance to humans, and of the basic history, laws and principles underlying forest-recreation management in the United States. The technical aspects of recreation management are emphasized, as is the study of public-land management, including wilderness.
FTC	221	-	Natural Resources Management	Addresses common issues in organizing a forest property to meet stakeholder goals. Techniques of growth and resource measurement, monitoring, and evaluation are emphasized. Examples and case studies of forest management and production activities are presented. A final project involves the application of knowledge accumulated at the ESF Ranger School in a management plan for an assigned forest property.
FTC	224	-	Field Applications	Forty hours field laboratory visiting various facilities, including private, state, industrial, nongovernmental organizations and other groups. Students will learn how these agencies address financial, political, and environmental concerns within their professional fields.
FTC	236	-	Interpretive Techniques in Forest Recreation	Students complete NAI's Certified Interpretive Guide course, and more closely study the relationship between interpretation and recreation management.

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General Engineering

GNE	441	641	Air Pollution Engineering	study of physical, chemical, legislative, and meteorological aspects of air pollution and its control. Air quality and emission standards. Local and global effects of air pollution and atmospheric dispersion modeling. Design principles of air pollution control devices.
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Landscape Architecture

LSA	132	-	Orientation Seminar: Landscape Architecture	Introduction to the professional culture and some topics of interest to landscape architects.
LSA	220	-	Introduction to Landscape Architecture	Overview and introduction to the profession of landscape architecture and how the profession responds to societal needs in providing services to various public and private clients. Emphasis is placed on understanding the significance of environmental, socio/cultural, physical/visual, and aesthetic factors in developing intervention strategies and designs.

LSA	226	-	Foundation Design Studio I	Studio time devoted to demonstrations, exercises and projects. Content focuses on skills and knowledge necessary to visualize and communicate 2-D and 3-D design ideas using appropriate traditional or digital graphic tools, techniques and technology. An emphasis is placed on the development of a working graphic and spatial design vocabulary and an introduction and application of fundamental design principles and the design process.
LSA	227	-	Foundation Design Studio II	Five hours of studio and one hour of lecture per week. Studio time is devoted to demonstrations, exercises and projects. Content focuses on the expansion of skills and knowledge necessary to visualize and communicate 2-D and 3-D design ideas. An emphasis is placed on the development of a working understanding of the design process and its application toward the synthesis of design form in the landscape.
LSA	305	-	History of Landscape Architecture I	This course offers a survey of landscape architecture and urban design in the context of the cultural history of the western world.
LSA	306	-	History of Landscape Architecture II	Survey of landscape design in the modern era, emphasizing the 20th century through the emergence of contemporary practice. Lectures and readings on significant movements, works and designers in the cultural, social and environmental context of the period.
LSA	312	-	Place/Culture/Design	Introduction to the interpretation of common places (streets, plazas, shopping malls, neighborhoods, parks, etc.) as expressions of culture. The course uses an interdisciplinary cultural studies approach to analyze the cultural processes and practices that shape places and applies these understandings in the context of design professions.
LSA	342	-	Landscape Architectural Construction Technology	This course provides an introduction to important site construction basics, including landscape grading and landform manipulation. Topics addressed will include appropriate slopes for various site uses, surface and subsurface drainage, principles of cut/fill analysis, pedestrian and vehicular circulation design, horizontal and vertical road alignment, storm water management, and soil erosion control.
LSA	343	-	Landscape Materials and Structures	This course introduces the properties of various "hardscape" design materials used in landscape architectural construction, as well as the appropriate structural systems and design detailing typical for design elements.
LSA	432	-	Landscape Architectural Design Studio IV	Addresses the final refining stages of small-scale site design, design detailing, precise layout and grading, selection of individual plant specimens and other materials, and the production of "working drawings" or contract documentation. Projects will include development of a complete set of working "contract documents," including layout plans, grading plans, planting plans and design details and specification. Occasional field trips to illustrate various design solutions.
LSA	480	-	Seminar in Urban Design	This course is an exploration of literature and case studies that address the history, theories, principles and practice of 19th and 20th century North American and European urban design.
LSA	481	681	Cultural Landscape Preservation	The course provides an overview and introduction to cultural landscape preservation and the general preservation movement in the United States. Philosophy, history, and legislation of the preservation movement will be presented.
LSA	-	615	Site Construction Grading, Drainage and Road Layout	This course provides an introduction to important site construction basics, including landscape grading and landform manipulation to achieve appropriate slopes for use and positive surface drainage, principles of cut/fill analysis and subsurface drainage, horizontal and vertical alignment for road design, storm water management, and soil erosion control.
LSA	-	652	Community Development and Planning Process	This course introduces planning and community development as connected, interdependent processes. Community dynamics, the participants in the planning and development processes, theories, principles and practices, and the role of design will be explored.
LSA	-	680	Seminar in Urban Design	This course is an exploration of literature and case studies that address the history, theories, principles and practice of 19th and 20th century North American and European urban design.
LSA	-	697	Topics and Issues of Landscape Architecture	Topics for discussion are selected to acquaint the entering graduate student with a generalized view and current issues facing landscape architects.
LSA	-	796	Special Topics in Landscape Architecture	Special topics of current interest to graduate students in landscape architecture and related fields.
LSA	-	799	Capstone or Thesis Proposal Development	Students develop and defend a proposal for their MLA capstone projects or MS thesis.
LSA	-	800	Capstone Studio	Students complete an academic landscape architecture investigation or professional-level project.

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Paper Science and Engineering

PSE	132	-	Introduction to Process Engineering I	Introduction to process engineering as a field of study and career path. Topics covered include engineering ethics, laboratory and process safety, resumes and interviewing, and teamwork.
PSE	133	-	Introduction to Process Engineering II	Introduction to process engineering as a field of study and career path. Topics covered include engineering calculations, basic statistics, problem solving, basic engineering design, computer tools, ethics, and professional responsibility. The internship and co-op requirements will also be covered.
PSE	200	-	Introduction to Papermaking	Historical and commercial consideration of the paper industry. Topics include wood handling, pulping, stock furnish, stock preparation and paper machine operation. Introductory discussions of papermaking technology, materials and paper making processes including environmental aspects.
PSE	223	-	Introduction to Lignocellulosics	Topics included: structure and chemistry of lignocellulosic materials such as wood, including bark, agriculture residues, and grasses; major (cellulose, hemicelluloses, lignin) and minor constituents (extractives, proteins, ash); biosynthesis, distribution, structure, properties, conversion into energy, chemicals, and other products.
PSE	350	550	Fiber Processing	Discussion of the principles of operation and the basic chemistry used in pulping, bleaching, and deinking processes. Transport and physical operations involved in fiber procurement, preparation, pulping, dispersion, washing, screening and refining are presented. Principles of operation of pulp mill equipment are reviewed and demonstrated in the laboratory.
PSE	438	638	Biorenewable fibrous and nonfibrous products	Three credit-hour advanced science course through the topics in the production and properties of lignocellulosic products. Topics cover fibrous products including different paper grades, nanocellulose and cellulose derivatives, and nonfibrous products including products of enzymatic and/or chemical conversion of biomass constituents.
PSE	465	665	Fiber and Paper Properties	Evaluation, study, and discussion of the physical, optical, and chemical properties of fibers, non-fibrous paper additives, and paper. The interrelationships between papermaking fibers, nonfibrous additives, and manufacturing methods, and their effects on the final quality of paper are discussed in correlation with different test methods.
PSE	467	667	Papermaking Wet End Chemistry	Provides the student with the fundamental principles of colloid and surface chemistry as they relate to the interaction of papermaking materials and chemical additives in the wet end of a paper machine system. The topics of retention of fine solids and dewatering are addressed in detail. Application of the various topics presented during the course are made during a pilot paper machine trial.
PSE	468	668	Papermaking Processes	Laboratory study of the papermaking process, with emphasis on operation of the semi-commercial Fourdrinier paper machine. Emphasis is on the fundamentals of pulping, stock preparation, paper machine operation, evaluation of the finished product, and the collection and analysis of data to develop material and energy balances. Results of each paper machine run are evaluated in seminar-type discussions.
PSE	481	-	Engineering Design	Design-project procedure; data sources and development. Application of simulation and computer-aided design to process synthesis and plant layout. Formulation and solution of original design problems.

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