

Campus Sustainability at the University of Maryland

Academics: Courses

The following are University of Maryland undergraduate courses related to environmental sustainability. The purpose of this resource is to give you an idea of the many ways you can study environmental issues through different disciplines. This list might also help undergraduate students find electives or majors related to sustainability. Although this list is extensive, it does not include special topics courses. Always check the schedule of classes (<http://www.testudo.umd.edu/ScheduleOfClasses.html>) for current course offerings.

Courses Listed by Department	
AGNR – Agriculture and Natural Resources	ENST – Environmental Science and Technology
ANSC – Animal Science	GEOG – Geography
ANTH – Anthropology	GEOL – Geology
AOSC – Atmospheric and Oceanic Science	GVPT – Government and Politics
AREC – Agricultural and Resource Economics	HIST – History
BSCI – Biological Sciences	LARC – Landscape Architecture
CHEM – Chemistry	NFSC – Nutrition and Food Science
ECON – Economics	PHIL – Philosophy
EDCI – Education, Curriculum, and Instruction	PLSC – Plant Science
ENBE – Biological Resource Engineering	SOCY – Sociology
ENCE – Civil and Environmental Engineering	URSP – Urban Studies and Planning
ENCH – Chemical Engineering	WRLD – World Courses
ENSP – Environmental Science and Policy	

Undergraduate Courses (000-499)

AGNR 105 Introduction to Agriculture and Natural Resources (1) Formerly AGRI 105. Technical and human components of agriculture in a cross-disciplinary context. Agricultural origins, crop and animal domestication, agricultural geography, food and nutrition, the natural resource base and environmental concerns, agricultural policy formation, agricultural marketing and trade, sustainable agriculture, international agriculture, and the future of farming.

AGNR 422 International Agriculture Science and Culture (6) Four hours of lecture and six hours of discussion/recitation perweek. Prerequisite: Permission of department. Immersionbased, intensive course of study in a foreign agricultural education setting. UM Students will study with local students in a variety of University classes and field experiences in agriculture, natural resources and environmental sciences, laboratory science, economics, education technology, etc. Students will learn customs, culture and language of the host country.

AGNR 423 Exploring International Agriculture (3) Prerequisite: Permission of department. Not open to students who have completed AGNR 422. Immersion-based, intensive course of study in a foreign agricultural setting. Students may expect to have university classes and field experiences in one or more agriculture and natural resource disciplines. Students will learn about the culture and customs of the host country as well as undertake at least an introductory language course.

AGNR 464 Rural Life in Modern Society (3) Formerly AGRI 464. The historical and current nature of rural and agricultural areas and communities in the complex structure and culture of U.S. society. Basic structural, cultural, and functional concepts for analyses and contrasts of societies and the organizations and social systems within them.

AGNR 467 Agricultural Knowledge and Institutional Change in Latin America (3) Junior standing. The roles of agricultural research and extension in furthering agricultural development and trade in Latin America and the implications of contemporary reforms of these institutions. A review of basic concepts relating to agriculture and its knowledge systems, such as agricultural research, education and extension with emphasis on Latin America's cultural and institutional diversity. Students will be introduced to career possibilities in national and international organizations involved with development assistance.

ANSC 220 Livestock Management (3) Prerequisite: ANSC101. Management of meat animals including beef, sheep, and swine. This course will emphasize obtaining optimal efficiency of production through the integration of leading edge breeding, feeding, management, and marketing practices.

ANSC 252 Introduction to the Diseases of Wildlife (3) Two hours of lecture and one hour of discussion/recitation per week. Prerequisite: BSCI105 or equivalent or permission of department. The principal diseases of North American wildlife will be briefly considered. For each disease, specific attention will be given to the following: signs evidenced by the affected animal or bird, causative agent, means of transmission and effects of the disease on the population of the species involved.

ANSC 453 Animal Welfare and Bioethics (3) Prerequisite: ANSC101 or BSCI106 or permission of instructor. Junior standing. Ethical concerns related to the use of animals in modern society. Historical and philosophical overview of animal welfare and bioethics. Applied ethical discussions on human/animal interrelationships, physical and genetic manipulation, and other current issues associated with the treatment of animals used in food production, research, zoos, and as pets.

AMST 211 Technology and American Culture (3) Historical and contemporary technological innovations in American society, with special emphasis on the humanities. Varied social and cultural responses to one contemporary technological issue e.g. (environmental pollution, genetic engineering, communications technology, and psychopharmacology).

ANTH 262 Culture and Environment (3) Prerequisite: ANTH 260 or permission of department. Credit will be granted for only one of the following: ANTH 221 or ANTH 262. Formerly ANTH 221. Theory and method in cultural ecology and the formulation of a critical perspective on the explanation of the concept of adaptation. Includes the ecological understanding of gender differences and considers conflicting natural resource management strategies and environmental degradation.

ANTH 422 Human-Plant-(Human & Bioactive Plant) interaction (3) Prerequisites: ANTH220 and ANTH320 or permission of department. Also offered as ANTH622. Not open to students who have completed ANTH428I or ANTH689I. Credit will be granted for only one of the following: ANTH422 or ANTH622. Formerly ANTH 428I. This seminar course will discuss the evolutionary, historical, cultural, and ecological aspects of coevolution, with respect to humans and their interactions with specific bioactive plants. Case studies of human- plant-(pathogen) interactions will be discussed as well as an inclusive survey of anthropologically important phytochemicals. The seminar incorporates human-plant-(pathogen) interactions into models of human evolution and ecology.

ANTH 450 Theory and Practice of Environmental Anthropology (3) Junior standing. Also offered as ANTH650. Credit will be granted for only one of the following: ANTH450 or ANTH650. An overview of contemporary application of cultural theory and methods to environmental problems. Topics include the use of theories of culture, cognitive approaches, discourse analysis, and political ecology. Case studies from anthropology, other social sciences, humanities, conservation, and environmental history are used to demonstrate the applied value of a cultural-environmental approach.

ANTH 464 Culture and Sustainable Development (3) Prerequisite: ANTH262 or equivalent. Also offered as ANTH688V. Credit will be granted for only one of the following: ANTH464 or ANTH688V. Explores anthropological approaches to economic development, particularly the new sub-field of sustainable development. Examines the local-level social, political and economic consequences of development and the potential for grass roots strategies to manage resources.

AOSC 123 Causes and Implications of Global Change (3) Also offered as GEOG123, and GEOL123. Credit will be granted for only one of the following: AOSC123, GEOG123, GEOL123, or METO123. Formerly METO 123. This course offers a unique experience in integrating physical, chemical, geological and biological sciences with geographical, economic, sociological and political knowledge skills toward a better understanding of global change. Review of environmental science relating to weather and climate change, acid precipitation, ozone holes, global warming and impacts on biology, agriculture and human behavior. Study of the natural, long-term variability of the global environment, and what influence mankind may have in perturbing it from its natural evolution. Concepts of how physical, biological and human behavioral systems interact, and the repercussions which may follow from human endeavors. The manner in which to approach decision and policy making related to issues of global change.

AOSC 200 Weather and Climate (3) Three hours of lecture and one hour of discussion/recitation per week. Prerequisites: MATH110 or MATH115. Recommended as a corequisite: AOSC201/METO201. Formerly METO 200. Broad survey of the state of knowledge and problems of atmospheric science. Origin and structure of the atmosphere, meteorological observations, weather maps, forecasting, satellites, energetics, wind, general circulation, storms, severe weather, climate change, air pollution.

AOSC 201 Weather and Climate Laboratory (1) Two hours of laboratory per week. Corequisite: AOSC200/METO200. Formerly METO 201. Laboratory exercises to supplement AOSC200, including weather observations, weather map analysis, use of the Internet, forecasting practice and climate modeling.

AOSC 346 Cycles in the Earth System (3) Prerequisite: MATH140, AOSC/GEOG/GEOL123, or permission of department. Recommended: MATH141, PHYS141, PHYS171, or PHYS161. Also offered as GEOG346, GEOL346. The Earth System operates through some fundamental cycles such as water, energy, and the carbon cycles. This course will build on GEOL/GEOG/AOSC123 starting with concept of feedbacks within the Earth System, global energy balance and the Greenhouse Effect. A brief introduction to the atmospheric and oceanic circulation will lead to the water cycle connecting the land, ocean, and atmosphere to the Earth System. Introduction to the Global carbon, nitrogen, and sulfur cycles will be followed by the concept of long-term climate regulation and short-term climate variability. The concepts of cycles, feedbacks, forcings, and responses in the Earth System will be applied to Global Warming and Ozone Depletion.

AOSC 400 The Atmosphere (3) Prerequisites: MATH141, PHYS161, PHYS171 or permission of department. Formerly METO 400. The atmosphere and its weather and climate systems. Composition of the atmosphere, energy sources and sinks, winds, storms and global circulation. The application of basic classical physics, chemistry and mathematics to the study of the atmosphere.

AOSC 401 Global Environment (3) Prerequisite: AOSC400/METO400. Formerly METO 401. The global weather and climate system; the natural variability of the atmosphere-ocean-biosphere. Potential human effects: greenhouse effects, deforestation, acid rain, ozone depletion, nuclear winter. Social, political and economic effects of changes in global environment. Policy options.

AOSC 431 Meteorology for Scientists and Engineers I (3) Prerequisites: MATH240 or 461; PHYS270 and PHYS271 (Formerly: 263); CHEM103. Recommended: MATH246. The general character of the atmosphere and its weather and climate systems, phenomena and distributions of variables (winds, temperature, pressure and moisture). The formal framework of the science; the application of basic classical physics, chemistry, mathematics and computational sciences to the atmosphere.

AOSC 432 Meteorology for Scientists and Engineers II (3) Prerequisite: AOSC431/METO431. Corequisite: MATH246. 3 semester hours. Formerly METO 432. The general character of the atmosphere and its weather and climate systems, phenomena and distributions of variables (winds, temperature, pressure and moisture). The formal framework of the science; the application of basic classical physics, chemistry, mathematics and computational sciences to the atmosphere.

AOSC 434 Air Pollution (3) Prerequisites: {CHEM113 and MATH241} or permission of department. Formerly METO 434. Production, transformation, transport and removal of air pollutants. The problems of photochemical

smog, the greenhouse effect, stratospheric ozone, acid rain and visibility. Analytical techniques for gases and particles.

ARCH 410 Architecture Technology I (4) Prerequisites: MATH140 or MATH220; PHYS121 and (one of the following: BSCI205, GEOG140, GEOL120, GEOL123/AOSC123/METO123/GEOG123). Corequisite: ARCH400. For ARCH majors only. First course in a four course sequence which develops the knowledge and skills of architectural technology. Addresses climate, human responses to climate, available materials, topography and impact on culture. Principles of assembly, basic structural principles and philosophies of construction.

ARCH 461 Sustainability in Architecture (3) Prerequisite: ARCH401 and ARCH410 or permission of department. Credit will be granted for only one of the following: ARCH418S or ARCH461. Formerly ARCH 418S. Strategies of sustainability as related to the broader context of architectural problem solving.

AREC 240 Introduction to Economics and the Environment (4) Costs and social impacts of pollution and human crowding in the modern environment. The economic, legal and institutional causes of these problems. Public policy approaches to solutions and the costs and benefits of alternative solutions.

AREC 250 Elements of Agricultural and Resource Economics (3) An introduction to economic principles of production, marketing, agricultural prices and incomes, farm labor, credit, agricultural policies, and government programs.

AREC 306 Farm Management (3) The organization and operation of the farm business to obtain an income consistent with family resources and objectives. Principles of production economics and other related fields as applied to the individual farm business.

AREC 332 Introduction to Natural Resource Policy (3) Prerequisite: AREC240. Credit will be granted for only one of the following: AREC432 or AREC332. Formerly AREC 432. Development of natural resource policy and analysis of the evolution of public intervention in the use of natural resources. Examination of present policies and of conflicts between private individuals, public interest groups, and government agencies.

AREC 365 World Hunger, Population, and Food Supplies (3) An introduction to the problem of world hunger and possible solutions to it. World demand, supply, and distribution of food. Alternatives for leveling off world food demand, increasing the supply of food, and improving its distribution. Environmental limitations to increasing world food production.

AREC 382 Computer-Based Analysis in Agricultural and Resource Economics (3) One hour of lecture and three hours of laboratory per week. Prerequisites: MATH111/STAT100 or equivalent; ECON200/AREC240/AREC250 or equivalent. Credit will be granted for only one of the following: AREC182 or AREC382. Formerly AREC 182. Analysis of economic data using computer spreadsheets. Exercises include analyses of forest land shares, farmer willingness to pay, farm production planning, fisheries management, corn prices, and index numbers. Analyses features use of cell formulas, spreadsheet functions, Excel's Data Analysis Tool and Solver. This is a lab course featuring experimental learning.

AREC 433 Food and Agricultural Policy (3) Prerequisite: ECON306. Economic and political context of governmental involvement in the farm and food sector. Historical programs and current policy issues. Analysis of economic effects of agricultural programs, their benefits and costs, and comparison of policy alternatives. Analyzes the interrelationship among international development, agricultural trade and general economic and domestic agricultural policies.

AREC 445 Agricultural Development, Population Growth and the Environment (3) Prerequisite: ECON306. Development theories, the role of agriculture in economic development, the agricultural policy environment, policies impacting on rural income and equity, environmental impacts of agricultural development.

AREC 453 Natural Resources and Public Policy (3) Prerequisite: ECON306. Rational use and reuse of natural resources. Theory, methodology, and policies concerned with the allocation of natural resources among alternative uses. Optimum state of conservation, market failure, safe minimum standard, and cost-benefit analysis.

AREC 455 Economics of Land Use (3) Prerequisite: ECON306. Fundamentals of location theory. Microeconomics of land use decisions, including determination of rent and hedonic pricing models. Impacts of government decisions on land use, including regulation (e.g., zoning), incentives (transferable development rights), provision of public services, and infrastructure investments. Impacts of land use on environmental quality, including issues relating to sprawl, agricultural land preservation, and other topics of special interest.

AREC 484 Econometric Applications in Agriculture and Environmental/Natural (3) Resources Prerequisite: ECON321 or equivalent. Corequisite: ECON306. Application of econometric techniques to problems in agriculture, environment, and natural resources. Emphasis on the assumptions and computational techniques necessary to structure, estimate, and test economic models in the fields of agricultural, environmental, and resource economics.

AREC 489G The Economics of Climate Change (3) Prerequisite: ECON306. The role of economics in the formation of climate policy. Climate change and basic concepts of environmental economics including efficiency, externalities, and environmental policy instruments. The role of intertemporal decisions, uncertainties about impacts of climate change and costs of mitigation and adaptation, and problems of international cooperation. The impact of climate change on agriculture, the role of energy use, and prominent climate policy approaches at the national and international level.

BMGT 472 Advanced Logistics Operations (3) Prerequisite: BMGT372. Analysis of the operational aspects of logistics management, including purchasing policies, transportation planning and inventory control. Attention is directed toward total logistics cost minimization and the establishment of a sustainable competitive advantage based on logistical activities.

BSCI 124 Plant Biology for Non-Science Students (3) For non-science majors only. Not open to students who have completed BSCI105/BIOL105. Formerly PBIO 100. A basic course in plant biology specifically designed for the non-science student. Emphasis is placed on an evolutionary and ecological approach to studying fundamental concepts and processes of plants, their place in the biosphere, the importance of plants to man, and the manner in which humans impact on plants and their environment. This course will not count toward graduation requirements for any student in the College of Chemistry and Life Sciences or the College of Agriculture and Natural Resources.

BSCI 205 Environmental Science (3) Formerly PBIO 235. Basic ecological principles as they relate to the ecological dilemmas of overpopulation, pollution, increasing consumption of natural resources, and deteriorating land use ethics facing mankind today. Course not acceptable toward major requirements in the College of Chemistry and Life Sciences.

BSCI 206 Chesapeake: A Living Resource (3) Credit will be granted for only one of the following: BSCI206 or BSCI373. Formerly PBIO 255. The living resources of the Chesapeake Bay from an ecosystem perspective. Designed for non-science majors, it will acquaint students with the Bay's watershed, its physical environment, and its living organisms, with an emphasis on the connections between these factors. Understanding the relationships between physical, chemical and biological processes will equip students to comprehend and appreciate the remarkable productivity of our estuary, as well as provide them with the knowledge needed to protect the Bay. Course not acceptable toward major requirements in the College of Chemistry and Life Sciences.

BSCI 361 Principles of Ecology (4) Three hours of lecture and one hour of discussion/recitation per week. Prerequisites: BSCI106 and (MATH140 or MATH220). Formerly ZOO 328N. Basic principles of population, community, and ecosystem ecology. Use of these principles to predict possible consequences of human-caused changes in the environment and to understand the level of uncertainty of those predictions.

BSCI 363 The Biology of Conservation and Extinction (3) Prerequisite: BSCI106. Formerly ZOO 312. Ecology, evolutionary biology, and paleontology will be applied to the study of conservation, species invasions, and extinction.

BSCI 366 Biodiversity Issues in Conservation Management (3) Prerequisite: BSCI224 or BSCI225 or BSCI227 or permission of department. Formerly ENTM 313. How biological diversity affects the stability and economic viability of agriculture, urban landscapes, and other managed resources and what actions can be taken to reduce losses.

BSCI 373 Natural History of the Chesapeake Bay (3) Three lectures per week and at least one Saturday field trip. Prerequisite: a course in biological sciences or permission of department. Formerly ZOO 381. Consideration of the major groups of organisms associated with the Chesapeake Bay and current issues that determine humans' present and future uses for the Chesapeake and its biota.

BSCI 374 Chesapeake Bay Laboratory (2) One hour of lecture, two hours of laboratory, and eight hours of fieldwork per week. Pre- or corequisite: BSCI373. Formerly ZOO 382. A laboratory and field experience of the watershed and Chesapeake Bay biota. Laboratories will be used to identify the biota collected by students on Thursday and Saturday field trips to a wide variety of collecting sites available along the 200 mile length of the Chesapeake Bay.

BSCI 462 Population Ecology (3) Prerequisites: BSCI106 and MATH220. Formerly ZOO 470. Theory of population growth and regulation, life tables, and theory of competition and predation, evolution in ecological settings, community structure and dynamics.

CHEM 474 Environmental Chemistry (3) Prerequisite: CHEM481 or equivalent. The sources of various elements and chemical reactions between them in the atmosphere and hydrosphere are treated. Causes and biological effects of air and water pollution by certain elements are discussed.

ECON 375 Economics of Poverty and Discrimination (3) Prerequisites: (ECON200 and ECON201) or ECON205. The causes of the persistence of low income groups; the relationship of poverty to technological change, to economic growth, and to education and training; economic results of discrimination; proposed remedies for poverty and discrimination.

ECON 381 Environmental Economics (3) Prerequisite: ECON200, ECON205, or permission of department. Application of economic theory to problems of environmental quality and management. Theory of economic externalities, common property resources, alternative pollution control measures, and limits to economic growth.

ECON 481 Theory and Policy in Environmental Economics (3) Prerequisite: ECON306. For ECON and ENSP majors only. Credit will be granted for only one of the following: ECON381 or ECON481. Formerly ECON 381. Application of economic theory and empirical tools to the analysis of environmental issues. The concepts of externalities, public goods, property rights and cost-benefit analysis are applied to air pollution, water pollution, solid waste management, hazardous waste, and global warming. The optimal role and various tools of public policy are addressed.

EDCI 473 Environmental Education (3) Two hours of lecture and three hours of laboratory per week. An interdisciplinary course covering the literature, techniques and strategies of environmental education.

EDCI 476 Teaching Ecology and Natural History (3) An introduction to the teaching of natural history in the classroom and in the field. Ecological principles; resources and instructional materials; curricular materials. Primarily for teachers, park naturalists, and outdoor educators.

ENBE 100 Basic Biological Resources Engineering Technology (3) For non-engineering majors. Formerly ENAG 100. An introduction to the applications of engineering concepts to biology, agriculture, and environment. Topics include quantification measurements, mechanical, thermal, fluid, and electrical principles.

ENBE 110 Introduction to Biological Resources Engineering (1) One hour of lecture and one hour of laboratory per week. Biological engineering applications, including aquaculture, bioinstrumentation, biomedicine, biotechnology, environment, food, and plant growth. Simple laboratory experiments will illustrate important techniques used by biological engineers.

ENBE 234 Principles of Erosion and Water Control (1) Introduction to principles of estimating runoff and erosion. Engineering principles necessary to control erosion and runoff from agricultural areas. For non-engineering students.

ENBE 236 Design of Drainage Systems (1) Effect of drainage on crop production and quality. Design of agricultural drainage systems. For non-engineering students.

ENBE 237 Design of Irrigation Systems (1) Principles and practices of agricultural irrigation, including types of irrigation systems, soil water concepts, computing evapotranspiration, irrigation scheduling and design of a sprinkler irrigation system. For non-engineering students.

ENBE 422 Water Resources Engineering (3) Prerequisite: ENME342 or ENCE330; or permission of department. Formerly ENAG 422. Applications of engineering and soil sciences in erosion control, drainage, irrigation and watershed management. Principles of agricultural hydrology and design of water control and conveyance systems.

ENBE 435 Aquacultural Engineering (3) Prerequisite: algebra, ability to read and interpolate graphical material and one semester each of college physics and college chemistry; and permission of department. Formerly ENAG 435. The course will explore the natural aquatic environment and how aquatic organisms are effected by this environment. The course will then explore ways to modify aquatic environments, especially in recirculating systems, and will explore ways to increase production of fish with less water usage. Components of recirculating systems including water filtration, pumps, aerators, level and flow meters, and other system components will be described and their operating principals explored.

ENBE 451 Water Quality: Field and Lab Analysis Methods (3) Two hours of lecture and three hours of laboratory per week. Prerequisites: CHEM103 and (CHEM104 or CHEM113). Also offered as NRMT451. Credit will be granted for only one of the following: ENBE451 or NRMT451. Hands-on experience with techniques for assessing physical, chemical, and biological characteristics of surface waters, including streams, lakes, and wetlands. Emphasis is placed on understanding effects of water quality on ecosystem structure and function.

ENBE 462 Nonpoint Source Pollution Assessment Techniques (3) Prerequisite: one course in hydrology or permission of department. Various techniques to identify and measure nonpoint source pollution. Primary focus is on agriculture and water.

ENCE 100 Introduction to Civil and Environmental Engineering (1) An introduction to, and an overview of, Civil and Environment Engineering. It will introduce students to the undergraduate curriculum and also exposes them to students and graduates who are at various points in their CEE careers. The course blends panel presentations by seniors and graduate students, faculty and practitioners with a project and book review to be performed by the students.

ENCE 215 Applied Engineering Sciences (3) Prerequisite: CHEM135 and permission of department. Examination of fundamental and applied aspects of chemistry, biology, and geochemistry. Fundamental principles will be coupled with analytical and computational skills essential for addressing crucial processes on human impact on the environment and urban infrastructure. Applications to the development of new materials and technologies will be covered in case studies. Students should come out with an appreciation of how understanding the fundamental concepts could facilitate the development of technologies to mitigate human impact on the environment.

ENCE 310 Introduction to Environmental Engineering (3) Prerequisites: ENCE215, PHYS260 (Formerly: PHYS262) and permission of department. Introduction to the physical, chemical and biological systems relating to the quality of water, land and air environments. Fundamental principles will be emphasized, current environmental pollution problems will be examined and methods of pollution abatement discussed.

ENCE 411 Environmental Engineering Science (3) Two hours of lecture and four hours of laboratory per week. Prerequisites: ENCE310 and permission of department. The basic physical, chemical and biological processes that occur in engineered and natural environmental systems will be discussed. Included will be presentation of

parameters used to describe the quality of water, air and land. Measurement techniques will be discussed. A weekly lab will provide hands-on experience with environmental quality measurements and treatment techniques.

ENCE 412 Environmental Engineering Unit Operations (3) Prerequisites: ENCE305, ENCE310 and permission of department. Examination of unit operations and processes encountered in environmental engineering field. Fundamental principles learned from previous classes will be applied into the design and operation of unit operations and processes, particularly in the area of water and wastewater treatment. Similar processes will be applied to air pollution control, solid waste disposal and hazardous waste treatment.

ENCE 489 Special Problems in Civil Engineering (1-4) Prerequisite: permission of department. Senior standing. A course arranged to meet the needs of exceptionally well prepared students for study in a particular field of civil engineering.

ENCH 300 Chemical Process Thermodynamics (3) [Offered by UMERC]. Three hours of lecture and one hour of discussion/recitation per week. Prerequisites: CHEM241; and ENCH215. Corequisite: MATH241 and ENCH250. Principles of thermodynamics and their application to engineering problems. First and second laws of thermodynamics, properties of gases, liquids and solids, phase equilibrium, flow and non-flow systems, energy conversion, production of work from heat, thermodynamic analysis of processes, equilibrium stage operations and the thermodynamics of chemically reacting systems.

ENCH 424 Transport Processes II (3) [Offered by UMERC]. Three hours of lecture and one hour of discussion/recitation per week. Prerequisites: ENCH300 and ENCH422. Principles of mass and heat transfer as applied to model development and process design. Species continuity equation with application to diffusion, and convection in laminar flow. Macroscopic balances and mass transfer coefficients with application to turbulent flow. Microscopic equation of energy with application to heat conduction, and convection in laminar flow. Macroscopic energy balance and heat transfer coefficients with application to turbulent flow. Heat exchanger design.

ENCH 472 Control of Air Pollution (3) Credit will be granted for only one of the following: ENCH468D or ENCH472. Formerly ENCH 468D. Effects and sources of air pollutants, legislation and regulatory trends; meteorology, atmospheric dispersion models; distribution functions, particle size distributions; particulate control.

ENCH 484 Environmental Biochemical Engineering (3) Credit will be granted for only one of the following: ENCH468B or ENCH484. Formerly ENCH 468B. Interdisciplinary solutions to complex environmental contamination problems; basic biological and biochemical engineering principles as applied to bioremediation. Transport of contaminants in various environments, aerobic and anaerobic biodegradation, ex situ and in situ bioremediation reactor design, reaction kinetics, process optimization, and modeling. Current regulatory issues governing the use of bioremediation processes.

ENCH 497 Recycling of Waste Material (3) Prerequisites: ENCH424 and ENCH426. Credit will be granted for only one of the following: ENCH468R or ENCH497. Formerly ENCH 468R. Introduction of municipal and industrial waste recycling technology. Unit operations and governing mathematical models for predicting equipment performance. Role of engineers in the recycling industry.

ENMA 461 Thermodynamics of Materials (3) [Offered by UMERC]. Prerequisite: ENES230. Junior standing. Thermodynamic aspects of materials; basic concepts and their application in design and processing of materials and systems. Topics include: energy, entropy, adiabatic and isothermal processes, internal and free energy, heat capacity, phase equilibria and surfaces and interfaces.

ENME489W (PermReq) Special Topics in Mechanical Engineering: Pollution and Waste Technology; (3 credits) [Offered by UMERC].

ENNU 465 Nuclear Reactor Systems Analysis (3) [Offered by UMERC]. Prerequisites: (MATH246; and {PHY 270 and 271 (Formerly PHY 263)}); and ENN 455) or permission of both department and instructor. Power reactor (BWR,PWR,HTGR) system design and analysis. System specifications and modes of operation. Plant documentation (PSAR,FSAR, etc.). Piping and instrumentation drawings. Theory and application of pump and

pipng calculations. Steam power plant cycles and calculations. Steam plant equipment (turbines, heaters, condensers, etc.) analysis.

ENSP 101 Introduction to Environmental Science (3) Three hours of lecture and one hour of discussion/recitation per week. Not open to students who have completed BSCI235 or PBIO205. One of two required courses that introduce students to the topics studied and methods employed in environmental science and policy. Emphasis on scientific ways of knowing; the systems, cycles, flows, and interfaces that characterize the atmosphere, lithosphere, hydrosphere, and biosphere; the analysis of human impacts on these systems; and the nature of scientific uncertainty and methods of quantifying environmental processes.

ENSP 102 Introduction to Environmental Policy (3) Three hours of lecture and one hour of discussion/recitation per week. Second of two courses that introduce students to the topics studied and methods employed in environmental science and policy. Emphasis on the process of formulating, implementing, and evaluating policy responses to environmental problems, with particular attention to policy controversies related to scientific uncertainty, risk assessment, the valuation of nature, and distributional equity. May be taken before or after ENSP101.

ENSP 386 Internship (3-6) Prerequisite: internship proposal approved by the specialty advisor, the director of ENSP and the student's internship sponsor.

ENSP 399 Special Topics in Environmental Science and Policy (1-3) Restricted to ENSP majors or permission of department. Repeatable to 12 credits if content differs. A substantive and specialized examination of contemporary issues in environmental science or policy.

ENSP 400 Capstone in Environmental Science and Policy (3) Prerequisite: Senior Standing or Permission of the Director of ENSP; ENSP101 and 102. For ENSP majors only. Integration of physical, biological, and social sciences with applications to environmental science and policy. Problem-solving and multi-disciplinary case study evaluations pertinent to contemporary and future issues related to the environment.

ENST 100 International Crop Production-Issues and Challenges in the 21st (3) Century Credit will be granted for only one of the following: ENST100 or NRSC100. Formerly NRSC 100. Examines the role of crop production in elevating humans out of poverty in developing countries. It will introduce students to the basic principles of plant and soil science underlying the international production of food crops and world food security. The role of multinational agencies such as the World Bank in the promotion of sustainable crop production using environmentally-sound technologies will also be discussed.

ENST105 Soil and Environmental Quality (3) Two hours of lecture and one hour of discussion/recitation per week. Formerly AGRO 105. Soil as an irreplaceable natural resource, the importance of soils in the ecosystem, soils as sources of pollution, and soils as the media for the storage, assimilation or inactivation of pollutants. Acid rain, indoor radon, soil erosion and sedimentation, nutrient pollution of waters, homeowners' problems with soils, and the effect of soils on the food chain.

ENST233 Introduction to Environmental Health; (3) How humans are affected by the quality of air, water, and food as well as how humans affect these survival necessities are examined. Students will learn how the evolution and prosperity of the human species has resulted in concerns about pollution, overpopulation, and other issues that are having a harmful effect on humans and our environment.

ENST333 Ecosystem Health and Protection; (3). *Credit will be granted for only one of the following: ENST499A or ENST333.* Discussion of the philosophies, principles, and practices for assessing ecosystem health with emphasis on sustainability and degradation associated with human activities. Concepts will be clarified using case histories from the Chesapeake Bay watershed.

ENST 405 Energy and Environment (3) Prerequisite: MATH140 or MATH220. Junior standing. Credit will be granted for only one of the following: ENST405, NMRT489Z, or MEES698Z. Formerly NRMT 489Z. Introduction to the role of energy in environmental and human-dominated systems. Discussion of the

historical and modern production and consumption of energy. Introduction to energy systems computer simulation and energy auditing.

ENST 413 Soil and Water Conservation (3) Three hours of lecture and two hours of laboratory per week. Prerequisite: NRSC200. Credit will be granted for only one of the following: AGRO413 or NRSC413. Formerly AGRO 413. Importance and causes of soil erosion and methods of soil erosion control. Effects of conservation practices on soil physical properties and the plant root environment. Irrigation and drainage as related to water use and conservation.

ENST 423 Soil-Water Pollution (3) Prerequisites: ENST200 (formerly NRSC200) and CHEM104; or permission of department. Credit will be granted for only one of the following: ENST423 or NRSC423. Reaction and fate of pesticides, agricultural fertilizers, industrial and animal wastes in soil and water with emphasis on their relation to the environment.

ENST 425 Terrestrial Bioremediation (3) Two hours of lecture and two hours of discussion/recitation per week. Prerequisite: one course in biology; and CHEM103 or CHEM131 and CHEM132; or permission of department. Formerly AGRO 425. Biologically based methods for the remediation of contaminated soil. Bioremediation using bacteria, fungi and higher plants, of both organic and inorganic contaminants in soil will be addressed.

ENST 430 Wetland Soils (3) Two hours of lecture per week, plus four field trips scheduled on Saturday. Prerequisite: ENST200 (formerly NRSC200). Credit will be granted for only one of the following: ENST430 or NRSC461. Formerly NRSC 461. The soils of wetlands including hydrology, chemistry, genesis, and taxonomy are discussed. The understanding of federal and regional guidelines to wetland soils are covered with an emphasis on validating interpretations through field observations. Saturday field trips are required.

ENST 440 Crops, Soils and Civilization (3) Credit will be granted for only one of the following: AGRO440 or NRSC440. Formerly AGRO 440. Role and importance of crop and soil resources in the development of human civilization. History of crop and soil use and management as they relate to the persistence of ancient and modern cultures.

ENST 441 Sustainable Agriculture (3) Credit will be granted for only one of the following: ENST441 or NRSC441. Formerly NRSC 441. Environmental, social and economic needs for alternatives to the conventional, high-input farming systems which currently predominate in industrial countries. Strategies and practices that minimize the use of non-renewable resources.

ENST 444 Restoration Ecology (3) Prerequisite: MATH220. Sophomore standing. Formerly NRMT 489F. Discussion of the philosophies, principles, and practices of ecosystem restoration. Presentation of restoration case histories include wetlands, lakes, streams, coastal systems, mined lands, and new ecosystems.

ENST 450 Wetland Ecology (3) One hour of lecture and four hours of laboratory per week. Prerequisite: BIOM301 or permission of department. Also offered as MEES650. Credit will be granted for only one of the following: NRMT450 or MEES650. Plant and animal communities, biogeochemistry, and ecosystem properties of wetland systems. Laboratory emphasizes collection and analysis of field data on wetland vegetation, soil, and hydrology.

ENST 451 Water Quality: Field and Lab Analysis Methods (3) Two hours of lecture and three hours of laboratory per week. Prerequisites: CHEM131/132 and CHEM104 or CHEM231/232. Also offered as ENBE451. Credit will be granted for only one of the following: NRMT451 or ENBE451. Hands-on experience with techniques for assessing physical, chemical, and biological characteristics of surface waters, including streams, lakes, and wetlands. Emphasis is placed on understanding effects of water quality on ecosystem structure and function.

ENST 454 Environmental Issues in Plant and Soil Sciences (3) Credit will be granted for only one of the following: AGRO454 or NRSC454. Formerly AGRO 454. Effects of air pollutants such as ozone, sulfur dioxide, acid rain, etc., and soil pollutants such as toxic metals and pesticides on the growth, productivity and quality of crops.

ENST 460 Principles of Wildlife Management (3) Three hours of lecture per week. Three Saturday field trips are scheduled. Prerequisite: two semesters of biology laboratory or permission of department. Ecological principles and requirements of wildlife as basis for management, and introduction to the scientific literature. Conflicts in wildlife management, government administration of wildlife resources, legislation, and history of the wildlife management profession.

ENST 461 Urban Wildlife Management (3) Two lectures per week. Two Saturday field trips are scheduled. Ecology and management of wildlife in urban areas. For students in biological sciences, geography, landscape design, natural resources management, recreation and urban studies. Planning, design, and wildlife conservation in landscape ecology. Public attitudes, preferences, and values, reviews of private conservation organizations.

ENST 462 Field Techniques in Wildlife Management (2) Four hours of laboratory per week. Recommended: NRMT460 and NRMT461. Junior standing. Credit will be granted for only one of the following: NRMT489B or NRMT462. Formerly NRMT 489B. Hands-on experience with field techniques in wildlife management focusing on various methods of conducting indices, estimates, and censuses of wildlife populations. Includes capture and handling of amphibians, reptiles, birds, and mammals by use of drift fences, cover boards, mist nets, box traps, and dart guns.

ENST 470 Natural Resources Management (4) For NRMT majors only. Field work and independent research on watersheds. Intensive seminar on resource management planning and report preparation.

ENST 479 Tropical Ecology and Resource Management (1-6) Prerequisites: BSCI106, an introductory economics course, and permission of instructor. Repeatable to 10 credits if content differs. Tropical ecosystems and issues of human use and impact. Includes lectures which lead up to an off-campus trip in a tropical environment.

GEOG 123 Causes and Implications of Global Change (3) Also offered as AOSC123 and GEOL123. Credit will be granted for only one of the following: AOSC123, GEOG123, GEOL123, or METO123. A unique experience in integrating physical, chemical, geological, and biological sciences with geographical, economic, sociological, and political knowledge skills toward a better understanding of global change. Review of environmental science relating to weather and climate change, acid precipitation, ozone holes, global warming, and impacts on biology, agriculture, and human behavior. Study of the natural, long-term variability of the global environment, and what influence mankind may have in perturbing it from its natural evolution. Concepts of how physical, biological, and human behavioral systems interact, and the repercussions which may follow human endeavors. The manner in which to approach decision and policy making related to global change.

GEOG 130 Developing Countries (3) An introduction to the geographic characteristics of the development problems and prospects of developing countries. Spatial distribution of poverty, employment, migration and urban growth, agricultural productivity, rural development, policies and international trade. Portraits of selected developing countries.

GEOG 140 Coastal Environments (3) Introduction to coastal environments, with emphasis on U.S. East Coast. Physical and ecological systems, beach processes, waves, currents, human impacts, coastal zone management and shoreline engineering. Case studies of coastal areas, including Ocean City, Maryland.

GEOG 201 Geography of Environmental Systems (3) A systematic introduction to the processes and associated forms of the atmosphere and earth's surfaces emphasizing the interaction between climatology, hydrology and geomorphology.

GEOG 202 Introduction to Human Geography (3) Introduction to what geographers do and how they do it. Systematic study of issues regarding social and cultural systems from a global to a local scale. Looks at the distribution of these variables and answers the question "Why here, and not there"?

GEOG 211 Geography of Environmental Systems Laboratory (1) Two hours of laboratory per week. Pre- or corequisite: GEOG201 or GEOL100 or GEOL120. A laboratory course to accompany GEOG 201. Analysis of the

components of the earth's energy balance using basic instrumentation; weather map interpretation; soil analysis; the application of map and air photo interpretation techniques to landform analysis.

GEOG 310 Maryland and Adjacent Areas (3) Credit will be granted for only one of the following: GEOG310 or GEOG321. Formerly GEOG 321. The physical environment, natural resources, and population in relation to agriculture, industry, transport, and trade in the State of Maryland and adjacent areas

GEOG 331 Introduction to Human Dimensions of Global Change (3) Prerequisites: GEOG201, GEOG202, ANTH220, or ANTH260; or permission of department. Credit will be granted for only one of the following: GEOG331 or GEOG361. Formerly GEOG 361. Introduction to global-scale interrelationship between human beings and the environment. The development of global issues including but not limited to the environment, food, energy, technology, population, and policy.

GEOG 332 Economic Geography (3) Credit will be granted for only one of the following: GEOG203, GEOG303, or GEOG332. Formerly GEOG 303. Principles of managing scarce resources in a world where everyone faces tradeoffs across both time and space. Focuses on the relationship between globalization processes and changing patterns of locational advantages, production, trade, population, socioeconomic and environmental grace and sustainability.

GEOG 342 Introduction to Biogeography (3) Prerequisite: GEOG201. Recommended: GEOG211. Credit will be granted for only one of the following: GEOG342 or GEOG347. Formerly GEOG 347. The principles of biogeography, including the patterns, processes and distributions of living organisms from local to global scales, aspects of ecophysiology, population and community ecology and evolutionary biology. Spatial processes in the biosphere will be covered.

GEOG 345 Introduction to Climatology (3) The geographic aspects of climate with emphasis on energy-moisture budgets, steady-state and non steady-state climatology, and climatic variations at both macro-and micro-scales.

GEOG 346 Cycles in the Earth System (3) Prerequisite: MATH140, AOSC/GEOG/GEOL123, or permission of department. Recommended: MATH141, PHYS141, PHYS161, or PHYS171. Also offered as AOSC346 and GEOL346. Credit will be granted for only one of the following: AOSC346, GEOG346, or GEOL346. The Earth System operates through some fundamental cycles such as water, energy, and the Carbon Cycle. This course will build on GEOL/GEOG/AOSC123 starting with concept of feedbacks within the Earth System, global energy balance and the Greenhouse Effect. A brief introduction to the atmospheric and oceanic circulation will lead to the water cycle connecting the land, ocean, and atmosphere to the Earth System. Introduction to the Global carbon, nitrogen, and sulfur cycles will be followed by the concept of long-term climate regulation and short-term climate variability. The concepts of cycles, feedbacks, forcings, and responses in the Earth System will be applied to Global Warming and Ozone Depletion.

GEOG 415 Land Use, Climate Change, and Sustainability (3) Prerequisite: GEOG123, GEOG306, or permission of department. Recommended: GEOG201/211, GEOG340, GEOG342, or GEOG331. Credit will be granted for only one of the following: GEOG415 or GEOG498D. Formerly GEOG 498D. The issues of climate change and land use change as two interlinked global and regional environmental issues and their implications for society and resource use are explored.

GEOG 418 Field and Laboratory Techniques in Environmental Science (1-3)

Prerequisite: permission of department. Credit will be granted for only one of the following: GEOG418 or GEOG448. Formerly GEOG 448. Lecture and laboratory learning each week. A variable credit course that introduces field and laboratory analyses in environmental science. Individual learning contract are developed with instructor.

GEOG 431 Culture and Natural Resource Management (3) Credit will be granted for only one of the following: GEOG421 or GEOG431. Formerly GEOG 421. Basic issues concerning the natural history of humans from the perspective of the geographer. Basic components of selected behavioral and natural systems, their evolution and adaptation, and survival strategies.

GEOG 435 Population Geography (3) Credit will be granted for only one of the following: GEOG422 or GEOG435. Formerly GEOG 422. The spatial characteristics of population distribution and growth, migration, fertility and mortality from a global perspective. Basic population-environmental relationships; carrying capacity, density, relationships to national development.

GEOG 436 Issues in Urban Transportation (3) Spatial patterns of personal travel, movement of goods, and public transit services in cities. Transportation and land use. Public policy issues; transportation access, energy use, and neighborhood disruption. Methods of data collection and analysis, travel demand surveys.

GEOG 442 Biogeography (3) Prerequisite: GEOG342 or equivalent. Recommended: GEOG123. Credit will be granted for only one of the following: GEOG442, GEOG447, or GEOG484. Formerly GEOG 447. Current Biogeographical topics of global significance, including a consideration of measurement techniques, and both descriptive and mechanistic modeling. Topics may include: scale in biogeography, climate and vegetation, global carbon cycle, biodiversity, interannual variability in the biosphere, land cover, global biospheric responses to climate change, NASA's Mission to Planet Earth and Earth Observation System.

GEOG 445 Climatology (3) Prerequisite: GEOG345. Credit will be granted for only one of the following: GEOG445 or GEOG446. Formerly GEOG 446. Quantitative investigations into the Earth's radiation balance, water cycle, and the interrelationship of climate and vegetation. Methodologies in climate research. Case studies related to global climatic change.

GEOL 120 Environmental Geology (3) Credit will be granted for only one of the following: GEOL100 or GEOL120. A review of geologic factors underlying many environmental problems and the interactions between population and physical environment: geologic hazards, land-use planning, conservation, mineral resources, waste disposal, land reclamation, and the geologic aspects of health and disease. The course is aimed at lower division students in education and liberal arts, and should be useful to any student concerned with geologic perspectives of environmental problems.

GEOL 123 Causes and Implications of Global Change (3) Also offered as AOSC123 and GEOG123. Credit will be granted for only one of the following: AOSC123, GEOG123, GEOL123, or METO123. This course offers a unique experience in integrating physical, chemical, geologic, and biological sciences with geographical, economic, sociological and political knowledge skills toward a better understanding of global change. Review of environmental science relating to weather and climate change, acid precipitation, ozone holes, global warming, and impacts on biology, agriculture, and human behavior. Study of the natural, long-term variability of the global environment, and what influence mankind may have in perturbing it from its natural evolution. Concepts of how physical, biological, and human behavioral systems interact, and the repercussions which may follow from human endeavors. The manner in which to approach decision and policy making related to issues of global change.

GEOL 214 Global Energy Systems and Resources (3) Prerequisite: A course in the natural sciences, environmental policy, geography, or permission of the instructor. Possible courses include: CPSP123, ENSP101, ENSP102, GEOG100, GEOG201, GEOL100, GEOL120, MATH140, or PHYS117, CHEM131 and CHEM132, CHEM135 and CHEM136, or CHEM103. Focuses on energy systems and resources on a global scale. It addresses energy transfer in natural systems, distribution of energy resources in the natural world, and problems of efficiency and limited energy resources. It is appropriate for those interested in science and technical energy issues as well as policy, education and the media.

GEOL 346 Cycles in the Earth System (3) Prerequisite: MATH140, AOSC/GEOG/GEOL123, or permission of department. Recommended: MATH141, PHYS141, PHYS171, or PHYS161. Also offered as AOSC346, GEOG346. Credit will be granted for only one of the following: AOSC346, GEOG346, or GEOL346. The Earth System operates through some fundamental cycles such as water, energy, and the Carbon Cycle. This course will build on GEOL/GEOG/AOSC123 starting with concept of feedbacks within the Earth System, global energy balance and the Greenhouse Effect. A brief introduction to the atmospheric and oceanic circulation will lead to the water cycle connecting the land, ocean, and atmosphere to the Earth System. Introduction to the Global carbon, nitrogen, and sulfur cycles will be followed by the concept of long-term climate regulation and short-term climate variability. The

concepts of cycles, feedbacks, forcings, and responses in the Earth System will be applied to Global Warming and Ozone Depletion.

GEOL 375 Introduction to the Blue Ocean (3) Prerequisite: MATH140. Recommended: MATH141, PHYS161, or PHYS171. Also offered as AOSC375. Credit will be granted for only one of the following: AOSC375, GEOL375, or METO375. Introduction to physical, chemical, and biological properties of the ocean. Role of the ocean in climate as a component of the Earth system. El Nino and the ocean, impact of global warming on the ocean and marine habitats including fisheries.

GEOL 437 Global Climate Change: Past and Present (3) Prerequisite: MATH115 or MATH140; GEOL100 or GEOL120, and one of the following: CHEM131 and CHEM132, CHEM135 and CHEM136, or CHEM103. The goal of the course is to highlight the fact that global climate change is part of the Earth's past as well as of its present and future. Changes in climate that have occurred in the geologic past can be viewed as the Earth's natural climate variability. These changes are different from, though could be linked with, historical and present anthropogenically-induced climate change. We will discuss the modern climate system, the factors capable of forcing climate change on various time scales, the geologic proxies of past climate change and what these proxies tell us. Finally, we will compare and contrast past climate change with what is understood (and not understood) about modern climate change.

GEOL 444 Low Temperature Geochemistry (4) Three hours of lecture and three hours of laboratory per week. Prerequisite: CHEM103, or CHEM135 and CHEM136; MATH115, GEOL100, and GEOL322. Basic chemical principles, thermodynamics, and kinetics of low-temperature inorganic and organic geochemical reactions in a wide range of surface environments. These geochemical tools will be used to provide a context for understanding elemental cycling and climate change. Laboratories will include problem sets as well as wet chemical and mass spectrometric techniques used in low temperature geochemistry.

GVPT 273 Introduction to Environmental Politics (3) A comprehensive overview of environmental problems, institutions, policies, practices, and remedies found in present-day world society, with special emphasis on environmental matters as objects of American public policy, both domestic and foreign.

GVPT 306 Global Ecopolitics (3) Prerequisite: GVPT200. Consideration of global problems such as the growth controversy, agricultural productivity, pollution, resource depletion, the energy crisis, and the general impact of science and technology on the world ecological, socio-economic, and political system, with particular emphasis on such matters as objects of public policy.

HIST 405 Environmental History (3) An introduction to the key issues and methods of environmental history. The scope of the subject is discussed, as well as its relationship with other disciplines, such as ecology, anthropology, and geography. A primary focus is environmental change in history with emphasis on the American experience.

LARC 160 Introduction to Landscape Architecture (3) Two hours of lecture and one hour of discussion/recitation per week. History, theory, philosophy and current practice of the profession of landscape architecture. Explores the interactive relationship between humans and their environment by examining people's perceptions of and changing attitude towards the landscape, as well as, an examination of how these are related to ecological and cultural influences.

LARC 265 Site Analysis and Ecological Principles (3) Two hours of lecture and one hour of discussion/recitation per week. Prerequisite: LARC141 and Permission of LARC program. Corequisite: LARC240 and LARC221. Sophomore standing. For LARC majors only. Credit will be granted for only one of the following: LARC265 or ARCH460. Principles and methods of site analysis with an emphasis on the application of ecological principles in landscape architecture, architecture and planning.

LARC 440 Urban Studio Design (5) Two hours of lecture and six hours of laboratory per week. Prerequisites: LARC321, LARC340, and LARC341. For LARC majors only. The landscape architect's role within the interdisciplinary urban design process, focusing on urban site design issues. Pedestrian friendly site design and the future of sustainable development will be studied.

LARC 450 Environmental Resources (3) Prerequisite:NRSC200 or permission of department. A review of ecosystems and an examination of planning strategies for preservation, conservation, management and development of sensitive natural and cultural landscape resources in the mid-Atlantic region.

LARC 451 Sustainable Communities (3) Explores concepts, strategies and examples of community design which address the needs of a growing population while preserving the environment and its resources.

NFSC 470 Community Nutrition (3) Two hours of lecture and three hours of discussion/recitation per week. Prerequisites:NFSC100 or NFSC200; and NFSC315. Formerly NUTR 470. Perspectives underlying the practice of nutrition services in community settings. Assessment of needs, program planning and evaluation. Programs and strategies to meet nutrition needs outside the acute care setting, such as nutrition education and food assistance. National nutrition policy and federal initiatives in nutrition will be examined. Students will be required to travel to local community nutrition sites during the semester.

PHIL 261 Philosophy of the Environment (3) Not open to students who have completed HONR218F or PHIL209N. Formerly HONR 218F. An evaluation of different kinds of arguments for the claim that the natural environment should be preserved. Perspectives cut across the disciplines of philosophy (environmental ethics, philosophies of nature), economics (cost-benefit analysis), and biology (evolution, ecology, environmental studies).

PHYS105 Physics for Decision Makers: The Global Energy Crisis; (3) CORE Physical Science (PS) Course. Human society require In this marquee course, we will take a scientific perspective to study questions related to the global energy crisis: What is energy? What are the basic laws of thermodynamics, and how do they constrain our understanding of energy production? How is electricity produced and distributed? What is a greenhouse gas? With an understanding of these facts, we will then address more difficult questions. What options exist for addressing global warming? This course will give tomorrow's decision makers the basic tools needed to make informed, rational choices about the world's future energy policy. The course is aimed at the non-sciencemajor.

PLSC 101 Introductory Crop Science (4) Two hours of lecture and two hours of laboratory per week. Credit will be granted for only one of the following: AGRO100 and AGRO102; or AGRO101 or PLSC101. Formerly AGRO 101. Major crop plants including: anatomy, physiology, morphology, history, use, adaptation, culture, improvement and economic importance.

PLSC171 Introduction to Urban Ecosystems; (3) *Not open to students who have completed NRSC271. Credit will be granted for only one of the following: NRSC171, NRSC271, or PLSC171. Formerly NRSC171.* The diverse and significant impacts of strategically maintaining greenspace within communities will be highlighted. Students learn about the role of green infrastructure in relation to quality of life and environment. Also taught are basic principles central to urban ecosystems, which contain vegetation, natural resources, the built environment and are dominated by people. The impacts of science, community development, landscape management, public policies, laws and their interactions on sustainability are studied.

PLSC 400 Environmental Plant Physiology (3) Two hours of lecture and two hours of laboratory per week. Not open to students who have completed NRSC401. Formerly NRSC 401. An introduction to the basic physical and physiological principles necessary for understanding the interactions between plants and their environment. The overall objective is to understand plant responses and adaptations to the environment and the ecological relevance of these responses.

PLSC 406 Forage Crops (3) Prerequisite: BSCI105. Recommended: BSCI106. World grasslands and their influence on early civilizations; current impact on human food supply; role of forages in soil conservation and a sustainable agriculture. Production and management requirements of major grass and legume species for silage and pasture for livestock feed. Cultivar development, certified seed production and distribution.

PLSC 471 Forest Ecology (3) Prerequisite: BSCI106 or PLSC201. An understanding of the forest ecosystem, its structure and the processes that regulate it are provided. It also considers changes that occur in forests, the interaction of environment and genetics in promoting ecosystem sustainability, and the role of human influences on urban forest ecosystems.

PLSC 475 Silviculture (4) Three hours of lecture and two hours of laboratory per week. Prerequisite: PLSC100 or BSCI106; or permission of instructor. Recommended: PLSC253 or PLSC254. Junior standing. Silviculture is the science of forest stand dynamics and the biotic and abiotic factors affecting it. Issues addressed will be related to forest stand development, from regeneration to harvesting and the sustainable management for multiple uses. Topics covered will be related to natural and managed stands in both rural and urban environments.

SOCY 305 Scarcity and Modern Society (3) Prerequisite: three credits of sociology. Resource depletion and the deterioration of the environment. Relationship to lifestyles, individual consumer choices, cultural values, and institutional failures. Projection of the future course of American society on the basis of the analysis of scarcity, theories of social change, current trends, social movements, government actions, and the futurist literature.

SOCY 456 Sociology of Consumerism (3) Prerequisites: SOCY 203 and three additional credits of sociology or permission of department. Issues relating to consumerism. Among the issues to be explored are advertising, the settings in which we consume, what we consume and why, the changing nature of consumption.

UNIV 188 Introduction to Global Communities (1) Prerequisite: Admittance to the Global Communities Program. Repeatable to 2 credits if content differs. Students to explore culture, identity, value construction and contemporary issues in global society.

URSP 100 Challenge of the Cities (3) Formerly URBS 100. Contemporary urban patterns, trends and problems. Major urban issues, such as: population change, the economy, land use, housing, neighborhood development, fiscal and unemployment crises, and social, environmental, and political controversies of metropolitan areas. International urbanization patterns and policies.

URSP 320 Planning and the Contemporary City (3) Prerequisite: URSP240. Credit will be granted for only one of the following: URSP320, URBS220, or URBS320. Formerly URBS 320. A survey of major social, economic, technological and environmental factors influencing the current form of the United States city and the well being of its inhabitants. Emphasis on understanding ways of analyzing urban issues and evaluating alternative planning and policy options.

WRLD 135 To Stem the Flow: The Nile, Technology, Politics and the Environment (3) Two hours of lecture and one hour of discussion/recitation per week. Students may count this course for CORE in ONE of three areas: Life Sciences, non-lab {LS} Physical Sciences, non-lab {PS} Social or Political History {SH}. Credit will be granted for only one of the following: UNIV138A or WRLD135. Formerly UNIV 138A. This interdisciplinary, team-taught course looks at the interplay of engineering, the environment, biological communities, and politics from the historical context of Egyptian development of the Nile River Valley and the Aswan High Dam.

Graduate-level Courses (600-899)

ARCH 601 Topical Studio (6) Prerequisite: ARCH 600. For ARCH majors only. Topical architectural design studio with concentration on advanced theoretical, programmatic, contextual, and/or technical issues, with topical inquiry addressing but not limited to: architectural competitions, housing, sustainable design, collegiate architecture, regional architecture, classicism versus modernity.

ENCE 672 Regional Transportation Planning (3 credits) Prerequisite: ENCE 471 or permission of instructor. Factors involved and the components of the process for planning statewide and regional transportation systems, encompassing all modes. Transportation planning studies, statewide traffic models, investment models, programming and scheduling.

ENCE 674 Urban Transit Planning and Rail Transportation Engineering (3 credits) Prerequisite: ENCE 471 or permission of instructor. Basic engineering components of conventional and high speed railroads and of air cushion and other high speed new technology. The study of urban rail and bus transit. The characteristics of the vehicle, the

supporting way, and the terminal requirements will be evaluated with respect to system performance, capacity, cost, and level of service.

ENCE 675 Airport Planning and Design (3 credits) Prerequisite: ENCE 471 or permission of both department and instructor. The planning and design of airports including site selection, runway configuration, geometric and structural design of the landing area, and terminal facilities. Methods of financing airports, estimates of aeronautical demand, air traffic control, and airport lighting are also studied.

ENME 632 Advanced Convection Heat Transfer (3) [Offered by UMERC]. Prerequisites: {ENME 315; and ENME 321; and ENME 342; and ENME 343} or permission of instructor. Also offered as ENNU 615. Credit will be granted for only one of the following: ENNU 615 or ENME 632. Statement of conservation of mass, momentum and energy. Laminar and turbulent heat transfer in ducts, separated flows, and natural convection. Heat and mass transfer in laminar boundary layers. Nucleate boiling, film boiling, Leidenfrost transition and critical heat flux. Interfacial phase change processes; evaporation, condensation, industrial applications such as cooling towers, condensers. Heat exchangers design.

ENME 635 Energy Systems Analysis (3) [Offered by UMERC]. Prerequisites: ENME 633 or equivalent or permission of instructor. Rankine cycles with nonzeotropic working fluid mixtures, two-multi-, and variable stage absorption cycles and vapor compression cycles with solution circuits. Power generation cycles with working fluid mixtures. Development of rules for finding all possible cycles suiting a given application or the selection of the best alternative.

ENME808D Advanced Topics in Mechanical Engineering: Sustainable Energy Production and Utilization; (3) [Offered by UMERC]

ENNU648H Special Problems in Nuclear Engineering: Advanced Nuclear Physics and Engineering; (3) [Offered by UMERC]

ENNU 651 Risk and Performance Based Technologies (3) [Offered by UMERC]. Prerequisite: ENNU 605, ENNU 620, ENNU 625. Also offered as ENRE 670. Why study risk, sources of risk, probabilistic risk assessment procedure, factors affecting risk acceptance, statistical risk acceptance analysis, psychometric risk acceptance, perception of risk, comparison of risks, consequence analysis, risk benefit assessment. Risk analysis performed for light water reactors, chemical industry, and dams. Class projects on risk management concepts.

Other Resources Include:

- Joint Global Change Research Institute <http://globalchange.umd.edu>
- Center of Integrated Environmental Research <http://www.cier.umd.edu>
- Earth System Science Interdisciplinary Center <http://www.essic.umd.edu>
- EcoHouse <http://www.ecohouse.umd.edu>
- Sustainability at UMCP <http://www.sustainability.umd.edu>
- Department of Atmospheric & Oceanic Sciences. <http://www.atmos.umd.edu>
- Uni. of Maryland Energy Research Center. <http://www.umerc.umd.edu>
- Solar Decathlon
- Center for Environmental Energy Engineering. <http://www.enme.umd.edu/ceee>
- Engineers without Borders at UMCP