

## List of Undergraduate Water Courses

### AAEC 3004 Agricultural Production & Consumption Economics

The economic principles of production. Applications to decision-making and the allocation of resources for the agricultural firm. Consumer behavior and demand for agricultural products. Pre: AAEC 1005. (3H,3C) II.

### AAEC 3014 Analytical Methods of Applied Economics

Quantitative methods used in applied empirical economic analysis including simple and multiple regression, estimation and application of elasticity, decision analysis, economic simulations, linear programming, and risk analysis. Analysis using spreadsheets stressed. Pre: STAT 3005 or BIT 2405 or STAT 3615. (3H,3C)

### AAEC 3314 Environmental Law

Principles of law involved in environmental issues, survey of environmental litigation, legislation and administrative rulings. Law topics include natural resources, water pollution, private land use, air pollution, toxic substance, food, drug, pesticides, and biotechnology. (3H,3C) II.

### AAEC 3324 Environment and Sustainable Development Economics

Economics of environment and sustainable development. Topics include economic efficiency, property rights, externalities, benefit-cost analysis, economic evaluation procedures, public and private conflicts in land use, water quality, and international growth/development/environmental issues. Pre: AAEC 1005 or ECON 2005. (3H,3C)

### AAEC 3604 Agricultural Law

Legal problems of farm and agribusiness management. Practical application of principles of contracts, negligence, debt instruments and commercial transactions of the farm and agribusiness organization. Selected state and federal laws regulating the farm and agribusiness sector; basic animal laws including state and federal regulation of agricultural sector. I (3H,3C)

### AAEC 4314 Environmental Economic Analysis & Management

Quantitative methods and computer-aided tools used in the economic analysis of environmental/natural resource issues. Economic concepts and analytical tools will be applied to realistic, problem-solving situations. Topics include cost effectiveness analysis, benefit-cost analysis, economic simulations, and statistical analysis. Pre: AAEC 3324 or ECON 4014 or FOR 3424 or FREC 3424. (3H,3C) II.

### AAEC 4344 Sustainable Development Economics

Sustainable development concepts are critically explored particular emphasis on implications for domestic and international sustainable development agriculture and for economic development. Students investigate case studies illustrating problems of sustainable development and potential policy solutions. I Pre: (AAEC 3324 or AAEC 3004 or ECON 4014). (3H,3C)

#### ALS 3404 Ecological Agriculture Theory & Practice

Presents an overview of historic and modern agricultural practices. Surveys the principles of ecology in the context of managed ecosystems, civic agriculture, and food systems. Explores ecologically based practices and their use in holistic and integrated agricultural systems. Pre: ALS 2204. (2H,3L,3C)

#### ALS/HORT 4714 Global Seminar

Student-centered internet-based course including text and real-time video conferencing among students at collaborating institutions in the United States and Canada. Focus is contemporary North American environmental sustainability issues based on student-prepared case studies. Pre-requisite: Junior or Senior Standing required. (1H,1C)

#### ALS/NR 4614 Watershed Assessment, Management, and Policy

Multidisciplinary perspectives of assessment, management and policy issues for protecting and improving watershed ecosystems. Topics include: monitoring and modeling approaches for assessment, risk-based watershed assessment geographic information systems for watershed analysis, decision support systems and computerized decision tools for watershed management, policy alternatives for watershed protection, urban watersheds, and current issues in watershed management. Pre: Two 4000 level courses in environmental/natural resource science, management, engineering, and/or policy in BSE, CEE, FOR, FREC, GEOL, LAR, CSES, ENT, BIOL, GEOG, AAEC, UAP or equivalent. (2H,2C)

#### BIOL 4004 Freshwater Ecology

Interactions of physical, chemical, and biological properties of freshwater ecosystems. Pre: BIOL 2804. (3H,3L,4C)

#### BIOL 4114 Global Change Ecology

Effects of human alteration of climate, landscapes and biogeochemical cycling on ecological structure and functioning at the global scale. Influence of global changes on ecosystem processes and biodiversity with paleo- and contemporary examples. Current and future potential feedbacks between biological systems and the global environment. Pre: BIOL 2704, BIOL 2804. (3H,3C)

#### BIOL 4454 Invertebrate Zoology

Identification, morphology, evolutionary relationships, and natural history of free-living invertebrates, excluding insects. Pre: BIOL 2504. (3H,3L,4C)

#### BIOL/CSES/ENSC 4164 Environmental Microbiology

Ecology, physiology, and diversity of soil and aquatic microorganisms; incorporates the significance of these topics within the context of environmental applications such as bioremediation, wastewater treatment, control of plant- pathogens in agriculture, and pollution abatement in natural systems. The laboratory portion of the course will stress methodology development, isolation and characterization of microorganisms from natural and engineered systems, and examination of the roles of microorganisms in biogeochemical cycling. Pre: BIOL 2604. (2H,3L,3C)

#### BIOL/ENT 4354 Aquatic Entomology

Biology and taxonomy of insects and other macroinvertebrates most commonly encountered in freshwater environments. Selected aspects of biology, such as habitat, feeding, locomotion, and life history. Identification of individual taxa, mostly at family and genus level. Significance of these organisms in aquatic ecology, pollution monitoring, and natural resource management. Pre: (BIOL 1005, 1006), (BIOL 1015, 1016) or (BIOL 1105, 1106, 1115, 1116). (3H,3L,4C)

#### BSE 3324 Small Watershed Hydrology

Precipitation, soil physics, infiltration, evapotranspiration, groundwater hydrology, overland flow, open channel flow, flow routing, hydraulic analysis. Course requirements may be satisfied by taking CEE 3304 or CHE 3114 or ESM 3234 or ESM 3024 or ME 3404 prior to or concurrent with course. (3H,3C)

#### BSE 3334 Nonpoint Source Assessment & Control

Erosion prediction and control; transport and fate of sediment, nutrients, and microorganisms; design of nutrient management plans, wetlands, detention facilities and other management practices for rural and urban nonpoint source pollution control. Pre: BSE 3324. (2H,3L,3C)

#### BSE 4224 Field Methods in Hydrology

Site characterization: surveying, channel and floodplain mapping, land use, electronic data acquisition. Techniques for measuring surface and subsurface hydrologic processes: water flow, hydrologic conductivity, precipitation, evaporation. Sampling techniques: surface water, groundwater, and soil pore water sampling. In-situ monitoring: automatic samplers, dataloggers, water quality sondes. Laboratory analyses: good laboratory practices, selection of analytical method, calibration, quality assurance/quality control. Co: BSE 3324 or CEE 3314 or FOR 4354. (2H,3L,3C)

#### BSE 4304 Nonpoint Source Pollution Modeling & Management

Concepts, principles and application of modeling and monitoring for assessment and management of nonpoint source pollution. Design and implementation of monitoring systems. Concepts of modeling agroecosystems and land use impacts on hydrologic/water quality response of upland catchments. Model selection, calibration, validation, and application for comparative analysis. Screening models using Geographic Information Systems. Case studies in current watershed management issues, with a focus on agricultural waste and nutrient management, using existing field and watershed models. Pre: BSE 3334. (2H,3L,3C)

#### BSE 4394 Water Supply & Sanitation in Developing Countries

Social, economic and engineering principles of water supply and sanitation in developing countries as affected by climate, cultural and sociological factors, and material and financial resources. Pre: CEE 3104. (3H,3C)

#### CEE 3104 Introduction to Environmental Engineering

Overall view of environmental engineering with emphasis on hazardous waste management, water treatment, wastewater treatment, air pollution and its control, solid waste management, groundwater pollution and environmental regulations. A grade of C- or better required in pre-requisites. Pre: (CHEM 1035 or CHEM 1074), (CHEM 1045 or CHEM 1084), (MATH 1206 or MATH 1206H or MATH 1226 or MATH 2016 or MATH 2024), (PHYS 2305 or PHYS 2205). (3H,3C)

#### CEE 3274 Intro Land Development Design

An introduction to the land development design process including site selection and feasibility, environmental considerations, utility layout, grading, stormwater management and integrating planning with the design of infrastructure to support residential and commercial development. A grade of C- or better in prerequisite. Pre: CEE 2814. (3H,3C)

#### CEE 3304 Fluid Mechanics for Civil and Environmental Engineering

Hydrostatics; fluid motion; continuity, momentum, and energy equations; viscous effects; applications to pipe networks and hydraulic systems, including open channel flow. Laboratory experiments and demonstrations. A grade of C- or better in pre-requisite ESM 2104. Pre: ESM 2104. (3H,2L,3C)

#### CEE 3314 Water Resources Engineering

Open channel flow; hydrology; hydraulic modeling; hydraulic machinery and structures; laboratory experiments and demonstrations. A grade of C- or better required in pre-requisite 3304. Pre: CEE 3304. (3H,2L,3C)

#### CEE 4104 Water & Wastewater Treatment Design

Design of municipal water and wastewater treatment plants. Emphasis on characterization of water and wastewater and physical, chemical, and biological treatment methods. Sludge processing advanced treatment methods and treatment plant hydraulics are considered. A grade of C- or better required in prerequisites. Pre: CEE 3104, CEE 3304. (3H,3C)

#### CEE 4114 Fundamentals of Public Health Engineering

Public health engineering principles for protection against biological and chemical health hazards. Emphasis on major communicable diseases that plague mankind, organisms that cause them, routes of transmission, and engineering methods of control. Appropriate control methods for rural areas and developing countries. A grade of C- or better required in pre-requisite. Pre: CEE 3104. (3H,3C)

#### CEE 4134 Engineering Solutions for Environmental Sustainability

Quantitative methods to evaluate environmental sustainability using a systems approach. Sustainability assessment frameworks, orientors and indicators, indicators of sustainable development, green-house gas emissions, renewable energy systems, whole-system design, economic systems and input-output techniques, system dynamics models, emergence and agent-based models. Class project requiring integration of environmental, economic and social systems using system dynamics and agent-based models. Senior Standing. Pre: MATH 2214. (3H,3C)

#### CEE 4174 Solid & Hazardous Waste Management

Introduction to the problems, regulations and techniques associated with the management of solid and hazardous waste. Composition, volume and characterization of the wastes. Design of collection and disposal systems, including landfills, solidification/stabilization and incineration. A grade of C- or better required in pre-requisite 3104. Pre: CEE 3104. (3H,3C)

#### CEE 4264 Sustainable Land Development

An introduction to the modern techniques for developing land while maintaining a focus on long-term sustainability. Topics include site layout, stormwater impact, air quality and microclimate, living resources, LEED and EarthCraft development standards. Pre-requisite: Senior Standing required (3H,3C)

#### CEE 4304 Hydrology

Precipitation, evaporation, consumptive use, infiltration; stream flow, flood routing; statistical analysis of hydrologic data, flood and drought forecasting, risk analysis, subsurface flow, well hydraulics, introduction to urban drainage design. A grade of C- or better required in pre-requisite. Pre: CEE 3304. (3H,3C)

#### CEE 4314 Groundwater Resources

Fundamentals of groundwater hydrology; flow through porous media, both saturated and unsaturated; flow to wells in both confined and unconfined aquifers; seepage of groundwater to canals and field drains; analysis of aquifer test data to quantify flow and storage parameters; contaminants in groundwater, basic introduction to groundwater modeling. A grade of C- or better required in prerequisite CEE 3304. Pre: CEE 3304. (3H,3C)

#### CEE 4324 Open Channel Flow

Mechanics of open channel flow, including uniform flow, gradually varied flow, channel transitions, and unsteady flow. Pre: CEE 3314. (3H,3C)

#### CEE 4344 Water Resources Planning

Analysis of the water resources planning process and the institutional framework for water resources management. Criteria and procedures for evaluating management alternatives are examined, with emphasis on assessment of economic and environmental impacts. Senior standing required. (3H,3C)

#### CSES 3614 Soil Physical & Hydrological Properties

Soil physical and mechanical properties and the physical processes controlling soil water retention and flow in agronomic and natural settings. Grain size distribution, weight-volume relationships, specific surface, electrical charge density, consistency, stress, compaction, rainfall runoff, water retention, steady/non-steady water flow in saturated/unsaturated soil, infiltration, bare soil evaporation, and soil water balance. Pre: (CSES 3114, CSES 3124) or (GEOS 3614, GEOS 3624). (3H,3C)

#### CSES 4644 Land Based Systems for Waste Treatment

Soils as a medium for waste treatment; potential for environmental degradation from biologicals and chemicals added to soils; development of land-based treatment and utilization systems for solid and liquid wastes; issues and concerns relating to large-scale applications of municipal and industrial wastes to land. (3H,3C)

#### CSES/BIOL/ENSC 4164 Environmental Microbiology

Ecology, physiology, and diversity of soil and aquatic microorganisms; incorporates the significance of these topics within the context of environmental applications such as bioremediation, wastewater treatment, control of plant- pathogens in agriculture, and pollution abatement in natural systems. The laboratory portion of the course will stress methodology development, isolation and characterization of microorganisms from natural and engineered systems, and examination of the roles of microorganisms in biogeochemical cycling. Pre: BIOL 2604. (2H,3L,3C)

#### CSES/ENSC 3634 Physics of Pollution

Physical processes that control the fate of pollutants in our land, air, and water resources. Types and sources of pollutants, physical processes in the soil-water-atmosphere continuum controlling the dispersion and deposition of pollutants, the movement of pollutants, including radionuclides, by surface and subsurface water flow in soils, and physics of disturbed soils. Pre: CSES 3114, PHYS 2205, (MATH 2016 or MATH 2024). (3H,3C)

#### CSES/ENSC/CHEM 4734 Environmental Soil Chemistry

Chemistry of inorganic and organic soil components with emphasis on environmental significance of soil solution-solid phase equilibria, sorption phenomena, ion exchange processes, reaction kinetics, redox

reactions, and acidity and salinity processes. Pre: CSES 2114, CSES 3124, CHEM 2514 or CHEM 2535, CHEM 2114, (MATH 2015 or MATH 1026). (3H,3C)

#### CSES/GEOG/GEOS 3304 Geomorphology

Examines the variety of landforms that exist at the earth's surface. Detailed investigation of major processes operating at the earth's surface including: tectonic, weathering, fluvial, coastal, eolian, and glacial processes. Field excursion. Pre: GEOG 1104 or GEOS 1004 or GEOS 2104. (3H,3C)

#### ENSC 3604 Fundamentals of Environmental Science

Interrelationships between human activities and the environment; provides national and global perspective; emphasis is on the physical, chemical, and biological principles and processes that are essential to an understanding of human-environment interactions; the role of energy in human and natural systems; environmental legislation and human behavior. Pre: BIOL 1105 or CHEM 1035. (3H,3C)

#### ENSC 4314 Water Quality

Provide comprehensive information on the physical, chemical, biological, and anthropogenic factors affecting water quality, fate and transport of contaminants in water, water quality assessment and management, and current water quality policies. (3H,3C)

#### FIW 4534 Ecology & Management of Wetland Systems

Introduction to the variety of wetland systems found in North America, though emphasis will focus on eastern and mid-Atlantic wetland systems. Origin and processes of formation of wetlands, functions and values of wetlands, wetland delineation, wetland classification, regulatory processes affecting wetlands. Objectives of and management techniques used to protect and/or manipulate wetland systems for wildlife and other human needs. Enrollment restricted to junior, seniors and graduate students. Pre: BIOL 3204. (2H,3L,3C)

#### FIW 4614 Fish Ecology

Interactions of fish with the physical and biological environment. Adaptations of organisms, populations, and communities. Impacts of human activities on major aquatic ecosystems and important fishes. Ecological principles for management of important sport, commercial, and prey fishes. Pre: BIOL 1006. (3H,3C)

#### FIW 4624 Marine Ecology

Marine organism, biological, ecological, chemical and physical processes of marine ecosystems in open sea, coastal and benthic environments, research methods and models in marine ecosystem simulation; fisheries in a dynamic ecosystem: human interference and conservation. Pre: BIOL 2804 or GEOS 3034. (3H,3C)

#### FIW 4714 Fisheries Management

History, theory, and practice of fisheries management. Emphasis on basic strategies used in effective management and setting management objectives. Synthesis of fish population dynamics and manipulation, habitat improvement, and human management to achieve objectives. Case studies of major fisheries. Pre: FIW 3514. (3H,3L,4C)

#### FREC 2124 Forest, Society & Climate

Role of forest ecosystems on the global carbon cycle, climate, biodiversity and economies. Anthropogenic impacts on forest ecosystems and their ecological function in the face of changing

climate. Climate-related threats to global forests, including loss of biodiversity, deforestation, forest fires, and invasive species. Sustainable forest management for anticipated future scenarios. (3H,3C)

#### FREC 3104 Principles of Watershed Hydrology

Study of hydrology in watersheds. Qualitative and quantitative principles of physical hydrological processes governing the movement, storage, and transformation of water on the Earth's surface as influenced by watershed characteristics, including human modifications. Pre: Junior Standing Pre: (MATH 1206 or MATH 1226) or (MATH 2015 or MATH 1026). (3H,3C)

#### FREC 3604 Climate Science

Physical and biological principles that govern Earth's climate with applications to natural resource management. Mechanisms explaining the causes of past and future climate change. Concepts of system dynamics as applied to the analysis of the climate system. Current and future effects of climate on ecosystem functioning and the associated provision of natural resources. Junior Standing. Pre: MATH 1026 or MATH 1206 or MATH 1226 or MATH 2015. (3H,3C)

#### FREC 3754 Watersheds and Water Quality Monitoring

Delivery of water quality constituents from watersheds to water bodies (streams, lakes, and estuaries). Field monitoring methods to assess watershed drivers and how they affect water quality and aquatic ecosystem condition. Linkages among water quality, watershed characteristics, land use and management, and climate. Design of watershed monitoring programs to guide watershed management for protecting water quality and ecological condition of aquatic systems. Pre: BIOL 1106, CHEM 1035, (FREC 2004 or FREC 2114 or FREC 3314 or BIOL 2804 or ENSC 360 4). (3H,3C)

#### FREC 4014 Natural Resources Economics

Examination of domestic and international natural resource use, exploitation, and degradation problems, with special focus on use of economics to understand why potential overuse of natural resources exists, and what policy options are available to correct these problems and ensure sustainable natural resource use over time. Water, forests, fisheries, land and exhaustible resources. Permission of instructor may be substituted for the pre-requisite. Pre: ECON 2005 or AAEC 1005. (3H,3C)

#### FREC 4354 Forest Soil and Watershed Management

Properties and processes of soil and water in forests. Emphasis on management for the delivery of ecosystem goods and services. Includes analysis and interpretation in field and laboratory. Pre: CSES 3114 or ENSC 3114 or GEOS 3614 or CSES 3134 or ENSC 3134. (2H,3L,3C)

#### FREC 4374 Forested Wetlands

Classifications, jurisdictional delineation, and management options of forested wetlands. Relationship of hydrology, soils, and vegetation to ecosystem processes, societal values, and management with regard to environmental and legal considerations and best management practices. Emphasis is on forested wetlands in the southern U.S., but national and international wetlands are included. Pre: CSES 3114 or CSES 3134. (3H,3C)

#### FREC 4464 Water Resources Policy & Economics

Economic concepts to understand public and private decisions about water use. Current water policies and law. Analytical tools to evaluate policies and address management challenges. Water markets, climate change, and environmental flows. Pre: AAEC 1005. (3H,3C)

#### FREC 4784 Wetland Hydrology and Biogeochemistry

Water flows creating wetland hydrologic regime. Hydrologic controls on wetland processes. Linkages between hydrology and biogeochemical cycles. Carbon, nitrogen, phosphorus, and other element cycles within and across wetland boundaries. Field methods to assess hydrologic regime and biogeochemical cycles. Ecosystems services from hydrologic and biogeochemical processes. Applications of wetland hydrology and biogeochemistry in wetland restoration, delineation, and creation. Co: FREC 4374 or FIW 4534 or CSES 4854 or ENSC 4854. (3H,3C)

#### FREC/SBIO 2784 Global Forest Sustainability

A socio-economic approach to examining the management and use of the world's forests, enhance knowledge of global forest resources and products, and understand the roles and relationships of key stakeholders. (3H,3C)

#### GEOG 3104 Environmental Problems & Population Development

Environmental problems in their social, spatial, and global contexts. Impacts of globalization, population, culture, and poverty on environmental crises. Examination of effects of relations between developed and developing countries on the environment. Focus on selected key environmental issues, such as population growth, agriculture, energy and biofuels, pollution, disasters, land use, and environmental justice. (3H,3C)

#### GEOG 4204 Geography of Resources

Physical and cultural systems that influence the spatial distribution of resources and resource use. Emphasis on historical and current contexts of natural resources use and perspectives in the United States, with consideration of worldwide distributions of resources. Environmental cognition and perception, water, public lands, conservation and preservation, food and hunger, human population, and alternative energy. Junior Standing. (3H,3C)

#### GEOG/GEOS 1514 Introduction to Meteorology

Introduction to the foundational properties and processes of Earth's atmosphere and the consequential forms and patterns of weather, including atmospheric composition and structure, energy, humidity, clouds and precipitation processes, atmospheric motion, air masses, fronts, and cyclones, and severe weather and hurricanes. (3H,3C)

#### GEOG/NR 2004 Introduction to Water Resources and Environmental Issues

Introduction to the hydrologic cycle, water resources, and related environmental issues. Emphasis on relationships between human needs for and effects upon water including: factor influencing water quality, droughts, and floods; water for health, energy, and food; water laws, allocation, and conflict; water resources and climate change; and potential solutions for these and other critical water issues. Pre: Sophomore-level standing. (3H,3C)

#### GEOS 3014 Environmental Geosciences

The roles of geology and geophysics in defining and monitoring the natural environment, with special application to interactions between humans and the geologic environment. Both descriptive treatment and quantitative concepts related to environmental processes involving the solid earth and earth's surface, with emphasis on geologic hazards (e.g., earthquakes, volcanoes, landslides and slope failures, flooding, groundwater problems, mineral and rock dusts). Pre: GEOS 1004 or GEOS 1024 or GEOS 2104. (3H,3C)



#### GEOS 4634 Environmental Geochemistry

Application of quantitative methods of thermodynamic and physicochemical analysis to the study of the distribution and movement of chemical elements in surface and near-surface geological environments. Emphasis on practical approaches to environmental geochemistry. Pre: (MATH 1205 or MATH 1225), CHEM 1036. (2H,3L,3C)

#### GEOS 4804 Groundwater Hydrology

Physical principles of groundwater flow, including application of analytical solutions to real-world problems. Well hydraulics. Geologic controls on groundwater flow. Pre: (PHYS 2205 or PHYS 2305), (MATH 1206 or MATH 1226 or MATH 2016 or MATH 2024). (2H,3L,3C)

#### IS 4014 Seminar in Grassroots Development

Utilizes development, gender, and social theory to examine the impact of aid programs on communities in the Third World. Analyzes such issues as the impact of development projects in agriculture, natural resources, and employment on the local people, the impact of aid on women; and the policies and administrative structures that direct the world of international development. (3H,3C)

#### LAR 3154 Watershed Sensitive Design & Construction

Examines soil and water resource issues related to landscape architectural site planning and design. Key topics include watershed sensitive site design, estimation and management of storm water runoff, rainwater conservation, design of open channel conveyances for site planning applications, and erosion and sedimentation control. Pre-requisite: LAR 2164 or consent of instructor Pre: LAR 2164. (2H,4L,4C)

#### ME/ESM 4194 Sustainable Energy Solutions for a Global Society

Addresses energy metrics, global and US energy supply and demand, transitional energy sources (natural gas, petroleum, coal, nuclear), sustainable/renewable source (solar, geothermal, hydro, tidal, wind, biofuels), and methods for increasing efficiencies (energy storage, batteries, green building, conservation). Options for transportation, electricity, lighting and heating needs of industry, agriculture, community, and citizens. Production, transmission, storage, and disposal issues considered in the context of global political, economic, and environmental impacts. Senior Standing in major may be substituted for pre-requisite ENGL 3764. Pre: (CHEM 1035 or CHEM 1055), PHYS 2306, ENGL 3764. (3H,3C)

#### NR 4444 Practicing Sustainability

Practicum in sustainability. Synthesize and integrate knowledge from undergraduate career and apply to real world problems of sustainability. Topics and projects selected from opportunities to examine specific local and regional sustainability issues on the VT campus, in the New River Valley and the Commonwealth at large. Pre-requisite: Senior Standing required. (3H,3C)

#### PSCI/UAP 3344 Global Environmental Issues: Interdisciplinary Perspectives

Critical examination of major global environmental problems (e.g., global warming, atmospheric ozone depletion, acid rain, tropical deforestation, toxic waste) with emphasis on their social, economic, political, ethical, and policy implications and solutions. Completion of Area 4 of University Core required. (3H,3C)

#### UAP 3224 Policy Implementation

Systematic analysis of the field and practice of public policy implementation. Includes analysis of the structure and dynamics of the policy process as well as specific analytic approaches to understanding

policy implementation. Includes analysis of intra-organizational, interorganizational and intergovernmental implementation processes. Must complete prerequisites UAP 3014 (B- or higher) or 3354, and UAP 3024 (B- or higher). Pre: UAP 3024, (UAP 3014 or 3354). (3H,3C)

#### UAP 3354 Introduction to Environmental Policy & Planning

Introduction to the interdisciplinary principles of environmental policy, planning, economics, and ethics to address pollution abatement, resources conservation, habitat protection, and environmental restoration. The course will focus on practical means of identifying environmental problems and creatively solving them. (3H,3C)

#### UAP 4184 Community Involvement

Issues, concepts, and techniques of citizen participation in community development. Institutional frameworks and their historical precedents. Exercises developing group communications skills, public meeting facilitation, and design of community involvement programs. Pre: Senior standing required. (3H,3C)

#### UAP 4344 Law of Critical Environmental Areas

This course examines the legal principles and policy debates involved in the regulation and protection of critical environmental resources. Specific topics vary but will likely include wetlands law and policy, endangered species habitat, open space, forestland and farmland protection, coastal zone management, and floodplain regulation and policy. (3H,3C)

#### UAP 4374 Land Use & Environment: Planning & Policy

Environmental factors involved in land use planning and development, including topography, soils, geologic hazards, flooding and stormwater management, ecological features, and visual quality. Techniques used in conducting environmental land inventories and land suitability analyses. Policies and programs to protect environmental quality in land use planning and development. Pre: Junior standing. (3H,3C)

#### UAP/GEOG/SOC 4764 International Development Policy & Planning

Examination of major development theories and contemporary issues and characteristics of low-income societies (industrialization, urbanization, migration, rural poverty, hunger, foreign trade, and debt) that establish contexts for development planning and policy-making. Junior standing required. (3H,3C)

#### UAP/GEOG/WGS 4214 Women, Environment, and Development in a Global Perspective

Explores intersecting roles of gender, culture, and socio-economic status in people's use of nature, management of environmental resources, and experiences of environmental change. Examines debates on environmental and development initiatives, environmental ethics, and environmental social movements from feminist perspectives. Pre: Junior standing required. (3H,3C)