

**Graduate Certificate in Applied Environmental Science**  
**Akamai University**  
**Dr Anthony Maranto**  
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**Introduction**

The Graduate Certificate Programs at the Akamai University represents a documented and regimented exploration of post-baccalaureate level topics for students who do not currently wish to pursue a full Masters degree program. The Certificate in Applied Environmental Science consists of 15 credits of graduate-level coursework, representing the equivalent of six months of full time graduate study. Unlike our graduate degree programs, the Akamai University Graduate Certificate is entirely coursework based and requires no research (thesis) component.

Students will work with their primary mentor to individualize course topics. At the beginning of the program, the student will identify a principal focus area, which will serve to target course readings and assignments to areas directly applicable to the student s educational and professional goals.

**Areas of Focus**

Some suggested areas of study and research include (but are not limited to) the following:

Acid Deposition	Environmental	Marine Studies
Agricultural Studies	Compliance	Pesticides
Air Quality	Environmental Education	Pollution Control
Atmospheric Composition	Environmental Ethics	Population Dynamics
Biodiversity	Environmental Health	Recycling
Bioremediation	Environmental	Renewable Energy
Climate Change	Management	Resource Management
Conservation	Environmental Policy	Risk Assessment
Drinking Water	Environmental Technology	Sustainability
Ecology	Habitat Studies	Water Quality
Endangered Species	Hazardous Waste	Xenoestrogens
	Invasive Species	

**Intended Audience**

The Graduate Certificate programs at Akamai University are intended for mid-career professionals who require a structured, yet flexible post-baccalaureate curriculum focused on specific and practical topic areas within environmental science. Course content and assignments will be focused on a student s stated academic and professional goals. Graduate Certificates may be appropriate for demonstrating mastery of a specific set of topics or applications relevant to professional advancement, career change, or preparatory to future graduate study.

**Course Requirements**

A total of 15 credits (equivalent to six months of full time graduate study) are required for the completion of a Graduate Certificate in Applied Environmental Science. The student will be required to enroll in one of the 6-credit foundational reading course (500-level) from the Environmental Studies Program. The remaining 9 credits of required course work will be

planned on an individual basis. The student and his or her advisor will work to select courses that will add academic significance and continuity to the Certificate program and focus the remaining coursework towards the student's academic and professional goals.

### **Program Time Frames**

Akamai University strives to create flexible programs where students can work at their own pace to accommodate professional and personal commitments while pursuing their higher education goals. The standard time frame for completion of a Graduate Certificate in Applied Environmental Science is 6-8 months. However, students may work at an accelerated pace and complete all course requirements in a minimum of 4 months. Likewise, students may work at a more gradual pace and complete the Certificate in a maximum of 14 months.

### **Transferability**

All successfully completed Certificate programs or program courses are directly transferable to Akamai University Masters or Doctoral programs within the Center for Ecology and Environmental Studies. To be accepted for degree transfer, Certificate program enrollment should be completed within 5 years of matriculation in a graduate degree program.

### **Application**

Students wishing to enroll in an Akamai University Graduate Certificate program should first submit an Application for Admissions Extramural Studies Program along with all accompanying documentation and supporting material. A requirement for enrollment in the Graduate Certificate Program in Applied Environmental Science is the satisfactory completion of a Baccalaureate degree (BA, BS, or equivalent) from a recognized university. A student's undergraduate focus should be in a relevant academic discipline (e.g. Biology, Ecology, Chemistry, Geology, etc.), however, applicants with academic backgrounds not directly related to Environmental Science may be accepted to the program, pending a review of their application materials and relevant experience.

### **Tuition**

Courses-costs are \$150 per credit. Total Certificate program tuition is \$2,250 for enrolment to completion. Other Academic fees, including application fee, listed in the Akamai University Student Handbook may apply.

### **Transfer Credits and Course Waivers**

Since the Graduate Certificate programs at Akamai University are short intense courses of study; transfer credits, course waivers, or portfolio credits are typically not offered to reduce the total credit requirements for completion. Under extraordinary circumstances, individual exceptions may be made to this standard; however, students should expect to complete the full 15 credits for award of a Graduate Certificate. If a student has already demonstrated a level of mastery in a particular course topic pertinent to the chosen focus area, they will work with the advisor to choose another area of investigation relevant to the student's learning objectives.

## Course Descriptions

### Course Descriptions

#### **ELS500: Readings in Environmental and Life Sciences (6 credits)**

This course provides a graduate-level overview and detailed readings in the current theories, principles, and research related to ecological and environmental studies. The course assignments and learning activities will focus on the fundamental theories and foundational readings in environmental studies. Course content will be individualized to include literature reviews and case studies related to the student's area of emphasis. This course is required of all entry Environmental and Life Sciences Masters students within the first semester of study.

#### **ELS510: Interdisciplinary Environmental Studies (6 credits)**

This course will focus on the integration of life science, technology, social science, and economics within the study of environmental issues. Course readings and assignments will address both the need for and practice of systematic holistic analysis in the investigation of environmental and ecological issues. Course content will be individualized to include case studies or specific readings related to the student's area of emphasis.

#### **ELS511: Applied Environmental Science (6 credits)**

The focus of this course is the practical application of environmental science to the resolution, remediation, and exploration of real world issues and problems related to human interaction with the environment. Readings and case studies will focus on anthropogenic impacts and how current theories and protocols in environmental science are being applied to address those issues. Students will be encouraged to think about practical solutions and develop meaningful alternatives to address a variety of factors associated with these issues.

#### **ELS512: Global Ecology (3 credits)**

This course presents foundational readings and studies related to ecological dynamics on the regional and global scales. Students will be asked to consider a wide range of issues that may affect the stability or dynamics of the global ecosystem with respect to atmospheric chemistry, desertification, population dynamics, food resources, and natural bio-geochemical cycles. The course will facilitate detailed explorations of these topics as well as specific issues related to the student's area of emphasis.

#### **ELS515: Earth Science (3 credits)**

This course presents a graduate-level overview of current theories and concepts related to earth science. Specific topics to be covered in the course relate to tectonic features and patterns, natural geological cycles, and geosphere-biosphere interactions. Students will be asked to examine a variety of issues related to ecological shifts on a geological time-scale. Readings and assignments will also focus on the formation and occurrence of non-renewable earth resources.

#### **ELS518: Environmental Geology (3 credits)**

This course focuses on a detailed review of current theories and research related to geological cycles, processes, and patterns and how they relate to environmental conditions both past and present. Students will be asked to examine a variety of environmental and ecological issues

across the spectrum of natural history in an examination of definable patterns and an assessment of current trends. Readings and assignments will be individualized to address topics pertinent to the student's research focus.

**CED 522: Environmental Impact Assessment (3 credits)**

This course explores the impact of political activities for development upon natural and cultural systems and how detrimental human impacts on the environment might be mitigated. Students explore the political and social systems through which they might construct practical solutions and treatments for ecological problems. Topics cover the theory and practice of environmental impact assessment, the characteristics of ecosystems that are most sensitive to change, and rates of change in ecosystems. Students pursue case studies from the development field of particular environmental problems from a number of ecosystems.

**ELS 530: Agricultural Studies (3 credits)**

This course focuses on the connection between agriculture, husbandry, aqua- and mare-culture, and forestry practices on the environment. Readings and course assignments will address both sustainable best management practices and unsustainable agricultural practices. The student will be asked to examine the connections between specific practices and eutrophication, soil erosion, and aquifer depletion. Course related assignments will also focus on practices and alternatives in both developed and developing nations.

**ELS538: The Ecology of World Hunger (3 credits)**

This course focuses on the issues related to food production, population, food policy, and the resources required to meet human nutritional needs. Course assignments and readings will explore fishery pressures, monoculture impacts on genetic diversity, resource intensive agriculture, genetically modified organisms, and nutritional perspectives. Students will examine food policies, social-cultural influences, ethnographic evidence, and apply their findings to a wide range of problems related to world hunger.

**ELS541: Principals and Theories of Environmental Biology (6 credits)**

This course provides a detailed exploration of current topics research techniques, and theories in modern environmental biology. Students will be required to do an extensive literature review on a variety of issues related to the field. Course readings and assignments will help the student develop analytical and critical analyses of methodologies, study results, scope/limitations, and applications of appropriate protocols and technologies. Readings will be individualized to address specific research interests of the student. There are no pre-requisites for this course.

**ELS543: Zoology and Species Studies (3 credits)**

This course explores the areas of animal classification, anatomy, natural history, and behavior. Readings and assignments will focus on the general theories, classification patterns, and identification protocols. Additionally, the student will be asked to undertake a detailed examination of a particular family of organisms of interest to the student of their research. Focus will be on basic anatomical systems, embryology, ecological niches, feeding patterns, mating habits, and habitat requirements. Attention will also be given to the care and ethical treatment of captive, domestic, or research animals. Students should have completed ELS541 or have permission from the instructor prior to enrolling in this course.

**ELS545: Marine Biology (3 credits)**

This course serves as a graduate level exploration of the biology of coastal and open-water marine organisms. Readings and course assignments will present a broad overview of the field and will present a wide range of current research in marine biology. Studies will focus on the marine environment, the physical and chemical factors influencing marine organisms, marine ecosystems, the diversity of marine life, classification of marine organisms, distribution, natural history, physiology, community types, and anthropogenic stresses on the marine environment. Students should have completed ELS541 or have permission from the instructor prior to enrolling in this course.

**ELS546: Processes in Coastal and Estuarine Zones (2 credits)**

This course serves as an interdisciplinary description and analysis of environmental processes that form, maintain, and influence coastal habitats. Readings and course assignments will focus on the science and management issues of the coastal ocean, including estuaries and continental shelves. The course is organized around six major topics: 1) the unique nature of the coastal and estuarine environments; 2) sediment transport and dynamics; 3) shallow water clastic environments with emphasis on barrier islands, deltas, estuaries, wetlands, and tidal flats; 4) eutrophication and habitat quality issues; 5) living resources and fisheries; and 6) ecology of major coastal and estuarine habitats.

**ELS552: Environmental Chemistry (3 credits)**

This course will focus on the examination of underlying chemical concepts and mechanisms of important environmental problems. Readings and course assignments will explore pollutant structures, pathways, reaction mechanisms, and by-products associated with energy production, ozone depletion, acid deposition, greenhouse effect, anthropogenic pollutants, agricultural compounds, and organochlorine compounds. The student will explore several case studies to examine the basic environmental chemistry of common practices and processes.

**ELS554: Ecotoxicology (3 credits)**

This course is a graduate-level introduction to ecotoxicology and the study of harmful chemicals in an ecosystem. Course readings will examine the fate, pathway, uptake, transference, and impacts of both naturally occurring and anthropogenic toxins upon various components within a wide range of ecosystem structures. Course assignments can be individualized to examine a compound, family of compounds, process, or ecosystem of particular interest to the student. Students should have completed ELS552 or have permission from the instructor prior to enrolling in this course.

**ELS556: Environmental Carcinogenesis (3 credits)**

This course will focus on a detailed examination of the process and action of chemical, biological, and physical carcinogens. Readings and course assignments will explore the environmental health implications of environmental carcinogens and examine human and mammalian cancer rates in conjunction with epidemiological studies, known carcinogenic mechanisms, risk assessment techniques, and confounding factors. Students should have completed ELS541 and ELS552, or have permission from the instructor prior to enrolling in this course.

**ELS562: Life Sciences and Environmental Health (6 credits)**

This course will focus on a broad graduate-level overview of issues in modern environmental health studies. Course assignments and readings will explore issues related to epidemiology, chronic and acute exposures, body burdens, dose assessments, uptake pathways, and the mechanisms and effects of a wide spectrum of environmental toxins. Students will be asked to critically evaluate current research across a host environmental health concerns including lead poisoning, air quality, drinking water standards, UV exposure, and waste treatment. Course readings will be individualized to address specific research interests of the student. ELS541 is recommended, but not required for enrollment in this course.

**ELS564: Environmental Health and Protection (3 credits)**

This course focuses on the public health aspects of environmental research. Course assignments and readings will address public health protection and studies across a wide spectrum of environmental risks. The course assignments will emphasize a critical review of current research and theories in environmental public health from the work of John Snow to present. Course readings will be individualized to address specific research interests of the student. Students should have completed ELS562 or have permission from the instructor prior to enrolling in this course.

**ELS565: Case Studies in Environmental Public Health (2 credits)**

This short course will focus on a critical review and analysis of case studies in environmental public health. The student will be required to identify the area of investigation (instructor approval required) and will perform a comprehensive literature review and analysis on the issue. Students should have completed ELS562 and ELS564, or have permission from the instructor prior to enrolling in this course.

**ELS569: Emerging Diseases and the Environment (3 credits)**

This course will focus on the public health and environmental influences of emerging infectious diseases. Readings and course assignments will explore to the future of domestic and international public health practice as well as examine the role of societal incursion and modern transportation in the spread of previously isolate diseases and disease vectors. Students will review a wide spectrum of current research into such diseases as Pfiesteria, West Nile Virus, Avian Vacuolar Myelinopathy, and others, as well as resurgent/resistant strains of malaria, dengue, cholera, and tuberculosis. Course assignments will be individualized to the research interests of the student. Students should have completed ELS562 or have permission from the instructor prior to enrolling in this course.

**ELS590: Ecology and Biodiversity (6 credits)**

This course will provide an extensive survey and analysis of the foundational literature, theories, and research on the state, importance, maintenance, and analysis of biological and genetic diversity. Students will be asked to critically examine a wide spectrum of issues and theories associated with biological diversity and its conservation including ecological theory, taxonomic methods, diversity models, and assessment methods. Through course assignments and readings, students will explore their own theories related to trends and shifts in biodiversity patterns; pragmatic and economically feasible conservation solutions; and integration of interdisciplinary information into a comprehensive analysis of biodiversity issues as they relate to ecological

analysis. Completion of ELS541 or permission from the instructor is required for enrollment in this course.

## **Environmental Policy and Sustainability**

### **EPS500: Readings in Environmental Policy and Sustainability (6 credits)**

This course provides a graduate-level overview and detailed readings in the current theories, principles, and research related to the development of environmental policy and sustainable environmental planning. The course assignments and learning activities will focus on the fundamental theories and foundational readings in environmental policy and planning. Course content will be individualized to include literature reviews and case studies related to the student's area of emphasis. This course is required of all entry Environmental Policy and Sustainability Masters students within the first semester of study.

### **EPS502: Science, Environment, and Society (2 credits)**

This course explores the methods and nature of scientific inquiry and the role of interdisciplinary science in modern society. The course draws on a wide range of case studies in analyzing the way science is used to explore and manage the global environment and its resources. The student will be asked to examine the connection between politics, science, and social movements. Course readings and assignments will be targeted towards the student's area of research focus.

### **EPS503: Global Environmental Issues and Solutions (6 credits)**

This course provides a detailed graduate-level exploration of environmental issues, concerns, management practices, technical considerations, and proposed solutions related to a wide scope of natural and anthropogenic influences that impact global patterns. Course content will be individualized to include literature reviews and case studies related to the student's area of emphasis. There is no prerequisite required for enrollment in this course.

### **EPS511: Applied Ecology and Conservation (3 credits)**

This course provides a detailed exploration of issues related the study of ecology and conservation as interdisciplinary and systems sciences. Readings and course assignments will focus on interactions between living and non-living elements of the environment. Students will focus on a critical and analytical analysis of terrestrial and aquatic ecology, biogeochemical cycling, ecosystem community interactions, nutrient and energy pathways, competition, niche theory, population dynamics and human ecology. Course topics will also focus on practical, innovative, and integrated conservation principles and practices along with case studies focused on various conservation methods.

### **EPS514: Conservation Philosophy and Theory (6 credits)**

This course provides an extensive overview of the foundational readings and theories associated with formation and evolution of various international conservation movements. Course readings and assignments will integrate concepts in environmental ethics, social movements, and philosophy with elements of environmental economics, resource management, and utility theory. Students will be asked to examine the integrated nature of practical and theoretical conservation paradigms and critically assess the logical, environmental, and practical aspects of them. Some aspects of the course literature review will be individualized to include specific case studies related to the student's area of emphasis.



**EPS521: Sustainable Development and Management (3 credits)**

This course focuses on the balance between economic development and the necessity to protect and preserve the global environment. Students will explore domestic issues facing developed countries as well as those encountered in developing countries as they struggle to address economic, technical, and environmental problems. Readings and assignments will address international relationships, best management practices, and management policies. Students will examine a wide variety of case studies in order to understand the interaction and interdisciplinary issues related to the environment, society, economics, and sustainable development on the local, regional, and global levels.

**EPS522: Effective Environmental Stewardship (2 credits)**

This course examines the interdisciplinary analysis and management of environmental issues from an ethical, social, aesthetic, political, economic, and ecological perspective. Course readings and assignments will examine the environmental impact of modern societal decisions from a variety of frames of reference. Topics will include environmental justice, eco-feminism, activism, religion, ecological sustainability, biodiversity, globalization, animal rights, and political considerations. Students will be asked to explore case studies and develop a project investigating environmental issues of local, regional, or global significance.

**EPS524: Environmental Planning and Management (6 credits)**

This course examines topics related to regional planning and addresses the complex relationships between the geological environment and human development. Students will be asked to explore land use, the impact of geologic hazards on land use, impacts of land use on fragile environments, population patterns, resource capabilities, and transportation structures. Additional topics will include coastal erosion, flood control and management, groundwater resources, surface flow, and slope stability. Completion of EPS521 is recommended, but not required for enrollment in this course.

**EPS525: Natural Resources Management (3 credits)**

This course focuses on the sustainable management of both renewable and non-renewable natural resources. Course readings and assignments will explore renewable resource management, water rights and conservation issues, biological reserves, topsoil retention, mineral discovery and utilization, conservation of biodiversity, and best management practices for public resources. Students will be asked to critically examine case studies of a wide spectrum of real-world issues and provide analysis and options for sustainable management and utilization.

**EPS528: Energy Policy and Sustainability (3 credits)**

This course will examine the energy utilization patterns and policies of developed and developing nations. Readings and course assignments will focus on managed transition between fossil fuels and alternative/renewable energy sources; transportation fuels; sustainable energy growth; environmental impacts of energy conversion technologies; and technological developments in the field. Students will be asked to critically examine a wide range of case studies and current research and investigate alternatives to current limitation in energy development and utilization. Completion of EPS521 is recommended, but not required for enrollment in this course.

**EPS530: Environmental and Natural Resource Economics (3 credits)**

This course examines the fundamental economic theory of environmental and resource issues. Course assignments and readings will integrate environmental costs with total economic cycle costs to develop a true picture of the economic benefits and considerations of environmental planning. Students will be asked to investigate a variety of management issues associated with environmental compliance and sustainable practices, and provide a detailed environmental economic analysis to selected case studies. Course assignments will also examine economic incentives/disincentives to implementation of environmentally sound and sustainable policies.

**EPS540: Human Population and the Environment (3 credits)**

The focus of this course will be the detailed examination of the impact of human population growth on the status of consumable resources, habitat, and general environmental quality. Course readings and assignments will examine issues related to ecological carrying capacities, human population dynamics, and resource consumption patterns. The student will be asked to review a number of case studies and theoretical examinations from developed and developing nations to explore options for sustainable human interaction with regional and global ecosystems. Critical examinations will also include pertinent economic, social, and political factors, which influence these issues.

**EPS550: Environmental Analysis (3 credits)**

This course provides a graduate-level review of the environmental issues involved in the design, construction, and management of facilities. Students will focus on practical applications to support sustainable development and operations as well as on the impacts of the constructed environmental upon local, regional, and global ecosystems. Topics will include recycling, energy management, transportation/logistics support, waste stream analysis, process development, best management practices, and the appropriate selection of remedial technologies. Completion of EPS521, or permission from the instructor is required prior to enrolling in this course.

**EPS560: Environmental Security and Scarcity (3 credits)**

This course will examine the importance of environmental conditions and sustainability on regional conflicts and national defense. Students will be asked to examine sustainability and resource scarcity as a fundamental cause of unrest in oppressed or marginalized populations. Course readings and assignments will focus on case studies from modern history of environmental issues leading to conflict and the use of environmental pollution as a weapon of war or oppression. Students will explore trends and warning signs, and devise several proposals for the remediation of underlying unrest and the elimination of conflict related to environmental conditions.

**EPS564: Applied Environmental Policy Studies (6 credits)**

The focus of this course will be on the comprehensive examination of the development, implementation, and responsible authorities for environmental policy within the United States. Students will examine how public and corporate environmental policies are developed and applied to a wide range of environmental issues and statutes. Course readings and assignments will address the practical considerations of environmental rule making, economic and non-economic incentives to support policy, and socio-political considerations that often accompany the implementation of environmental policy. Some aspects of the course literature review will be individualized to include specific case studies related to the student's area of emphasis.

**EPS566: Environmental Justice and Ethics (3 credits)**

This course provides a detailed examination of environmental ethics and issues related to resource use, social philosophy, and environmental justice. Course readings and assignments will address the nature of public resources, ethical conflicts of development, the rights of future generations, and issues related to environmental racism. Students will be asked to consider and construct essays on how the philosophical issues of environmental ethics impact real-world decisions in environmental science and resource management policy.

**EPS571: Environmental Law and Policy (3 credits)**

This course will provide a broad graduate-level overview and survey of prominent standards in environmental law and policy. Readings and course assignments will examine laws, regulations, executive orders and policies within the United States; however, parallels will be drawn to accepted international standards and well known international exceptions. Students will be asked to explore current and historical legislation related to environmental protection, resource use, cleanup, chemical contamination, and occupational protection.

**EPS574: Principles and Applications of Environmental Law (6 credits)**

This course will present a comprehensive review of the current state of environmental law, statutes, regulations and policies, from the U.S. and abroad. Foundational readings will be examined with respect to the practical and interdisciplinary ramifications of environmental law as well as to the development and application of supporting policy. The student will also be asked undertake a comprehensive and critical review of the current literature with respect to a specific and relevant issue in environmental law. Enrollment in this course is by permission of the instructor.

**EPS576: International Environmental Policy and Regulation (3 credits)**

This course parallels EPS564, but will focus on a comprehensive examination of the development, implementation, and responsible authorities for environmental policy across the world. Students will examine how public and corporate environmental policies are developed and applied by a wide range of industrialized and developing nations, as well as by multi-national organizations such as the European Union and the G-8. Course readings and assignments will address the practical considerations of environmental rule making, economic and non-economic incentives to support policy, and socio-political considerations that often accompany the implementation of environmental policy.

**EPS579: Marine and Coastal Policy (2 credits)**

The focus of this course is the study of policy and policy making in the U.S. with regards to the coastal and marine environments. Course assignments and readings will include the history and authority of various maritime organizations, legislation, and policies. Students will be asked to examine policy implications with respect to local, regional, national, and international arenas, such as fisheries management, marine pollution, seabed minerals, and petroleum transportation. Topics in this course will be explored through critical interdisciplinary analysis and will draw upon a wide range of considerations including, economic, political, sociological, and ecological issues.

**Applied Environmental Technology****AET500: Readings in Applied Environmental Technology (6 credits)**

This course provides a graduate-level overview and detailed readings in the current theories, principles, and research related to the development and implementation of environmental technologies. The course assignments and learning activities will focus on the fundamental theories and foundational readings in environmental technology, management, engineering, and planning. Course content will be individualized to include literature reviews and case studies related to the student's area of emphasis. This course is required of all entry Applied Environmental Technology Masters students within the first semester of study.

**AET503: Interdisciplinary Studies in Environmental Technology (6 credits)**

The focus of this course is the detailed and practical examination of technology oriented problems and solutions. Students will be asked to examine a wide spectrum of real-world issues, case studies, and applications to determine how technological applications could be applied to modify problematic processes, re-engineer existing systems, re-locate dangerous or risky activities, re-structure waste streams, or eliminate unnecessary or wasteful processes. Students will be asked to examine issues from an interdisciplinary framework that considers not only the technical aspects of treatment and design, but also takes into account the economics, social ramifications, political impacts, and environmental particulars of the situations and processes identified. Permission from the instructor is required prior to enrolling in this course.

**AET521: Pollution Prevention (3 credits)**

This course will explore the nature, theory, and application of pollution prevention. Readings and course assignments will focus on opportunity assessments, waste stream evaluation, process evaluation and engineering, life-cycle valuation, cradle-to-grave logistics and management, and risk-based process decisions. Students will be asked to evaluate numerous scenarios designed to prevent pollution, rather than to treat it as an end-of-the-pipe, byproduct. Capital outlays, net-present value assessment, and return on investment analyses will also accompany case studies.

**AET523: Environmental Pollution, Control, and Remediation (6 credits)**

This course will present a broad and detailed overview of pollution control and remediation technologies. Readings and course assignments will focus on the practical application and appropriate use of various technologies in the remediation and compliance implementation of a wide variety of different industrial, agricultural, and technological processes. Some aspects of

the course literature review will be individualized to include specific case studies related to the student's area of emphasis.

**AET525: Bioremediation (3 credits)**

The focus of this course will be on topics related to the development, research, and application of bioremediation technologies. Course readings and assignments will address such issues as biotransformation, biodegradation, microbial ecology, biomolecular engineering, process assessment, bacterial transport, and bioremediation design. Students will also be asked to examine the use of hyper-accumulator species and other innovative bioremediation techniques. Some aspects of the course literature review will be individualized to include specific case studies related to the student's area of emphasis. Permission of the instructor is required to enroll in this course.

**AET527: Emergency Planning and Recovery (3 credits)**

The focus of this course will be to explore the environmental relevance of emergency planning and recovery operations from the framework of risk minimization and disaster control. The student will review management and preparedness plans, emergency operations procedures, policies (national and local), and interdisciplinary considerations necessary to minimize environmental impacts and human health risks from natural or man-made disasters. Some aspects of the course literature review will be individualized to include specific case studies related to the student's area of emphasis.

**AET530: Studies in Solid Waste Management (2 credits)**

This short course will present a detailed exploration of issues and research related to the management, reduction, and treatment of non-hazardous solid waste. Course readings and assignments will focus on the legal requirements of RCRA-Subtitle D, land farming, volume reduction, groundwater protection, recycling, incineration/RDF operations, and waste diversion technologies. Some aspects of the course literature review will be individualized to include specific case studies related to the student's area of emphasis. Completion of EPS521 or its equivalent is recommended but not required for enrollment in this course.

**AET544: Alternative and Renewable Energy Applications (6 credits)**

This course presents a comprehensive study of the numerous techniques for the conversion of energy using renewable and alternative sources of energy. Course readings and assignments will address the current state of technological development for these energy sources, possible applications in sustainable developments, technological limitations, and environmental impacts. Students will be asked to examine practical case studies and development issues and investigate alternative to current limitations of development and utilization.

**AET552: Community Ecology (2 credits)**

This course provides a framework for the study of community ecology and an examination of the role of interactions between two or more species and their environment. Course readings and assignments will focus on the fundamental models and theories of the discipline. Topics will include techniques of community description, abiotic and biotic controls of community structure, the effects of stress and disturbance on ecosystems and human communities, food web dynamics, and the integration and preservation of biodiversity within the community framework.

**AET560: Natural Processes and Environmental Consequences (3 credits)**

This course focuses on the physical, chemical, and biological processes that heavily impact environmental quality. Course readings and assignments will focus on atmospheric releases from forest fires, geothermal vents, and volcanoes; terrestrial disturbances from dolines, landslips, and seismic activities; and aquatic disruptions associated with cyclic weather patterns, red tides, and salinity gradients. The student will be asked to examine the natural disturbance cycles of these activities and compare environmental impacts/shifts to similar anthropogenic activities.

**AET562: Environmental Toxicology and Pollution Pathways (3 credits)**

This course provides a graduate-level exploration of food-web transportation of environmental pollutants, particularly organochlorine contaminants and heavy metals. Course readings and assignments will focus on current research articles, which address theories of toxicity, mechanisms, or interaction, pathways of uptake, biomagnification, bioaccumulation, and biological elimination. Completion of ELS552, its equivalent, or permission from the instructor are required prior to enrolling in this course.

**AET565: Acid Deposition: Its Consequences and Control (3 credits)**

This course focuses on the sources (both natural and anthropogenic), mechanisms, and environmental effects of acidic deposition (acid rain, acid fog, acid snow, etc.). Course readings and assignments will address industrial sources of atmospheric pollutants and alternative technologies to those processes. Students will also examine the biological and ecological impacts of elevated pH on freshwater and terrestrial systems. Completion of ELS552 or its equivalent, are suggested, but not required to enroll in this course.

**AET573: Environmental Risk Assessment and Management (3 credits)**

The focus of this course is on the definition, modeling, management, and proper utilization of environmental risk assessments and calculations. Course readings and assignments will examine theoretical modeling, exposure characterization, extrapolation of non-human data for human health protection, calculation of aggregate risk, risk reduction calculations, results-first vs. worst-first management, and hypothetical maximum exposed individual studies. Students will be expected to critically evaluate the limitations and appropriate use of a number of different risk assessment techniques under a variety of case studies.

**AET591: Applied Environmental Chemistry (6 credits)**

This course provides a detailed examination into the chemistry of environmental phenomena, pollution interactions, and remediation technologies. Students will be asked to undertake a major project related to a particular pollutant, waste-generating process, or remediation scenario. Through literature reviews, critical analysis of current research methods, and professional consultations, the student will be asked to fully explore the approved topic and propose unique chemical or process solutions to address negative environmental impacts associated with the particular issue. Completion of ELS552 or its equivalent, and permission of the instructor is required before enrolling in this course. Course project topics must be approved in advance of registration.

**AET592L Environmental Management in Ocean and Coastal Areas (3 credits)**

This course presents an exploration of development, management, and economic utilization of

coastal zone areas and ocean resources. Course assignments and readings will focus on the nature, extent, and value of coastal and ocean areas; water-based utility analyses; recreation resources; water quality; environmental degradation; ocean and coastal water regulation; fishery resources; mineral and petroleum extraction; and remediation/rehabilitation issues. Students will be asked to examine the impacts of human activity and economic exploitation on the sustainability of these ecosystems. Completion of EPS525 is recommended but not required for enrollment in this course.