

Master of Science in Environmental Studies

Akamai University

Dr. Anthony Maranto

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Welcome to the Environmental Studies Program!

On behalf of the faculty, staff, and administration of Akamai University, I would like to welcome you to the Environmental Studies Program. Over the last three decades, the study of environmental issues has grown from a narrow niche in the field of biology, to an overarching and interdisciplinary arena of investigation and application. The study of how humanity interacts with and impacts the natural environment touches every area of human endeavor, from science and technology, to economics and social structures.

Human activities have arguably done more damage to the environment in the last 200 years of recorded history, then throughout all of the rest of our species' existence. Many of the technological and industrial processes that we rely so heavily upon are built on a framework that is fundamentally unsustainable. Issues related to climatic change, acid deposition, energy production, hazardous waste, population growth, and depletion of non-renewable natural resources has forced humanity to take a closer look at how we interact with our environment. It is for this reason that the demand for researchers, educators, engineers, and policy makers with a firm grounding in the theoretical and practical aspects of environmental studies has reached new heights. The application of sound and socially responsible science to the forward-looking aspects of societal development are perhaps more important today than they have ever been.

The various academic area of focus offered through Environmental Studies can prepare students for careers in environmental research, policy development, industrial compliance, environmental consulting, academics, and many other related areas. The courses of study offered through the Center are not only academically challenging, but also provide a sound framework for career development. I hope that you will join us in exploring opportunities to further your academic pursuits in a field which is both exciting and offers the opportunity devote your skills to the improvement of the human condition..

Sincerely,

Anthony R. Maranto, Ph.D.
Program Director
Environmental Studies

Program Audience

Major decisions and actions affecting human and natural environments require professionals who can understand environmental problems in depth, who have the leadership and technical expertise to explore viable solutions, and who can plan and execute responsible actions. Career fields for which this program is appropriate include environmental research and management careers, professional educators, planners, consultants and lobbyists, specialists in sustainable resources and system, environmental regulation, and policy analysis. The program is also appropriate for practitioners in high technology industries and manufacturing, environmental or

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civil engineering, air and water quality specializations, park management and wildlife conservation, natural disaster specializations, environmental health careers, sustainable agriculture and husbandry, food production specializations, and life and physical science.

The study of life science is fundamental to the sustainability of the planet and its life giving systems. The goal of this department is to provide life and physical scientists with the professional tools, academic knowledge, and professional wisdom necessary to provide leadership in the fields of health, education, and environmental science. Our programs will contribute to the growth and development of the fields of natural disaster recovery, park management and wildlife conservation, sustainable agriculture, husbandry, and food production, environmental planning and a number of other essential fields.

Effective policy for environmental sustainability is essential to the maintenance of our planet as well as ecological and human systems. Through its policy and environmental actions, governments, local, national and global, must commit to integration of environmental and socially sustainable development. Sustainable policy should consider issues of environmental and energy planning, law and policy, environmental security, natural resource management, expansion, and population dynamics. The Department of Environmental Policy and Sustainability is committed to investigate these issue in a rigorous and detailed manner.

Environmental technology plays a major role in the sustainability of the environment, as well as its degradation. Technology provides tools for monitoring the health of the environment, in conservation and preservation of natural resources, wildlife management, and the disposal of wastes. It also plays an essential role in development of renewable and alternative energy resources. The goal of the Department of Applied Environmental Technology is to prepare world-class professionals capable of providing leadership within this essential field toward the sustainability of the planet and the betterment of the human condition.

Students applying to this program should have a background in the physical or biological sciences and familiarity with standard theories and practices associated with scientific investigation. Students seeking admissions to this program should also have demonstrated professional experience and expertise in environmental studies with some professional or academic experience in either laboratory or field research or applied issues.

- Self-help, stress management, personal growth, motivational neuro-linguistic programming, creative writing, home schooling, hypnotherapy, aromatherapy, Reiki. energy medicine, and art therapy.
- Life coaching, personal coaching, success coaching, and relationship coaching, leadership skills, consulting, memory training, nutrition. men's and women's issues, and action assertiveness
- Teaching, mentoring and facilitating disorder and prevention remedies: eating, sleep, anxiety, post traumatic stress (PTSD), attention deficit, addiction, dependency, burnout, autism, self-confidence, mid-life crisis, and self-worth dysfunctions.
- Counseling: pastoral, therapy, recovery, family, marriage and spiritual counseling, massage therapy and biofeedback.

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- Shamanism, spirituality retreat centers, self-esteem, Yoga, civil rights, therapist, retreat center training.
- Course instruction, workshop presentations, social work, conservation strategies, outdoor leadership, sociology, environmental education, and mental health.
- Meditation, complementary and alternative medicine, naturopathic medicine, parenting, relaxation, and intimacy.
- Founding or directing stress and healing programs, or creative writing courses for training or degree programs.
- Increasing training, administration, personal and professional benefits. improved conferences, progressive human services, independent contracting, child care, addressing global warming, retreats.

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Entry Requirements

As prerequisites for acceptance to the Master's degree, applicants should have completed the equivalent of a recognized baccalaureate degree in an appropriate field of study and have several years of meaningful career experience.

Applicants are expected to be proficient in collegiate English language skills. Second language English applicants should submit records of TOEFL examination with scores of 550 minimum. All applicants are expected to have access to a computer, email and the Internet, and verify access to academic library resources for the full extent of your program.

Degree Requirements

Participants in the Master of Science program in Environmental Studies complete a minimum of 40 credits above the baccalaureate degree, including examinations and the thesis project. The coursework requirements include the core academic requirements and major concentration, and research preparation coursework. Participants also complete a comprehensive examination at the conclusion of the academic coursework, prepare a formal thesis proposal, complete the thesis project, and prepare the manuscript for faculty physical and oral review.

[Core Academic Requirements \(Required: 18 credits minimum\)](#)

[Major Concentrations \(Required: 9 credits minimum\)](#)

[Research Preparation \(Required: 3 credits minimum\)](#)

[EXM 880: Comprehensive Examination \(Required: 2 credits\)](#)

[RES 885: Thesis Proposal \(Required: 2 credits\)](#)

[RES 890: Thesis Project \(Required: 4 credits\)](#)

[EXM 895: Oral Review of Thesis \(Required: 2 credits\)](#)

Core Academic Requirements (Required: 18 credits)

Participants in Environmental Studies complete core elements of the academic major comprising 18 credits of mandated studies, as outlined below:

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ELS 500: Readings in Environmental Studies (3 credits)
EPS 500: Readings in Environmental Policy and Sustainability (3 credits)
AET 500: Applied Environmental Technology (3 credits)
CED 522: Environmental Impact Assessment (3 credits)
EPS 576: International Environmental Policy and Regulation (3 credits)
ELS 564: Environmental Health and Protection (3 credits)

Major Concentrations (Required: 9 credits minimum)

A total of 9 credits in the Major Concentration areas must be select from the following list of courses to complete a major from among any one of the following concentrations:

- Environmental and Life Science
- Environmental Policy and Sustainability
- Applied Environmental Technology

Environmental and Life Science

This major concentration includes focus in applied environmental science, environmental biology, and environmental chemistry, environmental geology, environmental health, earth science, global ecology, sustainable agriculture, life science, natural history, environmental health, conservation theory, and interdisciplinary environmental studies.

Select a minimum of 9 credits from among the following courses:

ELS 512: Global Ecology (3 credits)
ELS 515: Earth Science (3 credits)
ELS 518: Environmental Geology (3 credits)
ELS 530: Agricultural Studies (3 credits)
ELS 538: The Ecology of World Hunger (3 credits)
ELS 541: Principals and Theories of Environmental Biology (6 credits)
ELS 545: Marine Biology (3 credits)
ELS 546: Processes in Coastal and Estuarine Zones (2 credits)
ELS 552: Environmental Chemistry (3 credits)
ELS 554: Ecotoxicology (3 credits)
ELS 562: Life Sciences and Environmental Health (6 credits)
ELS 564: Environmental Health and Protection (3 credits)
ELS 565: Case Studies in Environmental Public Health (2 credits)
ELS 569: Emerging Diseases and the Environment (3 credits)
ELS 590: Ecology and Biodiversity (3 credits)
EPS 503: Global Environmental Issues and Solution (6 credits)
EPS 511: Applied Ecology and Conservation (3 credits)
EPS 514: Conservation Philosophy and Theory (6 credits)
EPS 522: Effective Environmental Stewardship (2 credits)
EPS 540: Human Population and the Environment (3 credits)
EPS 579: Marine and Coastal Policy (2 credits)
AET 552: Community Ecology (2 credits)

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AET 560: Natural Processes and Environmental Consequences (3 credits)

AET 562: Environmental Toxicology and Pollution Pathways (3 credits)

Environmental Policy and Sustainability

This concentration includes focus in sustainable development, natural resources management, environmental planning, environmental law and policy, environmental security studies, energy policy and analysis, population studies and dynamics, applied environmental policy, environmental and natural resource economics, and interdisciplinary environmental policy studies

Select a minimum of 9 credits from among the following courses:

EPS 521: Sustainable Development and Management (3 credits)

EPS 522: Effective Environmental Stewardship (2 credits)

EPS 524: Environmental Planning and Management (4 credits)

EPS 525: Natural Resources Management (3 credits)

EPS 528: Energy Policy and Sustainability (3 credits)

EPS 530: Environmental and Natural Resource Economics (3 credits)

EPS 540: Human Population and the Environment (3 credits)

EPS 560: Environmental Security and Scarcity (3 credits)

EPS 571: Environmental Law and Policy (3 credits)

EPS 576: International Environmental Policy and Regulation (3 credits)

ELS 538: The Ecology of World Hunger (3 credits)

AET 520: Ecological Design and Engineering (3 credits)

AET 530: Studies in Solid Waste Management (2 credits)

AET 573: Environmental Risk Assessment and Management (3 credits)

AET 544: Alternative and Renewable Energy Applications (4 credits)

Applied Environmental Technology

This concentration includes focus in environmental remediation technology, bioremediation, emergency planning and recovery, pollution prevention, renewable and alternative energy technologies, and interdisciplinary studies in environmental technology.

Select a minimum of 9 credits from among the following courses:

AET 503: Interdisciplinary Studies in Environmental Technology (3 credits)

AET 521: Pollution Prevention (3 credits)

AET 523: Environmental Pollution, Control, and Remediation (3 credits)

AET 525: Bioremediation (3 credits)

AET 527: Emergency Planning and Recovery (3 credits)

AET 544: Alternative and Renewable Energy Applications (3 credits)

AET 562: Environmental Toxicology and Pollution Pathways (3 credits)

AET 565: Acid Deposition: Its Consequences and Control (3 credits)

AET 573: Environmental Risk Assessment and Management (3 credits)

ELS 564: Environmental Health and Protection (3 credits)

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EPS 522: Effective Environmental Stewardship (2 credits)

Research Preparation (3 credits minimum)

Master's students must pursue studies providing advanced research knowledge necessary for success in their final projects (thesis). At least three semester credits of research preparation coursework is required and this might focus upon quantitative and qualitative methods or participatory action research techniques including subject selection, research design, and statistical analysis, as appropriate to each student's proposed project.

Through this requirement, students learn to effectively define applied problems or theoretical issues and articulate the rationale for the study. They should learn to present an effective scholarly review of the academic literature and implement quantitative, qualitative or participatory action methods for evaluating academic issues.

Required: Minimum of three credits selected from among the following:

- RES 500: Survey of Research Methods (3 credits)
- RES 502: Understanding Research Journal Articles (3 credits)
- RES 504: Introductory Research Statistics (3 credits)
- RES 506: Advanced Research Statistics (3 credits)
- RES 508: Qualitative Research (3 credits)
- RES 510: Participatory Action Research (3 credits)
- RES 512: Effective Data Analysis (3 credits)
- RES 520: Social Science Research Methods (3 credits)
- RES 524: Techniques in Transpersonal Research (3 credits)
- RES 526: Biological Illustration (3 credits)
- RES 527: Biological Modeling (3 credits)
- RES 528: Environmental Science Research Methods (3 credits)
- RES 529: Calculus for Environmental Science (3 credits)

Comprehensive Examination (2 credits)

Once students have completed the coursework elements of their degree, they will be asked to schedule the Comprehensive Examination. The primary mentor and a faculty member representing the secondary academic area conduct both the written and oral components of the examination. The written portion is open book style with selected essay questions requiring creative responses that reach for the higher levels of cognition. Your answers are expected to draw from both the primary and secondary competencies of your program with proper referencing of the scholarly literature. The oral component of the examination is normally completed by telephone conference and is intended to allow detailed investigation of your written responses.

Required: EXM 880: Comprehensive Examination (Required: 2 credits)

Thesis Proposal (2 credits)

You are expected to prepare a formal proposal related to your concept for research under the

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direction of your primary faculty advisor and according to University expectations. At a minimum, your research proposal should clarify the thesis statement and methodology (including the data gathering instruments and data analysis techniques) and provide an effective overview of the scholarly literature that sets the foundation for the thesis. Your research proposal should also include a brief manuscript outline that demonstrates how you will present in written form the various elements of the research project.

Required: RES 885: Thesis Proposal (Required: 2 credits)

Thesis Project (4 credits)

Following approval of your thesis proposal, you will begin your research project. Your thesis may take the form of a traditional research project or it may be a major scholarly project of the type appropriate to the discipline. Whichever approach to the thesis is chosen, the resulting project must demonstrate mastery of a body of knowledge in the major field of study, be your original work and represent a meaningful contribution to the betterment of the human condition or an improvement to the professional field.

Your thesis research may be conducted via quantitative, qualitative, or participatory action research. The body of your thesis manuscript, structured according to a set of approved manuscript guidelines, should exceed 75 double spaced, typewritten pages. If your thesis takes the form of a scholarly project, it must follow the guidelines provided by the University for such projects.

Required: RES 890: Thesis Project (Required: 3 credits)

Oral Review of Thesis (2 credits)

Once you have prepared the thesis manuscript, you will be asked to schedule the formal review process. Your primary faculty advisor and a faculty member representing the secondary academic area will conduct both the formal physical review of the thesis manuscript and the oral review of thesis.

The physical review of the thesis manuscript usually takes the review committee four to six weeks. Each reviewer will prepare questions and commentary relative to your underlying review of the literature, the thesis methodology, the mechanics of your project, and your presentation of the findings, conclusions and recommendations.

The Oral Review of Thesis is conducted under the direction of your primary faculty advisor with the assistance of one qualified member of the faculty. The examination is carried out by telephone conference call and is designed to allow detailed investigation of your thesis. The faculty reviewers explore with you issues related to your thesis including methodology, review of literature and interpretation of the findings.

One outcome of the thesis review process is a set of final expectations directing you through the remaining tasks for completing the thesis manuscript. Once your final manuscript is approved,

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you will submit the formal document to an approved bindery and later ship the bound thesis to the University for permanent archival storage.

Required: EXM 895: Oral Review of Thesis (Required: 2 credits)

The Thesis Committee

Formation of Thesis Committee

Master's students have a Thesis Committee of two qualified graduate faculty appointed to oversee and govern the student's program structure, progress of studies, comprehensive examinations and thesis project

Responsibilities of Thesis Committee

The responsibilities of the Thesis Committee, under the leadership of the Committee Chair, are as follows:

- Directing the preparation and approval of the student's plan for study, clarifying the timeline for study and the assignment of faculty to provide instruction and to assist with the functions of the Thesis Committee.
- Providing direction regarding the student's foundational studies, core studies, specialization, and research preparation coursework.
- Providing leadership by integrating appropriate research preparation coursework or assignments within the plan for study, distributing the coursework to appropriate faculty for instruction and advisement.
- Providing leadership for the written and oral components of the student's comprehensive final examination, in unity with the other Committee members
- Providing oversight, direction, and mentorship during the conduct of the student's research project and manuscript preparation, in unity with the other Committee members
- Providing leadership for the physical and oral reviews of the research manuscript, in unity with the other Committee members.
- Assist the student in making formal changes in the plan study and timeline for completion, by written addendum, as needed to assure effective progress throughout the program of study.
- Providing final approval for the student's Thesis and overall degree program and cooperate fully in building the appropriate archival records for the University of record.

Master's Committee Appointment Schedule

- The Committee Chair is appointed immediately following the Master's student's registration and continues in charge of the student's program until final completion is recorded at the school of record. While the secondary and tertiary members of the Thesis Committee are identified and confirmed at the onset of the program, and listed in the plan of study, they become active later, just prior to the activities for which they are asked to participate.
- In lieu of the Thesis Committee Chair being appointed at the onset of the program, when appropriate, a primary faculty advisor will be appointed, in lieu of the Thesis Committee Chair, to guide the development of the Master's student's plan for study. Under this situation, the Chair will be appointed later, one month prior to the commencing of the written

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component of the Master's student's Final Comprehensive Examination and shall continue with governance of the student's program until final completion is recorded at the school of record.

- The Secondary Committee Member becomes active one month prior to the commencing of the written component of the Master's student's Final Comprehensive Examination and continues with the student's program until final completion is recorded at the school of record.

Building the Student's Plan for Study

Immediately following registration, Master's students begin work with their assigned Committee Chair in structuring their formal plan for study. The process determines and formalizes the elements of the student's Master's program and the timeline for completion. The plan for study includes the following essential elements:

- The designation of the degree major for the Study Plan
- The identification of the school contacts and contact information for the schools participating in the delivery of the Master's program.
- Identification of the required array of coursework for each element of the program.
- Identification of the secondary and tertiary members of the Thesis Committee.
- Appointment and notification of the course module instructors
- Acceptance of transfer courses for the student's program.
- The timeline for completion of the degree program.

These activities require active participation in program planning by the student and may take considerable time to complete the dialogue and exchange of information. Students are strongly advised to discuss in detail the elements in the plan for study including the coursework, the examinations, and elements of research including the manuscript guidelines.

Once all of the decisions have been made concerning the plan for study, the student and Committee Chair sign the formal document. Copies of the document are sent to the University headquarters for entry to the permanent student record. The plan for study is then distributed to the participating schools and becomes the document that determines effective progress toward the degree. When the expectations laid out in the plan for study have been successfully accomplished, the student is recommended for the degree by the Committee Chair. Students are alerted that the University can make no commitment to inclusion of course modules and assignment of instructors to a student program until after the plan for study has been fully processed and approved.

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

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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

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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

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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.

RES 500: Survey of Research Methods (3 credits)

This course inspects the foundational techniques of scholarly research. Topics explore sources of scholarly research literature, proper methods for evaluating research reports, fundamentals of qualitative and quantitative research methods.

RES 502: Understanding Research Journal Articles (3 credits)

This course empowers students in assessing the effectiveness of research papers from professional journals. Topics investigate the rigor or various research methods, replicability, bias and validity issues, and the appropriateness of statements of findings and recommendations from research. Students study effectiveness and problems in collecting, analyzing, and interpreting data from studies and investigate the applicability and generalization of findings and the proper manner of presenting the details of their own research studies.

RES 504: Introductory Research Statistics (3 credits)

This course covers the basic statistical concepts, theory and methods in statistical research. Topics include variables, graphs, frequency distributions, measures of central tendency, measures of dispersion, probability theory, binomial, normal and Poisson distributions, statistical sampling theory, and statistical decision theory.

RES 506: Advanced Research Statistics (3 credits)

This course covers parametric and nonparametric hypothesis testing. Topics include sampling theory, Chi-square test, least squares regression, correlation theory, non-linear regression, analysis of variance, Student's t-test, and various methods in nonparametric analyses.

RES 508: Qualitative Research (3 credits)

This course provides detailed study of qualitative research methods. Topics survey historical and theoretical foundations of qualitative research, explore major qualitative research strategies, and build an understanding of the art and science of collecting, analyzing, and interpreting qualitative information. The course provides background on applied qualitative research, the politics and ethics of qualitative inquiry, and the major paradigms that inform and influence qualitative research.

RES 510: Participatory Action Research (3 credits)

This course provides the foundational principles of participatory action research. Topics survey theoretical foundations of action research, the methodology and applications of PAR in contemporary culture. Students assess the rigor and usefulness of participatory action research in addressing major world problems.

RES 512: Effective Data Analysis (3 credits)

This course examines modern scientific data analysis including the elements of effectiveness in study design, data gathering, processing of statistics and interpretation of findings.

RES 520: Social Science Research Methods (3 credits)

This course examines essential issues in social science research. Topics include assessment of data gathering techniques using selected case studies from journal articles. Students learn to measure attitudes and performance, use tests in data gathering, contrast and compare uses of statistical and qualitative methods, and evaluate focus group research.

RES 524: Techniques in Transpersonal Research (3 credits)

This course offers an exploration of qualitative research methods that are specific to studies in the transformative and spiritual dimensions of human experience. Topics investigate ways of knowing such as intuition, direct knowing, emotional and bodily cues, dreaming, and other internal phenomena. Students apply transpersonal methods to the research process, and contrast transpersonal methods to traditional empirical methods.

RES 526: Biological Illustration (3 credits)

This course investigates in detail the skills of drawing and painting by hand or camera lucida, photographic methods, video and digital imaging in biological illustration.

RES 527: Biological Modeling (3 credits)

This course explores the analytical and quantitative approaches to the study of biological systems. Topics include fitting data to models, dynamics of systems, transects, random sampling, coring, volumetric measurements, tracking and global positioning. This course presents different mathematical and statistical approaches including deterministic, chaotic, stochastic as well as discrete and continuous models.

RES 528: Environmental Science Research Methods (3 credits)

The course investigates the application of knowledge and understanding to problems of original research in environmental studies. Topics distinguish and interpret the differences among research paradigms and methods. Students review essential principles of ecological problems and how they are approached, the minimal requirements of experimental design in ecology, trade-offs in ecological experimentation. Students analyze current literature, critique existing research methodologies and studies, develop practical research skills, and formulate approaches to scholarly research., and prepare a scholarly paper.

RES 529: Calculus for Environmental Science (3 credits)

This course covers the fundamental topics of derivatives and integrals with emphasis on methods and applications. It is especially directed towards environmental studies in order to provide a valuable and useful device to help solve problem

ENV 510: Business Impact on the Environment (3 credits)

Students examine the application of economic principles to the management of the environment, and addresses the importance of conventional business attitudes that lead to environmental degradation and resource depletion. Topics address the cost of environmental protection and ways to achieve efficient and sustainable use of environmental resources such as energy, minerals, water, forests and fisheries. Students study international economic perspectives on problems such as the loss of biodiversity, the exploitation of animals, the pollution of water, air and soil, global warming, and the threat to the ozone layer.

EXM 880: Comprehensive Examination (2 credits)

Masters students complete this comprehensive examination as a required element of their academic program, prior to undertaking the thesis. The examination usually includes both written and oral components and is confined to the programs of studies completed by the student.

RES 885: Thesis Proposal (2 credits)

This course is required of all Master s students designed to guide them through the formal research proposal process for their final projects, including the development of the research methodology, data gathering device and data analysis techniques. Students also prepare annotated bibliographies of the major scholarly works underlying their project.

RES 890: Thesis Project (4 credits)

This course governs the conduct of the thesis project for the Master's level student. The Masters thesis is the demonstration of the mastery of a body of knowledge in a given field and is presented in a manuscript usually 75 or more pages in length. The final project may take any of several forms, depending upon the field of study and the expectations of faculty. This may be quantitative or qualitative research, participatory action research, or a major project demonstrating excellence. Master's students may re-enroll for this course for no-credit, as needed.

EXM 895: Oral Review of Thesis (2 credits)

This examination is an oral review of the Masters thesis conducted by the graduate committee immediately following their reading of the thesis manuscript.