

ADDITIONAL COURSES OF INTEREST

This list includes other courses related to Global Change that might be of interest to IGC students, but that are not needed to satisfy the policy or conservation requirements of the program. Course descriptions follow.

GLOBAL CHANGE SCIENCE COURSES			
APSC	5044	Biotechnology in Agriculture and Society (PPWS 5024) (<i>EA Wong</i>)	CALS
BIOL	5024	Population and Community Ecology (<i>Lisa Belden</i>)	
BIOL	5114 G	Advanced Global Change Ecology (<i>Jeb Barrett</i>)	COS
BIOL	5564	Advanced Infectious Disease Ecology	COS
BSE	5124	Advanced Topics in Watershed Management (<i>Krometis</i>)	COE
CEE	5194	Environmental Engineering Microbiology (<i>Pruden</i>)	COE
CEE	6104	Advanced Environmental Chemistry (<i>Edwards</i>)	COE
CEE	5124	Fundamentals in Environmental Toxicology	COE
CEE	5184	Techniques for Environmental Analysis	COE
CSES	4595	Soil and Groundwater Pollution	CALS
CSES	5674	Atmospheric Pollution	CALS
CSES	5764 G	Advanced Bioremediation	CALS
CSES	5774	Advanced Rehabilitation of Disturbed Lands	CALS
CSES	5854	Advanced Wetland Soils	CALS
CSES	5864	Advanced Wetland Soils and Mitigation	CALS
CSES	5874	Reclamation of Disturbed Lands	CALS
ENT	5264	Biological Control of Arthropod Pests and Weeds (<i>Salom</i>)	CALS
ENT	5624	Animal and Plant Biosafety and Biosecurity	CALS
ENT	6164	Insecticide Toxicology	CALS
FOR	5984	Ecosystems and Climate (<i>Quinn Thomas</i>)	CNRE
FOR	5984	Quantitative Analysis of Social Science Data for Natural Resources (<i>Mike Sorice</i>)	CNRE
FST	5634 G	Advanced Epidemiology Food & Water Diseases	CALS
GEOG	5214	Health and the Global Environment	CNRE
PHS	5304	Zoonoses and Infectious Diseases Common to Humans and Animals	VMRCVM
PPWS	5204	Principles of Plant Disease Management	CALS
PPWS	5604 G	Advanced Biological Invasions (<i>Jacob Barney</i>)	CALS

Global Change Science Course Descriptions

APSC 5044 (PPWS 5044) - Biotechnology in Agriculture and Society

Worldwide impact of biotechnology applied to plants, animals, and microorganisms. Concepts, scientific and ethical issues, and public concerns related to genetic engineering. Safety and release of genetically engineered organisms; bioremediation; cloning; transgenic plants, animals, and microbes. Graduate standing required. Two semesters each of biology and chemistry.

Credit Hour(s): 3 Lecture Hour(s): 3 Level: Graduate

Instruction Type(s): Lecture, Online Lecture

BIOL 5024 - Population and Community Ecology

Population dynamics, interspecific interactions, succession, and diversity of plants and animals. Quantitative approaches emphasized. Ecology course required. II

Credit Hour(s): 0 OR 4 Lecture Hour(s): 0 OR 3 Level: Graduate

Instruction Type(s): Lab, Lecture; Lisa Belden

BIOL 5114G - Advanced Global Change Ecology

Human alterations of climate, landscapes and biogeochemical cycling influence ecological structure and functioning at the global scale. Such changes have the potential to disrupt natural and managed ecosystems with potentially significant biological and economic impacts. This course will examine the influences of these global changes on the ecosystem processes and biodiversity, drawing on paleo- and contemporary examples. Current and future potential feedbacks between biological systems and the global environment will also be addressed.

When: Even year, fall

Pre-requisite: Graduate Standing required

Credit Hour(s): 4 Lecture Hour(s): 4 Level: Graduate

BIOL 5564 - Advanced Infectious Disease Ecology

Advanced overview of the principles of infectious disease dynamics from ecological and evolutionary perspectives. Examines a variety of wildlife hosts and disease-causing agents. Selective coverage of specific host and pathogen models to illustrate underlying principles of wildlife disease emergence, maintenance, and spread, as well as connections between wildlife and human health. Pre-requisite: Graduate Standing required.

Credit Hour(s): 3 Lecture Hour(s): 3 Level: Graduate

Instruction Type(s): Lecture

BIOL 5084 Groundwater Ecology? Still offered? Not in catalog now

BSE 5124: Advanced Topics in Watershed Management

An interdisciplinary exploration of advanced topics in watershed management. Reading, discussion, summary and presentation of current research in the areas of water quality and watershed management. Topics will be built around a semester theme that will vary by semester. Graduate standing required.

Instructor: Krometis

Credit Hour(s): 2 Lecture Hour(s): 2 Level: Graduate

Instruction Type(s): Lab, Lecture

CEE 5194 - Environmental Engineering Microbiology

Roles of microorganisms in wastewater treatment, anaerobic digestion of municipal sludges, stream self-purification, and degradation of water quality in drinking-water systems. Disinfection of wastewater and drinking water to remove viruses, bacteria, and protozoa that cause waterborne disease.

Instructor: Pruden

Credit Hour(s): 0 OR 3 Lecture Hour(s): 0 OR 2 Level: Graduate

Instruction Type(s): Lab, Lecture

CEE 6104 - Advanced Environmental Chemistry

Advanced theories and practices in environmental engineering with special emphasis on inorganic aspects of water chemistry; application of water chemistry fundamentals for the description of aquatic systems. II

Credit Hour(s): 2 Lecture Hour(s): 2 Level: Graduate

Instruction Type(s): Lecture

Prerequisite(s): (CEE 5104 (UG) OR CHEM 3616 (UG)) OR (CEE 5104 OR CHEM 3616)

CEE 5124 - Fundamentals of Environmental Toxicology

Introduction to nomenclature, principles, and scope of environmental toxicology. The fate and effects of both organic and inorganic toxicants in the environment, in animals, and in various test systems. II

Credit Hour(s): 3 Lecture Hour(s): 3 Level: Graduate Instruction Type(s): Lecture

Prerequisite(s): CEE 5104 (UG) OR CEE 5104

CEE 5184 - Techniques for Environmental Analysis

An introductory course on techniques commonly utilized for analysis of environmental samples. Course will discuss gas and liquid chromatography, mass spectrometry, and atomic absorption spectroscopy, focusing on analysis of complex environmental samples. Practical techniques and applications are emphasized, but sufficient theory is introduced to provide students with an understanding of the principles involved.

Credit Hour(s): 3 Lecture Hour(s): 3 Level: Graduate

Instruction Type(s): Lecture

Prerequisite(s):

CSES 5674 - Atmospheric Pollution

Analysis of practical problems related to pollution of the earth's atmosphere.

Atmospheric structure, applications of the ideal gas law, ambient air quality standards, odor and visibility, pollutant scavenging processes, physical mechanisms controlling global winds, vertical mixing, and atmospheric stability. Gaussian plume models for pollutant dispersion in the atmosphere. Pre: Graduate standing.

Credit Hour(s): 3 Lecture Hour(s): 3 Level: Graduate

CSES 5764G - Advanced Bioremediation

Environmental biotechnology and use of microbes and other organisms to remove contaminants and improve environmental quality. Treatment of contaminated soils, waters, and wastewaters; remediation of industrial waste streams. Current topics and future directions in biodegradation research. Pre: Graduate standing.

Credit Hour(s): 3 Lecture Hour(s): 3 Level: Graduate
Instruction Type(s): Lecture
Prerequisite(s):

CSES 5774 - Advanced Rehabilitation of Disturbed Lands

Advanced study of human disturbance of soils and landscapes and various remediation strategies. Global environmental impacts of coal and metal mining, mineral processing, highway-utility corridor development, and urbanization. Acid mine drainage and treatment, including use of artificial wetlands. Study tours and field project. May not be taken after CSES 4774 or CSES 5874. Graduate standing required.

Credit Hour(s): 0 OR 4 Lecture Hour(s): 0 OR 3 Level: Graduate

Instruction Type(s): Lab, Lecture

Prerequisite(s): CSES 4124 (UG) OR CSES 4124 OR CSES 4134 (UG) OR CSES 4134 OR MINE 4544 (UG) OR MINE 4544

CSES 5854 - Advanced Wetland Soils

Wetlands soils as components of natural landscapes: biogeochemistry, hydrology, geomorphology, hydric soil indicators, and wetland functions under various land uses. Soil and hydrologic factors important to wetland delineation and jurisdictional determination. Mitigation of wetland impacts with emphasis on restoration and creation. Outdoor lectures at local wetlands and a two-day long field trip to observe and identify wetland soils are mandatory. Pre: Graduate standing.

Credit Hour(s): 0 OR 4 Lecture Hour(s): 0 OR 3 Level: Graduate

Instruction Type(s): Lab, Lecture

Prerequisite(s): null

CSES 5864 - Advanced Wetland Soils and Mitigation

Wetland soils as components of natural landscapes and their interactions with hydrologic systems. Hydric soil identification and delineation, preparation of wetland water budgets, restoration of damaged wetlands, and creation of compensation wetlands. Utilization of advanced soil information systems and GIS/GPS in wetlands study. Constructed wetlands for nutrient removal and acid mine drainage treatment.

Credit Hour(s): 3 Lecture Hour(s): 3 Level: Graduate

Instruction Type(s): Lecture, Online Lecture

Prerequisite(s): CSES 5114 (UG) OR CSES 5114

CSES 5874 - Reclamation of Disturbed Lands

Human disturbances of soils and landscapes and various remediation strategies. Environmental impacts of coal and metal mining, mineral processing, highway or utility corridor development, and urbanization. Field and lab testing protocols; development of site-specific revegetation protocols. Acid mine drainage and treatment, including use of artificial wetlands.

Credit Hour(s): 3 Lecture Hour(s): 3 Level: Graduate

Instruction Type(s): Lecture, Online Lecture

Prerequisite(s): CSES 5114

ENT 5264 - Biological Control of Arthropod Pests and Weeds

Principles involved in the use of indigenous and introduced biological agents in the regulation of arthropod pests and weeds. Course objectives are to emphasize concepts important in biological control: population dynamics, host-parasite interactions, characteristics of parasitism and predation, principles involved in current biological approaches to pest control, and use of biological agents to control weeds. Suitable for students in entomology, plant protection, and related curricula. II

Instructor: Scott Salom

Credit Hour(s): 0 OR 3 **Lecture Hour(s):** 0 OR 2 **Level:** Graduate

Instruction Type(s): Lab, Lecture

Prerequisite(s):

ENT 5624/ PPWS 5624 - Animal and Plant Biosafety and Biosecurity

Principles, tools, and techniques of disease detection, early warning, and containment of animal and plant pathogens. Regulatory agencies and guidelines used to ensure the biosafety and biosecurity of the US food supply from accidental introductions and potential bioterrorism.

Credit Hour(s): 3 **Lecture Hour(s):** 3 **Level:** Graduate

Instruction Type(s): Lecture, Online Lecture

Prerequisite(s): ENT 5044

ENT 6164 - Insecticide Toxicology

This course is designed to teach advanced graduate students the chemistry, toxicity, mode of action, and pharmacology of insecticides and related compounds, and to give them an opportunity to learn the methods employed in studying these compounds. The course is designed for entomology and other life science majors. II

Credit Hour(s): 0 OR 3 **Lecture Hour(s):** 0 OR 2 **Level:** Graduate

Instruction Type(s): Lab, Lecture

Prerequisite(s): ENT 6154

FOR 5984 Ecosystems and Climate

This course explores the interactions between ecosystems and climate. Specific topics include biogeophysics (albedo, energy balance, hydrology), biogeochemistry (carbon and nitrogen cycling), ecology, climate change, micrometeorology, forest dynamics, and Earth System modeling. Class discussions will explore the current research in global environmental change and ecosystem dynamics. Computer exercises and projects will develop skills in modeling ecosystem-climate feedbacks. Lecture and laboratory will be combined into a course that flows between lectures, discussions, debates, modeling exercises, and group projects. (2H, 3L, 3C)

Instructor: Quinn Thomas; Fall semester

Credit Hour(s): 3 **Lecture Hour(s):** 3 **Level:** Graduate

FOR 5984 Quantitative Analysis of Social Science Data for Natural Resources

Graduate-level course in applied social statistics with the objective to familiarize students with analytical procedures commonly used in the natural resources field. Attention focuses on the understanding, selection, use, interpretation, and criticism of these methods.

Instructor: Mike Sorice

FST 5634G - Advanced Epidemiology Food & Water Diseases

Overview of causes, transmission, and epidemiology of major environmental, food, and waterborne diseases. Outbreak and sporadic detection, source tracking, and control of pathogens. Overview of the impact of food-borne outbreaks on regulatory activities at the national and international level. Pre-requisite: Graduate Standing required

Credit Hour(s): 4 Lecture Hour(s): 4 Level: Graduate

Instruction Type(s): Lecture

Prerequisite(s):

GEOG 5214 - Health and the Global Environment

Examination of human-environment relations in the context of health and disease using a global perspective. Investigation of dynamic interactions between humans and the total environment, including the physical, biological, cultural, political, and economic environments, in relation to disease. Analysis of geographic variations in health, disease, and health care delivery, including differences between developed and developing regions and within a variety of human and physical environments.

Credit Hour(s): 3 Lecture Hour(s): 3 Level: Graduate

Instruction Type(s): Lecture

Prerequisite(s):

PHS 5304: Zoonoses and Infectious Diseases Common to Humans and Animals

Epidemiology of bacterioses, mycoses, chlamydioses, rickettsioses, parasitoses, viroses and prion diseases that are transmissible between animals and humans and / or are acquired by animals and humans from the same source and that have great impact on public health. Cultural, social and economic factors and impacts; modes of inter- and intra-species transmission including roles of vectors and environmental factors; concepts of emergence and re-emergence; pathogenesis in various hosts and host adaptation; temporal and spatial dynamics, and risk factors for exposure, infection and expression of clinical disease; modes of detection, control / mitigation and prevention; biosecurity, including food safety and security. Instructor: Elvinger; 3 credits

PPWS 5604G - Advanced Biological Invasions; CALS

Causes, consequences, and epidemiology of invasive plants animals, and microbes. Conceptual, mechanistic, societal, and political components of invasive species from Darwin to modern day; invasion process from introduction to ecological or economic impact. Taxonomy, management, and risk assessment, within a policy context. Pre: Graduate standing. (2H, 3L, 3C)

Instructor: Jacob Barney

Credit Hour(s): 3 Lecture Hour(s): 2 Level: Graduate

Instruction Type(s): Lab, Lecture

Prerequisite(s):

PPWS 5204 - Principles of Plant Disease Management

Methods of plant disease management, and theories and effectiveness of their application. Discussion based on epidemiological principles. Methods include: cultural practices, resistance, chemical, and biological control. Laboratory 5214 supplements this course. I

Credit Hour(s): 3 Lecture Hour(s): 3 Level: Graduate

Instruction Type(s): Lecture, Online Lecture

Prerequisite(s): PPWS 3104