

ENVIRONMENTAL SCIENCES (ENVS)

ENVS*1030 Introduction to Environmental Sciences Fall Only (LEC: 6) [1.00]

This course introduces students to what it means to think critically from an environmental sciences perspective. It covers an introduction to: philosophy of science, philosophy of the environment, the evaluation of scientific evidence, and scientific arguments. The course focuses on how we understand and recognize environmental problems, how we decide what to do about them, and what role science can and should play in these discussions.

Restriction(s): ENVS*1100. Registration in the BSC(Env) program or BBRM.EM.

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*1040 Natural History of the Great Lakes Region Fall Only (LEC: 3, LAB: 4) [1.00]

This course is an introduction to the ecological regions, habitats and biodiversity of the Great Lakes watershed with a focus on Southern and Central Ontario. Beginning with a survey of the physical environment of the region, including topography, geomorphology and glaciation, soils, hydrology and climate, the course explores each of the major ecological regions and habitats of the watershed in terms of their defining characteristics and biological communities, including representative flora and fauna.

Restriction(s): Restricted to students in BIESP, BIESPC.

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*1060 Discovering Planet Earth Summer, Fall, and Winter [0.50]

This course provides an introduction to geological principles, their historical development and application to interpreting Earth materials and processes. This course is suitable for those wishing a general knowledge of Earth sciences.

Offering(s): Offered through Distance Education format only.

Restriction(s): Not available to students registered in the BBRM, BIESP, BSC or BSC(Env) programs.

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*1100 Fundamentals of Environmental Sciences Fall Only (LEC: 3) [0.50]

This course introduces students to what it means to think critically from an environmental sciences perspective. It covers an introduction to: philosophy of science, philosophy of the environment, the evaluation of scientific evidence, and scientific arguments. The course focuses on how we understand and recognize environmental problems, how we decide what to do about them, and what role science can and should play in these discussions.

Restriction(s): ENVS*1030. Not available to students registered in the B.Sc.(Env.), BIESP, and BBRM.EM programs.

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*2030 Meteorology and Climatology Fall Only (LEC: 3, LAB: 2) [0.50]

This course examines solar and terrestrial radiation; pressure systems and winds; atmospheric stability and vertical motions; air masses and fronts; clouds and precipitation; selected topics in applied meteorology including air pollution. The laboratory emphasizes the analysis and use of atmospheric data for solving environmental problems.

Prerequisite(s): 1 of IPS*1500, MATH*1080, MATH*1200, PHYS*1070, PHYS*1080, PHYS*1130, PHYS*1300

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*2040 Plant Health and the Environment Winter Only (LEC: 3) [0.50]

This is an interdisciplinary course on the nature and importance of diseases, insects and abiotic stresses on plant productivity and quality. A case history approach will be used to illustrate the biology of plant pests, the principles of pest population management, and related topics.

Prerequisite(s): BIOL*1040 or (2 of BIOL*1050, BIOL*1070, BIOL*1080, BIOL*1090)

Equate(s): ENVB*2040

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*2060 Soil Science Summer and Fall (LEC: 3, LAB: 2) [0.50]

This course is an introduction to the principles of soil science - the origin of soils, their classification and interpretation in natural and modified environments. Soil will be studied as a product of the natural environment, with a focus on formation processes and changes which occur when it is modified through use. A variety of uses including agriculture, forestry, recreation, and urban development will be considered.

Offering(s): Also offered through Distance Education format.

Equate(s): SOIL*2010

Restriction(s): AGR*2320

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*2070 Environmental Ethics and Perspectives Fall Only [0.50]

This course provides an interdisciplinary approach to environmental issues that focus on normative questions of human perspective and choice. Students will investigate the ethical issues that arise from the impact of our actions on the natural world. The course will analyze and assess various influential approaches to developing a normative understanding, including those of philosophers, economists, indigenous communities, feminists, artists, and scientists. Students will develop the necessary intellectual skills to be able to understand and engage fruitfully in normative debates about the environment.

Offering(s): Offered through Distance Education format only.

Equate(s): UNIV*2050

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*2080 Introduction to Environmental Microbiology Winter Only (LEC: 2, LAB: 3) [0.50]

This course will introduce students to environmental microbiology, with a focus on the important roles of microorganisms in various environments such as soil, water and sediments. Discussion will emphasize the physiology, biochemistry, molecular biology and ecology of microorganisms, and how a good understanding of these microbial processes can enable beneficial applications of microorganisms in biotechnology and bioremediation.

Prerequisite(s): BIOL*1070, BIOL*1090

Restriction(s): ENVM*1020, ENVS*2320

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*2090 Problem Solving in Environmental Biology Winter Only (LEC: 2, LAB: 2) [0.50]

This course provides an introduction to current issues and problems in environmental biology. Approaches to characterizing and addressing problems through the systematic application of the scientific method will be critically examined. Students will have the opportunity to practice both oral and written presentation skills.

Prerequisite(s): BIOL*1070, BIOL*1090, CHEM*1050, MATH*1080

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*2120 Introduction to Environmental Stewardship Fall Only [0.50]

This course provides an introduction to the concepts of resource management, environmental planning and assessment, land stewardship and sustainable development. Case studies of specific issues such as parks and natural heritage conservation, agricultural land loss, and integrated rural resources management will provide insight on approaches to decision making. Included will be discussion of the concept of stewardship as an environmental ethics.

Offering(s): Offered through Distance Education format only.

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*2130 Eating Sustainably in Ontario Fall and Winter [0.50]

This course is intended to introduce students to the science behind food related issues within the context of Ontario agriculture and food systems. The course will provide students with an overview of the history of agriculture in Ontario and an opportunity to discuss both sides of current debates over food production and associated environmental and human health issues.

Offering(s): Also offered through Distance Education format.

Prerequisite(s): 4.00 credits

Restriction(s): Not available to students registered in the BAS, BBRM, BIESP, BSC, BSC(Agr) or BSC(Env) programs.

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*2210 Apiculture and Honey Bee Biology Summer, Fall, and Winter (LEC: 3) [0.50]

This course is designed to acquaint the student with the broad field of beekeeping. It will include honey bee biology and behaviour, management for honey production, products of the hive, pests and enemies and the value of bees as pollinators of agricultural crops.

Offering(s): Offered through Distance Education format only

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*2230 Communications in Environmental Science Fall and Winter (LEC: 4) [0.50]

This course provides students with direct training in the academic skills used in researching and communicating environmental science. Within the context of current problems in environmental science, students will develop skills in library research, statistical interpretation, oral and poster presentation and written communication to diverse audiences. Students will research and report on scientific issues within environmental issues being reported in the media.

Prerequisite(s): 1 of ENVM*1000, ENVM*1200, ENVS*1030

Restriction(s): Registration in BBRM, BSC(Env) or BSC(Agr) programs.

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*2240 Fundamentals of Environmental Geology Fall Only (LEC: 3, LAB: 3) [0.50]

This course introduces the concepts and real-world examples of environmental issues related to plate tectonics, natural resources and igneous, metamorphic and sedimentary processes and rocks, groundwater and structural geology. Students will develop laboratory skills in rock and mineral identification, geological map interpretation and site characterization.

Prerequisite(s): ENVS*1040 or GEOG*1300

Restriction(s): ENVS*1050

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*2250 Geology of Natural Disasters Winter and Summer (LEC: 3) [0.50]

This course will offer insight into the mechanisms of natural geological disasters and their effects on Planet Earth, human civilization and life in general. Events before, during and after geological disasters such as earthquakes, volcanic eruptions, meteorite impact and climate change will be the focus of this course. This course will not count as a science credit for B.Sc. students.

Offering(s): Offered through Distance Education format only.

Prerequisite(s): 1 of ENVS*1040, ENVS*1060, GEOG*1300, GEOG*1350

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*2270 Impacts of Climate Change Fall and Winter [0.50]

This course will provide students with an overview of recent research into what climate change means for Canada and Canadians. Students will learn about evidence for significant changes to the Boreal forests and about the potential impacts of climate change on human health through increasing heat waves and the heat stress on individuals. The course is intended to bridge the gap between abstract discussion of the climate and understand what these changes mean at both personal and societal levels.

Offering(s): Also offered through Distance Education format.

Prerequisite(s): Minimum of 4.00 credits

Restriction(s): Not available to students registered in the BAS, BBRM, BIESP, BSC, BSC(Agr) or BSC(Env) programs.

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*2310 Introduction to Biogeochemistry Winter Only (LEC: 4) [0.50]

This course explores quantitatively and qualitatively how biological processes control element fluxes between water, air, and earth materials. Students will gain an understanding of the cycles for major elements (C, N, P, S etc.) in Earth's surface environments, including soil, rivers, lakes and oceans. Topics of current interest, such as resource extraction, climate change and geoengineering will be discussed in terms of their contributions to major element cycles. Seminars include quantitation exercises, hands-on exercises, and discussions to complement topics covered in the lectures.

Prerequisite(s): BIOL*1070, CHEM*1040

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*2330 Current Issues in Ecosystem Science and Biodiversity Fall Only (LEC: 4) [0.50]

This course provides an introduction to a range of specific environmental and scientific issues relating to ecological sciences. Issues to be covered include the biology of climate change, forest science and management of terrestrial ecosystems. Three examples of current problems of societal concern will be used as starting points to examine the role of science in addressing them, while developing students' knowledge of the underlying science and its relation to policy and economics.

Prerequisite(s): 1 of BIOL*1050, BIOL*1070, ENVM*1000, ENVM*1200, ENVS*1030

Equate(s): ENVB*2030

Restriction(s): ENVB*3330, ENVS*2150

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*2700 Introduction to Trees and Conservation Fall Only (LEC: 3) [0.50]

This course offers an introduction to scientific principles and nature through the University of Guelph's Arboretum. It explores natural history, tree life, and a wide range of conservation and community issues with local to global relevance. Designed for students of all backgrounds, the course covers the creation and care of a world-class Arboretum, tree and shrub identification, and the biodiversity they support. Students will examine tree conservation, human interventions, and the ecological roles of natural areas, while land-based learning highlights the health benefits of green spaces. Lectures, discussions, observations, and hands-on activities will deepen students' appreciation for Ontario's trees and their place in the natural world.

Prerequisite(s): 4.00 credits

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*2710 Bird Identification and Conservation Winter Only (LEC: 3) [0.50]

This course provides an engaging introduction to the bird life of southern Ontario, designed for students of all backgrounds, including those with no prior science experience. Students will learn how to identify bird species by sight and, for many, by sound. The course explores bird behavior, conservation, and research, highlighting the ecological roles of birds and their benefits to human well-being, including mental health. Through hands-on observation and discussion, students will gain a deeper appreciation for birds, their diversity in Ontario, and their place in the natural world.

Prerequisite(s): 4.00 credits

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*3000 Nature Interpretation Fall and Winter (LEC: 2, LAB: 3) [0.50]

This course explores communication and experiential learning theories and their application to natural history interpretation and environmental education program design and delivery. Students will develop interpretive materials, plan an interpretive walk and deliver the interpretive walk to a community group.

Offering(s): Also offered through Distance Education format.

Prerequisite(s): BIOL*2060

Equate(s): ENVB*3000

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*3010 Climate Change Biology Summer and Fall (LEC: 3) [0.50]

This course examines the impacts of climate change on living organisms, biological communities and ecosystems. The course focuses on what is known, and what is not known, about the ways in which the suite of changing climate variables influence biological systems.

Offering(s): Also offered through Distance Education format.

Prerequisite(s): BIOL*2060

Equate(s): ENVB*3010

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*3020 Pesticides and the Environment Fall and Winter [0.50]

This course examines the role and use of pesticides by various facets of society and the effect of these pesticides on biological activities in the environment. Preparation of a research proposal is required for the course.

Offering(s): Also offered through Distance Education format.

Prerequisite(s): [BIOL*1040 or (2 of BIOL*1050, BIOL*1070, BIOL*1080, BIOL*1090)], CHEM*1040

Equate(s): ENVB*3030

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*3040 Natural Chemicals in the Environment Fall Only [0.50]

This course explores the roles of naturally occurring chemicals in the inter-relationships of organisms, and the historical and current uses of natural chemicals by humans for agricultural and medicinal purposes.

Offering(s): Offered through Distance Education format only.

Prerequisite(s): BIOL*1040 or (2 of BIOL*1050, BIOL*1070, BIOL*1080, BIOL*1090)

Equate(s): ENVB*3040

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*3050 Microclimatology Winter Only (LEC: 3) [0.50]

This course examines natural and intentionally-modified microclimates near the earth's surface; energy budgets; transport of mass and heat. Familiarization with some instruments for microclimatic measurements will be required.

Prerequisite(s): ENVS*2030

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*3060 Groundwater Winter Only (LEC: 3) [0.50]

This course provides a general understanding of the physical and chemical processes that operate in the groundwater zone under natural and human-induced conditions. The interrelations between the groundwater regime and the other components of the hydrological cycle are studied. Considerable emphasis is placed on the applied aspects of topics such as exploration, testing and development of aquifers for water supply, the chemical quality of groundwater, and the hydrogeological aspects of waste disposal.

Prerequisite(s): AGR*2320 or ENVS*2060

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*3080 Soil and Water Conservation Fall Only [0.50]

This course examines the processes leading to deterioration of soil and water quality, the impact of deterioration on use, and preventative or corrective measures: soil erosion by water and wind, soil compaction and salinization, drainage channel maintenance, sedimentation and nutrient enrichment of water, conservation programs and policies, and reclamation of severely disturbed soils and saline-sodic soils. Emphasis will be on concepts and solutions to problems in a systems approach.

Offering(s): Offered through Distance Education format only.

Prerequisite(s): 1 of AGR*2320, ENVS*2060, SOIL*2010

Equate(s): SOIL*3080

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*3090 Insect Diversity and Biology Winter Only (LEC: 3, LAB: 3) [0.50]

This course is an overview of insect diversity and biology emphasizing groups of importance in conservation biology, outdoor recreation and economic entomology. Labs focus on insect identification and the development of a small insect collection.

Prerequisite(s): BIOL*1040 or (2 of BIOL*1050, BIOL*1070, BIOL*1080, BIOL*1090)

Equate(s): ENVB*3090

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*3140 Management of Turfgrass Diseases Fall Only (LEC: 2, LAB: 2) [0.50]

In this course ecology of turfgrass diseases and cultural methods of management will be emphasized, in addition to field recognition and microscopic diagnosis of diseases. Advances in biological and chemical control measures and their impact on turfgrass ecosystems and surrounding environments will also be discussed.

Prerequisite(s): HORT*2450

Equate(s): ENVB*3160

Restriction(s): DTM*3200

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*3150 Aquatic Systems Winter Only (LEC: 3, LAB: 2) [0.50]

In this course students will be taught how to apply quantitative methods to the analysis of aquatic systems of the earth from many simultaneous perspectives. The material will include the physical, chemical and biological components of the various liquid surficial structures and processes and also how they interact with humans. The economic, social and policy implications of humans interacting with aquatic systems will also be emphasized. The history of the analysis of aquatic systems will be systematically included in the material.

Prerequisite(s): 10.00 credits including (BIOL*1030, BIOL*1040) or (BIOL*1070, BIOL*1090), CHEM*1040

Restriction(s): BIOL*3450

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*3180 Sedimentary Environments Fall Only (LEC: 3, LAB: 3) [0.50]

This course examines the principles of sedimentology and stratigraphy as applied to various ancient and modern sedimentary systems. Students will learn to describe and interpret sedimentary deposits in terrestrial and marine systems as well as the larger forces that control the preservation and evolution of these sedimentary systems over geological time. The course includes several field trips.

Prerequisite(s): ENVS*1050 or ENVS*2240

Restriction(s): ENVS*2400

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*3210 Plant Pathology Fall Only (LEC: 2, LAB: 3) [0.50]

This course examines the nature of disease in plants, including their causal agents, etiology, biology, epidemiology, and management. Emphasis is placed on the historical and social importance of plant diseases, and on current issues in plant health.

Prerequisite(s): 1 of BIOL*1040, BIOL*1050, BIOL*1070

Equate(s): ENVB*3210

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*3220 Terrestrial Chemistry Fall Only (LEC: 3) [0.50]

Chemical reactions within Earth surface environments are vital to element cycling, bioavailability and the remediation of contaminated environments. Soil and saturated sediments (wetlands, lakes, and rivers) are particularly vital reactors for chemical processes that move elements from rocks and minerals to water, biota and the atmosphere. Students in the course explore the major processes governing reactions in soils and freshwater sediments and apply their knowledge to understand contamination and remediation in environments such as legacy mines, acid- and salt-affected soil, as well as the chemical basis for soil productivity.

Prerequisite(s): CHEM*1050, (1 of ENVS*1050, ENVS*2060, ENVS*2240)

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*3230 Agroforestry Systems Fall Only (LEC: 2, LAB: 2) [0.50]

The planned and systematic integration of trees into the agricultural landscape can potentially result in sustainable environmental, ecological, economic and social benefits. The key aspects of deriving these benefits, associated science and management considerations, application potentials at the landscape level and adoption challenges will be discussed. Common temperate and tropical agroforestry systems (e.g. intercropping of trees and crops) will be discussed. Emphasis will be given to successful research and development case studies.

Prerequisite(s): 5.00 credits, (1 of BIOL*1040, BIOL*1050, BIOL*1070)

Equate(s): ENVB*3230

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*3240 Creative Writing for Environmental Science Winter Only (LEC: 4) [0.50]

Science is inherently a creative endeavour and scientists are increasingly being called upon to communicate their ideas and findings to new audiences. In this interdisciplinary course, we will examine texts of creative writing for the environmental science presented within, following up with reading scientific articles related to the subject matter. We will examine the role that creative writing (poetry, storytelling, essays and more) can play in creating inspiration, interest, and even rigour in scientific thinking and communication. By the end of the course, students will be able to interpret and appraise the capacity of the creative process to unfold scientific discoveries, apply techniques of creative writing, and explore the fundamentals of an environmental science topic.

Prerequisite(s): 9.50 credits

Restriction(s): Restricted to students in BSES, BBRM.EM or BSCH.ENVB.

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*3250 Forest Health and Disease Fall Only (LEC: 2, LAB: 2) [0.50]

The impact of beneficial and pathogenic microorganisms on forest health, and the biology and management of tree diseases in natural and urban ecosystems is covered in this course. Emphasis will be placed on ecological processes, host-pathogen interactions, mutualistic associations, wood decay, and human impacts on tree health.

Prerequisite(s): 1 of BOT*2100, ENVB*2030, ENVS*2040, ENVS*2330

Equate(s): ENVB*3250

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*3270 Forest Biodiversity Winter Only (LEC: 4) [0.50]

This course examines biodiversity in forest ecosystems at a variety of scales from genes to landscapes. Relationships between biodiversity and forest ecosystem structure, function, and stability are explored. Approaches to conserving biodiversity in managed forests are discussed and evaluated. Analysis of the relevant scientific literature and practical experience with methods of quantifying biodiversity are emphasized in the weekly seminar.

Prerequisite(s): 1 of BIOL*2060, BOT*3050, ENVS*2330

Equate(s): ENVB*3270

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*3290 Waterborne Disease Ecology Fall Only (LEC: 3, LAB: 2) [0.50]

This course examines emerging and re-emerging waterborne diseases (bacterial, protozoan, and viral) as a function of environmental change (including chemical and biological pollution and climate change). Waterborne diseases, in freshwater and marine ecosystems, will be examined from historical and contemporary issues as they relate to public and environmental health from regional, national, and international perspectives. Topics presented within the course will include current waterborne diseases of humans and aquatic fauna, detection of waterborne pathogens, microbial evolution, microbial physiology, water regulations and protection of drinking water.

Prerequisite(s): (ENVS*2080 or ENVS*2320 or [MBG*2040, (BIOL*2060 or MICR*2420)])

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*3300 Introduction to Controlled Environment Systems Fall Only (LEC: 3) [0.50]

Controlled Environment Systems (CES), otherwise known as Controlled Environment Agriculture (CEA), is a rapidly evolving technological framework for producing crops in a stable, controlled and efficient manner. This CES/CEA technological platform is poised to play a significant role in current and emerging social and environmental issues including, but not limited to, climate change adaptation, food insecurity (urban and Northern/remote communities), local food supply, food supply chain stabilization, food safety, medicinal crop production and standardization, biodiversity preservation, functional foods/improved human nutrition, etc. Highly controlled production of plants in CES is even an absolute requirement in the global quest to explore and colonize the moon, Mars and beyond. This course will provide the student with a strong understanding of the principles of CES/CEA and will dig deep into the wide range of commercial, research, and human space exploration applications of CES/CEA. Through numerous guest speakers, students will also develop a sense of the career opportunities in this rapidly growing sector.

Prerequisite(s): BIOL*1050 or BIOL*1070

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*3310 Soil Biodiversity and Ecosystem Function Winter Only (LEC: 4) [0.50]

Soils are the site of complex interactions between minerals, water, air, organic matter and living organisms. This course will focus on the organisms that live in the soil and their activities in soil ecosystems, soil as a habitat for organisms, the key role of microorganisms in nutrient cycles and plant-microbe relationships and will review basic soil microbial and ecological principles.

Prerequisite(s): 10.00 credits including (1 of AGR*2320, ENVS*2060, SOIL*2010)

Equate(s): ENVS*3200, SOIL*3200

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*3340 Environmental Data Analysis Fall Only (LEC: 2, LAB: 3) [0.50]

This course is focused on interpreting data of the physical environment. Students will access various online databases, such as meteorological and hydrological time series, and perform and interpret statistical analysis with the data. Issues around errors and data collection will be explored by performing simple experiments. Students will make a numerical simulation of a dynamic environmental phenomenon. Students will produce and interpret graphical presentations of data.

Prerequisite(s): 1 of ECON*2740, GEOG*2460, STAT*2040, STAT*2060, STAT*2230

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*3370 Terrestrial Ecosystem Ecology Winter Only (LEC: 3) [0.50]

In this course, the ecosystem is the biological level of organization of interest. Living organisms and their physical environment are considered as components of an integrated system. Key ecosystem processes such as energy flow, carbon and nutrient cycling, and succession, and the controls on these processes, are examined. The impacts of human activity and global change on ecosystem structure and function are investigated.

Prerequisite(s): BIOL*2060 or ENVS*2330

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*4000 Toxicological Risk Assessment Winter Only (LEC: 3) [0.50]

This advanced course will give students a working knowledge of current processes and techniques for toxicological risk characterization. The course material will cover problem definition, effect characterization, exposure characterization, risk assessment and risk management decision making.

Prerequisite(s): TOX*2000

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*4001 Project in Environmental Sciences Fall Only (LEC: 3) [0.50]

First part of the two-semester course ENVS*4001/2. The course permits the student the opportunity to integrate both the skills and knowledge acquired in earlier courses through application to current environmental problems and issues. Group research problems and exposure to critical environmental policy issues will form the core elements of the course. This is a two-semester course offered over consecutive semesters.

When you select it you must select ENVS*4001 in the Fall semester and ENVS*4002 in the Winter semester. A grade will not be assigned to ENVS*4001 until ENVS*4002 is completed.

Prerequisite(s): 12.00 credits

Equate(s): ENVS*4011

Restriction(s): 12.00 credits. Registration in the BSC(Env) or BSCH.ENVS programs.

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*4002 Project in Environmental Sciences Winter Only (LEC: 3) [0.50]

This is the second part of the two-semester course ENVS*4001/2.

The course permits the student the opportunity to integrate both the skills and knowledge acquired in earlier courses through application to current environmental problems and issues. Group research problems and exposure to critical environmental policy issues will form the core elements of the course. This is a two-semester course offered over consecutive semesters. When you select it you must select ENVS*4001 in the Fall semester and ENVS*4002 in the Winter semester. A grade will not be assigned to ENVS*4001 until ENVS*4002 is completed.

Prerequisite(s): ENVS*4001

Equate(s): ENVS*4012

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*4030 Ecohydrology Winter Only (LEC: 3) [0.50]

This course introduces the emerging discipline of ecohydrology, which focuses on interactions and feedbacks between the elements of the water cycle, ecosystems and organisms. The emphasis will be on how hydrological processes regulate ecological ones but also on the mechanisms of ecological regulation of hydrological processes - which are often ignored in traditional hydrologic investigations. Students will learn about complex dynamics prevailing in ecohydrological systems using a blend of theory, quantitative tools and case studies. Students will also learn to synthesize recent literature, collect and analyze relevant data from open-access databases, and perform holistic ecohydrological system analysis through a term project.

Prerequisite(s): (BIOL*3130 or GEOG*3610), (1 of GEOG*2460, STAT*2040, STAT*2060, STAT*2120, STAT*2230)

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*4050 Predicting Impacts of Environmental Change Winter Only (LEC: 3) [0.50]

This course is focused on the effects of urbanization and pollutant and greenhouse gas emissions on local, regional and global climates and the subsequent impacts on human life. Students will develop and apply simple numerical models of atmospheric processes toward solving practical problems, including applications related to land-atmosphere exchange of heat and water, air quality, and assessment of thermal comfort in urban environments. Students will learn tools for analysis of global climate model data, preparing them to work directly with the data underlying projected future climates.

Prerequisite(s): ENVS*3050

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*4070 Pollinator Conservation Winter Only (LEC: 3) [0.50]

This course will explore the ecology of pollination with an emphasis on the roles animals play in pollen movement. Students will critically examine hypothesized drivers of regional, national and global pollinator declines, and the range of potential strategies suggested to mitigate or reverse these declines. Students will examine the efficacy of a wide range of pollinator conservation strategies in different geographical, ecological and economic contexts to help them build an understanding of the available toolbox for conservation.

Prerequisite(s): BIOL*3130

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*4090 Soil Management Fall Only (LEC: 3, LAB: 1) [0.50]

A lecture-tutorial course on the practical aspects of soil management for crop production as they relate to the physical, chemical and biological properties of soils; major emphasis is placed on soil fertility as related to field soil properties and fertilizer, lime and manure use, soil and plant testing for mineral nutrients. The beneficial aspects of drainage, irrigation, erosion control and related tillage practices on soil fertility are also presented. Due regard is given to both economic and environmental aspects of soil management practices.

Prerequisite(s): AGR*2320 or ENVS*2060

Restriction(s): ENVS*4160

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*4100 Integrated Management of Invasive Insect Pests Winter Only (LEC: 3, LAB: 3) [0.50]

This course explores the concept of integrated pest management as it applies to the mitigation of invasive insect pests associated with agricultural and forest ecosystems.

Prerequisite(s): 1 of CROP*3300, CROP*3310, ENVB*2040, ENVB*3090, ENVS*2040, ENVS*3090, HORT*3280, HORT*3350, HORT*3510

Equate(s): ENVB*4100

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*4160 Soil and Nutrient Management Fall Only (LEC: 4, LAB: 3) [0.50]

This course consists of the same lectures and seminars as (ENVS*4090 or SOIL*4090), but with an additional laboratory. The laboratory portion will focus on the regulatory requirements as stated under the Nutrient Management Act, 2001. Students will discuss nutrient management issues and gain practical experience using the NMAN software program.

Prerequisite(s): 1 of AGR*2301/2, AGR*2320, ENVS*2060, SOIL*2010

Equate(s): SOIL*4130

Restriction(s): ENVM*1070, (ENVS*4090 or SOIL*4090)

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*4180 Insecticide Biological Activity and Resistance Winter Only (LEC: 4) [0.50]

This course explores the diverse modes of action of botanical, microbial and synthetic insecticides. Detoxification mechanisms, selectivity, resistance management and the process of pesticide discovery and development are also considered. The course includes a review of insect physiological systems and discussion of the stability and distribution of pesticides in the environment.

Offering(s): Offered in even-numbered years.

Prerequisite(s): Minimum of 12.00 credits

Restriction(s): Registration in the BAS, BBRM, BIESP, BSC, BSC(Agr) or BSC(Env) program

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*4190 Biological Activity of Herbicides Winter Only (LEC: 3) [0.50]

This course explores the diverse modes of action of botanical, microbial and synthetic herbicides. Detoxification mechanisms, selectivity, resistance management and the process of herbicide discovery and development are also considered. The course includes a review of plant physiological systems and discussion of the stability and distribution of herbicides in the environment.

Offering(s): Offered in odd-numbered years.

Prerequisite(s): Minimum of 12.00 credits

Restriction(s): ENVB*4240. Registration in the BAS, BBRM, BSC, BSC(Agr) or BSC(Env) program.

Department(s): Department of Plant Agriculture

Location(s): Guelph

ENVS*4210 Meteorological and Environmental Instrumentation Winter Only (LEC: 3) [0.50]

This course covers the design and implementation of measurement systems for atmospheric and environmental studies. Principles of operation and practical consideration of various meteorological and soil sensors will be discussed along with overall design and implementation procedures for environmental monitoring. Students will develop their understanding of data interpretation and quality control of data.

Prerequisite(s): STAT*2040

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*4230 Biology of Aquatic Insects Fall Only (LEC: 2, LAB: 3) [0.50]

This course is a study of the adult and immature forms of aquatic insects. Students are required to present a collection of at least 200 insect specimens identified to genus.

Offering(s): Offered in odd-numbered years.

Prerequisite(s): ENVB*3090 or ENVS*3090

Equate(s): ENVB*4220

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*4260 Field Entomology Fall and Winter (LEC: 1, LAB: 6) [0.50]

This course is taught in late April or May. Students may enroll in either the preceding Winter semester or following Fall semester. The course provides an introduction to insect sampling, observation, identification, and experimentation in field settings. Student activities are divided equally between observing, collecting and identifying specimens from more than 20 families and an experimental component involving one or more studies to test hypotheses about the ecology or behaviour of insects. There are occasional lectures and discussions to highlight particularly interesting observations of insects. Student evaluation is based on the student's insect collection and associated logbook, a written paper describing their experiment, contributions to class discussions and activities, and peer evaluation. The field site is generally in the USA or South America. Course fees cover costs of room, board, supplies, and transportation to the field site(s). This course must be recorded as part of the student's Fall or Winter course selection and tuition and compulsory fees will be calculated accordingly. Detailed information is available from the Office of the Director - School of Environmental Sciences.

Prerequisite(s): (ENVB*3090 or ENVS*3090) or (ENVB*4040 or ENVS*4040)

Equate(s): ENVB*4260

Restriction(s): Instructor consent required.

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*4320 Laboratory and Field Methods in Soil Biodiversity Winter Only (LEC: 1, LAB: 3) [1.00]

This course will use a hand-on approach to investigate concepts and develop skills needed for understanding key soil functions. Emphasis will be on the transformation of nutrients and contaminants in soils and groundwater by microorganisms. Approaches for analyzing microbial populations and activities in the environment, including molecular techniques will be covered.

Prerequisite(s): ENVS*3200 or ENVS*3310

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*4350 Forest Ecology Fall Only (LEC: 3, LAB: 3) [0.50]

This course will explore aspects of forest ecology with an emphasis on the ecological principles needed for sound forest management. Biotic and abiotic components of forest ecosystems will be discussed in the context of energy flow, nutrient cycling, forest succession and appropriate silvicultural systems.

Prerequisite(s): BIOL*2060 or ENVS*2330

Equate(s): ENVB*4780

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*4360 Glacial Environments Winter Only (LEC: 4) [0.50]

This course will explore modern to ancient glacial environments, focusing on the sedimentary record they leave behind and applications of glacial geology including reconstructing past environments, examining how glacial deposits affect the distribution of resources or groundwater contaminants, and discovering the response of glaciers to recent and past climate change. Students will develop skills in critically evaluating literature and geological data, description and identification of glacial deposits.

Prerequisite(s): ENVS*2400 or ENVS*3180

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*4370 Natural and Anthropogenic Compounds in the Environment Winter Only (LEC: 3) [0.50]

This course discusses the chemical processes that influence organic compounds in the air, water, and soil. The relationships between anthropogenic compounds (pollutants, pesticides, etc.), natural organic matter (humic materials, dissolved organic matter, biomolecules) and environmental quality will be discussed. Topics include: the persistence and degradation of contaminants in the environment, environmental analysis, environmental forensics, organic aerosols, aquatic dissolved organic matter, and soil organic matter.

Prerequisite(s): 1 of CHEM*3360, ENVS*3020, ENVS*3220, TOX*3360

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*4390 Soil Variability and Land Evaluation Fall Only (LEC: 3, LAB: 2) [0.50]

This course integrates formal in-field (including excursions held over two weekends during the semester, dates to be determined considering weather conditions) and laboratory training, with classroom discussions of concepts, to guide the gathering and interpreting of soilscape information. The principal focus is on soil, as a spatially- and temporally-variable product and component of ecosystems; special consideration is given to the factors controlling soil processes, from local to global scales. An examination of methods, for describing and quantifying the distribution of soils, includes survey and sensor-based techniques, in conjunction with data trend analysis and modelling.

Prerequisite(s): 10.00 credits including (1 of AGR*2320, ENVS*2060, ENVS*2310, ENVS*2340)

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*4410 Introduction to Advanced Independent Research Summer, Fall, and Winter (LEC: 1) [0.50]

In this course the student will undertake an independent research project of a practical or theoretical nature that relates to environmental sciences and is conducted under the supervision of a faculty member. This course is designed to provide senior undergraduate students with an introduction to independent research work. The course includes work with a faculty advisor to develop a research project, formulate hypotheses/objectives, design and conduct preliminary experiments to test the hypotheses. Students must make arrangements with both a faculty supervisor and the course coordinator at least one semester in advance. A school registration form must be obtained from the course coordinator and submitted no later than the second class day of the semester in which the course is taken.

Prerequisite(s): Minimum of 10.00 credits. Minimum cumulative average of 70%.

Restriction(s): Registration in BIESP, BSC(Env), BSC(Agr), BSCH or BBRM program. Instructor consent required.

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*4420 Advanced Independent Research Summer, Fall, and Winter (LEC: 1) [0.50]

In this course the student will undertake an independent research project of a practical or theoretical nature that relates to environmental sciences and is conducted under the supervision of a faculty member. This course is designed to provide a research intensive experience. This course is designed to be the completion of the research proposal developed in ENVS*4410. In this course the student will undertake an independent research project of a practical or theoretical nature that relates to environmental sciences and is conducted under the supervision of a faculty member. This course is designed to provide a research intensive experience. This course is designed to be the completion of the research proposal developed in which the course is taken.

Prerequisite(s): ENVS*4410. Minimum cumulative average of 70%.

Restriction(s): ENVS*4430. Registration in BBRM, BIESP, BSC(Env), BSC(Agr) or BSCH program. Instructor consent required.

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*4430 Advanced Independent Research Summer, Fall, and Winter (LAB: 12) [1.00]

In this course the student will undertake an independent research project of a practical or theoretical nature that relates to environmental sciences and is conducted under the supervision of a faculty member. This course is designed to be the completion of the research proposal developed in ENVS*4410 by the student in consultation with a faculty advisor. This course can be selected in place of ENVS*4420 if the student and faculty advisor deem the project to be of sufficient scope to necessitate a 1.00 credit course. Students must arrangements with both a faculty supervisor and the course coordinator at least one semester in advance. A school registration form must be obtained from the course coordinator and submitted no later than the second class day of the semester in which the course is taken.

Prerequisite(s): ENVS*4410. Minimum cumulative average of 70%.

Restriction(s): ENVS*4420. Registration in BSC(Env), BSC(Agr), BSCH or BBRM. Instructor consent required.

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*4440 Advanced Controlled Environment Systems Winter Only (LEC: 1, LAB: 3) [0.50]

Students will focus on the manipulation of specific environment parameters and how that manipulation affects biological growth and development or achieves a commercial/research objective. The technical skills developed will be balanced with in-depth discussions on the broader environmental and societal implications of controlled environment agriculture (e.g., food insecurity, urban agriculture, adapting to a changing climate). Weekly activities will focus on both practical and theoretical aspects of CES crop production and will be used to support student research activities.

Prerequisite(s): ENVS*3300

Restriction(s): Instructor consent required.

Department(s): School of Environmental Sciences

Location(s): Guelph

ENVS*4510 Topics in Environmental Sciences Summer, Fall, and Winter [0.50]

This course provides an opportunity for students to engage in advanced independent research and study. Students will undertake a project based on research in the literature that relates to environmental sciences.

Projects will be designed to be completed in a single semester. Students must make arrangements with both a faculty supervisor and the course coordinator at least one semester in advance. A School registration form must be obtained from the course coordinator and submitted no later than the second class day of the semester in which the course is taken.

Prerequisite(s): Minimum of 10.00 credits. Minimum cumulative average of 70%.

Restriction(s): Restricted to students in the BBRM.EM, BIESP, BSCH, BSC(Agr), BSC(Env) program. Instructor consent required.

Department(s): School of Environmental Sciences

Location(s): Guelph