

# ENVIRONMENTAL SCIENCES (ENVS)

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## **ENVS\*6000 Physical Environment of Crops and Forests Fall Only [0.50]**

Recent literature on temperature, humidity, radiation, wind, gases and particles in crop and forest environments; evapotranspiration and photosynthesis of plant communities; modification of microclimates; applied micrometeorology.

**Offering(s):** Even-numbered years

**Department(s):** School of Environmental Sciences

**Location(s):** Guelph

## **ENVS\*6010 Toxicology Risk Assessment Winter Only [0.50]**

An advanced course that gives students working knowledge of current processes and techniques for toxicological risk characterization. The course material covers: problem definition, effect characterization, exposure characterization, risk assessment, and risk management decision making. Offered in conjunction with ENVS\*4000. Extra work is required of graduate students.

**Department(s):** School of Environmental Sciences

**Location(s):** Guelph

## **ENVS\*6040 Molecular Basis of Plant-Microbe Interactions Fall Only [0.50]**

A lecture and seminar course on recent advances in the study of plant-microbe interactions. Topics included are the biochemical, physiological and genetic aspects of plant defenses and the interaction of plants with pathogenic and mutualistic bacteria, fungi and viruses. Offered in conjunction with P BIO\*4000. Extra work is required of graduate students.

**Restriction(s):** Credit may be obtained for only one of ENVS\*6040 or P BIO\*4000.

**Department(s):** School of Environmental Sciences

**Location(s):** Guelph

## **ENVS\*6050 Micrometeorology Fall Only [0.50]**

Exchanges of mass, momentum and energy between the surface and the atmosphere will be studied in the context of larger-scale meteorology. Diffusion and turbulence in and above plant canopies will be examined from theoretical and practical perspectives. Topics include time-series analysis, micrometeorological measurement theory, and basic principles of atmospheric science.

**Offering(s):** Even-numbered years

**Department(s):** School of Environmental Sciences

**Location(s):** Guelph

## **ENVS\*6060 Meteorological Instrumentation Winter Only [0.50]**

Theoretical and practical aspects of electronic circuits, sensors, and equipment used in meteorological research.

**Prerequisite(s):** ENVS\*4210

**Department(s):** School of Environmental Sciences

**Location(s):** Guelph

## **ENVS\*6070 Topics in Environmental Sustainability Winter Only [0.50]**

This course will allow students to examine, analyze and discuss the evolving concept of environmental "sustainability" and increase their knowledge and experience in this area. We will examine current issues (e.g., climate change, natural resource management, environmental governance) at the interface of more than one discipline (e.g., ecology, economics, psychology, environmental sciences) and which require global understanding.

**Offering(s):** Not offered through Distance Education

**Department(s):** School of Environmental Sciences

**Location(s):** Guelph

## **ENVS\*6190 Environmental Microbial Technology Unspecified [0.50]**

Current topics in selected areas of environmental microbial technology. An emphasis will be placed on the physiology and genetics of microorganisms useful in environmental biotechnology. The course involves extensive use of current journal articles. An undergraduate degree in microbiology or related discipline is recommended prior to registering in this course.

**Department(s):** School of Environmental Sciences

**Location(s):** Guelph

## **ENVS\*6242 Topics in Atmospheric Science Summer, Fall, and Winter [0.50]**

Students will explore topics within atmospheric science such as climatology, animal biometeorology, air pollution meteorology, and hydrometeorology. Normally, an independent course of study will be developed with a faculty advisor and one or more students in the semester prior to enrollment. Occasionally, the course will be offered as a lecture/seminar in a particular area, to be advertised in the semester prior to offering. Typically, students will produce a major paper or scientific report.

**Restriction(s):** Instructor consent required.

**Department(s):** School of Environmental Sciences

**Location(s):** Guelph

## **ENVS\*6280 Soil Physics Winter Only [0.50]**

The soil as a physical system with special regard to soil water movement and the diffusion and dispersion of chemical substances. Numerical techniques and computer solutions will be developed.

**Department(s):** School of Environmental Sciences

**Location(s):** Guelph

## **ENVS\*6300 Quantitative Pedology Fall Only [0.50]**

Pedology considers the morphology, survey, geography, characterization and analysis, development, classification, and interpretation of soil. This course focuses on the quantification of pedology, employing modern digital instrumentation, computational capacity and analytical strategies. Students explore how such multi-scale, spatial-temporal information is used in critical zone modeling. Students should have at least an introductory soil, ecology or physical geography course. Students with only an introductory level soil course are encouraged to audit ENVS\*4390.

**Restriction(s):** Cannot take if credit received for ENVS\*6250.

**Department(s):** School of Environmental Sciences

**Location(s):** Guelph

## **ENVS\*6340 Colloquium in Insect Systematics Winter Only [0.25]**

Weekly discussions and seminars dealing with current topics in systematic entomology.

**Offering(s):** Odd-numbered years

**Department(s):** School of Environmental Sciences

**Location(s):** Guelph

**ENVS\*6350 Soil Organic Matter and Biochemistry Fall Only [0.50]**

(1) Soil organic matter characterization, (2) dynamics of soil organic matter, (0.5) nutrient cycling.

**Offering(s):** Odd-numbered years

**Department(s):** School of Environmental Sciences

**Location(s):** Guelph

**ENVS\*6360 Soil and Water Chemistry Fall Only [0.50]**

Thermodynamics of soil solutions; solution-solid phase equilibria; reaction kinetics; computer modelling of solute-mineral interactions.

**Department(s):** School of Environmental Sciences

**Location(s):** Guelph

**ENVS\*6400 Soil Nitrogen Fertility and Crop Production Winter Only [0.50]**

Emphasis will be placed on soil N transformations and processes, and N sources for crops; field experimentation methods; environmental issues.

**Department(s):** School of Environmental Sciences

**Location(s):** Guelph

**ENVS\*6440 Field Sampling Strategies and Geostatistics Winter Only [0.50]**

Concepts and practical aspects of collecting, synthesizing and interpreting data from spatially and temporally variable and/or correlated fields. Hands-on experience in describing spatial structure of large data sets (supplied by student or instructor) using available software.

**Offering(s):** Even-numbered years

**Department(s):** School of Environmental Sciences

**Location(s):** Guelph

**ENVS\*6450 Multivariate Environmental Data Analysis Winter Only [0.50]**

This course will examine the application of statistical techniques to analyzing multivariate environmental data. Methods will include Ordination (e.g., Principal Components Analysis, NDMS), Multivariate Regression (e.g., Partial Least Squares Regression), and Structural Equation Modelling. Emphasis will be placed on peer and collaborative learning through discussion, and comparative application of analyses to multivariate environmental data. Students should have at least one undergraduate course in statistics.

**Restriction(s):** Instructor consent required.

**Department(s):** School of Environmental Sciences

**Location(s):** Guelph

**ENVS\*6452 Special Topics in Ecosystem Science and Biodiversity Summer, Fall, and Winter [0.50]**

Students will explore topics within ecosystem science such as terrestrial ecology, forest science, aquatic systems and environmental biology. Normally, an independent course of study will be developed with a faculty advisor and one or more students in the semester prior to enrollment. Occasionally, the course will be offered as a lecture/seminar in a particular area, to be advertised in the semester prior to offering.

Typically, students will produce a major paper or scientific report.

**Restriction(s):** Instructor consent required.

**Department(s):** School of Environmental Sciences

**Location(s):** Guelph

**ENVS\*6460 Environmental Remediation Winter Only [0.50]**

This course discusses environmental remediation/bioremediation topics including, but not limited to, phytoremediation, bioremediation, mycoremediation, and physical and chemical remediation to improve air, water and soil quality. For example, this course may explore the use of plants to take up and accumulate toxins from contaminated soils, use of bacteria to degrade groundwater contaminants, and physical/chemical processes to remove contaminated substrates or break down contaminants in those substrates. Environmental remediation is, by nature, multidisciplinary, involving chemistry, physics, biology, engineering, landscape design, etc. Numerous guest lectures from academic and commercial experts serve to explore this diverse field.

**Department(s):** School of Environmental Sciences

**Location(s):** Guelph

**ENVS\*6470 The Science and Management of Multiple Stressors in the Great Lakes Fall Only [0.50]**

In this course, students learn about historical and current environmental issues affecting the Great Lakes and its basin from the perspective of multiple stressors and their cumulative impacts. The importance of linking science and policy to manage historical and current problems is emphasized.

**Restriction(s):** Instructor consent required.

**Department(s):** School of Environmental Sciences

**Location(s):** Guelph

**ENVS\*6500 Environmental Sciences Research Project Unspecified [1.00]**

A concise, critical review of an area of study related to the field chosen by the student including analyses and interpretation of relevant data. The project will be written in the form of a scientific paper and presented to the department as a seminar.

**Restriction(s):** Restricted to Master of Environmental Science students.

**Department(s):** School of Environmental Sciences

**Location(s):** Guelph

**ENVS\*6501 Integrating Science and Policy in Environmental Science Fall Only [0.50]**

A case-study approach, based on current and historical issues, and involving presentations from faculty, professionals and students, will be used to develop an advanced understanding of current issues in the environmental sciences, including examination of the underlying science and management of the issues, and the effectiveness of associated policies.

**Restriction(s):** Restricted to Master of Environmental Science students.

**Department(s):** School of Environmental Sciences

**Location(s):** Guelph

**ENVS\*6502 Seminar in Environmental Science Winter Only [0.50]**

This course will provide an interactive and critical forum for students to participate in an advanced discussion and debate on current environmental issues, and to learn about the practical skill set(s) required by various employment sectors in solving these issues.

**Restriction(s):** Restricted to Master of Environmental Science students.

**Department(s):** School of Environmental Sciences

**Location(s):** Guelph

**ENVS\*6503 Biogeochemistry of Wetlands Landscapes Landscapes Fall Only [0.50]**

This course is focused on the role of wetlands in maintaining healthy ecosystems and in controlling contaminant fluxes to water. Lectures complement field and laboratory assessments of wetlands to understand element biogeochemical cycles in these transitional environments. The course includes field trips to Ontario wetlands.

**Prerequisite(s):** BIOL\*1020 BIOL\*1070 CHEM\*1040 CHEM\*1070 and PHYS\*1070 or PHYS\*1080

**Restriction(s):** Restricted to Environmental Sciences students.

**Department(s):** School of Environmental Sciences

**Location(s):** Guelph

**ENVS\*6505 Soil Survey and Interpretation Summer Only [0.50]**

Students will learn concepts, techniques and analysis related to the characterization of soil in the landscape. Focus will be given to soils encountered in southern Ontario. Course involves multiple field excursions to examine the distribution of soils in this region.

**Restriction(s):** Restricted to Environmental Sciences students.

**Department(s):** School of Environmental Sciences

**Location(s):** Guelph

**ENVS\*6506 Forest Ecosystem Patterns and Processes Summer Only [0.50]**

Students will learn concepts, techniques and analysis related to the ecological characterization of forests. Focus will be on southern and mid-central Ontario forests and will involve periodic excursions to various locations for the purpose of demonstrating theoretical principles, sampling techniques, in-field measurements, and collecting samples for in-lab assessment.

**Restriction(s):** Restricted to Environmental Sciences students.

**Department(s):** School of Environmental Sciences

**Location(s):** Guelph

**ENVS\*6520 Pollinator Biology Fall Only [0.50]**

The biology of pollinators will be discussed in lectures and seminars stressing fundamental and applied aspects. The honey bee will be used as the model system.

**Offering(s):** Odd-numbered years

**Department(s):** School of Environmental Sciences

**Location(s):** Guelph

**ENVS\*6530 Pollinator Conservation Winter Only [0.50]**

In this course students will explore the ecology of pollination with an emphasis on the factors affecting declines in pollinating insects as well as potential mitigation strategies to ensure long-term stability of food production and maintenance of biodiverse wild plant communities. Offered in conjunction with ENVS\*4070. Extra work is required of graduate students.

**Restriction(s):** Credit may be obtained for only one of ENVS\*6530 or ENVS\*4070.

**Department(s):** School of Environmental Sciences

**Location(s):** Guelph

**ENVS\*6540 Integrated Pest Management: Insects Winter Only [0.50]**

Concepts associated with integrated pest management of insect pests of various plant hosts will be introduced to students in an interactive lecture and laboratory format. Experiential learning and skill development, associated with economic entomology, will also be emphasized. Offered in conjunction with ENVS\*4100. Extra work is required of graduate students.

**Offering(s):** Annually

**Restriction(s):** Credit may be obtained for only one of ENVS\*6540 and ENVS\*4100

**Department(s):** School of Environmental Sciences

**Location(s):** Guelph

**ENVS\*6550 Bioactivity and Metabolism of Insecticides Winter Only [0.50]**

The basis of insecticide bioactivity will be examined, with emphasis on mode of action, structure-activity relationships and analytical methods. Students will choose a specific insecticide or class of insecticides as their primary topic of study for the semester. Students will participate in seminars, prepare a conference poster and complete a research paper.

**Offering(s):** Even-numbered years

**Department(s):** School of Environmental Sciences

**Location(s):** Guelph

**ENVS\*6560 Forest Ecosystem Dynamics Fall Only [0.50]**

An exploration of energy flow and distribution in forest ecosystems. Both components will be examined in the context of biomass and productivity, perturbations and resilience. Some aspects of modelling will be covered.

**Offering(s):** Odd-numbered years

**Department(s):** School of Environmental Sciences

**Location(s):** Guelph

**ENVS\*6582 Special Topics in Soil Science Summer, Fall, and Winter [0.50]**

Students will explore topics within soil science such as soil physics, pedology, soil chemistry and microbiology. Normally, an independent course of study will be developed with a faculty advisor and one or more students in the semester prior to enrollment. Occasionally, the course will be offered as a lecture/seminar in a particular area, to be advertised in the semester prior to offering. Typically, students will produce a major paper or scientific report.

**Restriction(s):** Instructor consent required.

**Department(s):** School of Environmental Sciences

**Location(s):** Guelph

**ENVS\*6720 Geology of Groundwater Systems Winter Only [0.50]**

This course will examine the geological characteristics and processes that influence groundwater flow systems and contaminant transport and fate in different geological settings. The course will include seminar discussions of readings, guest speakers from industry and government agencies as well as hands-on exercises in class.

**Offering(s):** Odd-numbered years

**Department(s):** School of Environmental Sciences

**Location(s):** Guelph

**ENVS\*6730 Special Topics in Environmental Earth Science Summer, Fall, and Winter [0.50]**

Students will explore topics within environmental earth science such as glacial geology, environmental geophysics and hydrogeology. Normally, an independent course of study will be developed with a faculty advisor and one or more students in the semester prior to enrollment. Occasionally, the course will be offered as a lecture/seminar in a particular area, to be advertised in the semester prior to offering. Typically, students will produce a major paper or scientific report.

**Restriction(s):** Instructor consent required.

**Department(s):** School of Environmental Sciences

**Location(s):** Guelph

**ENVS\*6740 Environmental Organic Chemistry Winter Only [0.50]**

This course explores the chemical processes that influence organic compounds in the environment. Topics discussed include: the transformation of anthropogenic organic contaminants, the form and function of natural organic matter, and analytical methods including compound specific stable isotope analysis and environmental nuclear magnetic resonance. Offered in conjunction with ENVS\*4370. Extra work is required of graduate students.

**Restriction(s):** Credit may be obtained for only one of ENVS\*6740 or ENVS\*4370. Restricted to Environmental Sciences students.

**Department(s):** School of Environmental Sciences

**Location(s):** Guelph

**ENVS\*6882 Special Topics in Plant and Environmental Health Summer, Fall, and Winter [0.50]**

Students will explore topics within plant and environmental health such as integrated pest management, apiculture and environmental microbiology. Normally, an independent course of study will be developed with a faculty advisor and one or more students in the semester prior to enrollment. Occasionally, the course will be offered as a lecture/seminar in a particular area, to be advertised in the semester prior to offering. Typically, students will produce a major paper or scientific report.

**Restriction(s):** Instructor consent required.

**Department(s):** School of Environmental Sciences

**Location(s):** Guelph

**ENVS\*6900 Research Seminar in Environmental Sciences Fall and Winter Reg Required [0.50]**

This course provides information and training in scientific presentations for thesis-based Environmental Sciences (ENVS) programs. Students will prepare a written research proposal and make an oral presentation of their proposed studies. Students are expected to complete this course in their second or third semester of study.

**Restriction(s):** Restricted to Environmental Sciences MSc and PhD students.

**Department(s):** School of Environmental Sciences

**Location(s):** Guelph