

ENVS*4370 - Natural and Anthropogenic Compounds in the Environment

Winter 2025 Course Outline

Section: 01

Credits: 0.50

Land Acknowledgement: Guelph

The University of Guelph resides on the ancestral lands of the Attawandaron people and the treaty lands and territory of the Mississaugas of the Credit. We recognize the significance of the Dish with One Spoon Covenant to this land and offer respect to our Anishinaabe, Haudenosaunee and Métis neighbours. Today, this gathering place is home to many First Nations, Inuit, and Métis peoples and acknowledging them reminds us of our important connection to this land where we work and learn.

Calendar Description

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

Course Description

This course discusses the chemical processes that influence organic compounds in the environment, including both anthropogenic organic compounds (pollutants, pesticides, etc...) and natural organic matter (humic materials and biomolecules).

Topics to be discussed will include:

1. The occurrence of natural and anthropogenic compounds in the environment;
2. The analysis of soil, water, and air samples.
3. The transformation and remediation of compounds in the environment

Lecture Schedule

MonWedFri 11:30am-12:20pm in MCKN*315 (1/6 to 4/21)

Instructor Information

James Longstaffe

Email: jlongsta@uoguelph.ca

Office: Alexander Hall 307

Office Hours:

Please email for availability

Learning Resources

Required Resources

Website: CourseLink (<https://courselink.uoguelph.ca/shared/login/login.html>)

Campus Resources

If you are concerned about any aspect of your academic program: Make an appointment with a Program Counsellor (<https://www.uoguelph.ca/uaic/programcounsellors/>) in your degree program. If you are struggling to succeed academically. There are numerous academic resources offered by the

Learning Commons (<https://www.lib.uoguelph.ca/using-library/spaces/learning-commons/>) including, Supported Learning Groups for a variety of courses, workshops related to time management, taking multiple choice exams, and general study skills.

Cost of Textbooks and Learning Resources

All suggested readings and resources will be provided through courselink at no additional cost.

Course Learning Outcomes

1. Identify environmentally important chemical compounds by their molecular structure and explain their functionality and environmental role/consequences through independent analysis.
2. Predict the fate of environmental contaminants by applying an understanding of the relationships between environmental attenuation processes and molecular properties.
3. Design solutions to environmental contamination by applying decision-making trees in case study exercises.
4. Demonstrate a familiarity with the application of advanced molecular-level tools for understanding the structure and behaviour of organic compounds in the environment, including NMR, fluorescence spectroscopy, stable isotope analysis, and biomarker analysis.
5. Demonstrate the importance of a molecular-level understanding of natural environmental systems as a basis from which to address contemporary environmental issues through oral and written communications to the class.

Lecture Topics

Overview

This course covers a variety of chemical processes that occur in the environment to produce, transform, or attenuate the occurrence and impact of chemical compounds in the environment. Specific topics covered are described below. Given the interconnectivity of these processes, their discussion does not necessarily follow a linear lecture schedule and topics will be revisited and expanded upon throughout the courses. The general flow of topics is outlined below.

Topic 1: The Murchison Meteorite

We will discuss the origins and analysis of the Murchison Meteorite - a relic from the era of abiotic chemical synthesis. This will include a review of functional groups and bonding, a discussion of chemical analysis, photochemical reactions, and the origin of organic life on Earth.

Topic 2: Analysis

We will discuss the analysis of soil, water and air samples for key contaminants of concern. Methods discussed include gas chromatography, liquid chromatography, mass spectrometry, and spectroscopy.

Topic 3: Petroleum and Coal

We will discuss the formation, occurrence, impact, and treatment of petroleum hydrocarbon and coal pollution in the environment.

Topic 4: Natural Attenuation

We will discuss naturally occurring processes that will transform compounds in the environment, including photolytic processes and the roles that natural organic matter in soils, sediments, and aquatic systems play in the fate and transformation of pollutants such as pesticides, and heavy metals.

Topic 5: Persistent Organic Pollutants and Emerging Contaminants

We will discuss the occurrence, measurement, and treatment of persistent organic pollutants and emerging contaminants including polychlorinated biphenyls, brominated flame retardants, perfluoroalkyl substances, and Microplastics.

Topic 6: Groundwater Contamination

We will discuss the transport, fate, and remediation of groundwater contaminants, including, biodegradation, in situ chemical remediation methods, and stable isotope environmental forensics.

Assessment Breakdown

Description	Weighting (%)	Due Date
Assignment 1: Site Assessment and Analysis	15%	January 27
Assignment 2: Calculating Properties	15%	February 14

Assignment 3: Transformation and Remediation	15%	March 24
Take Home Midterm Exam	25%	February 28
Final Exam	30%	April 21

Assessment Details

Assignment

Assignment 1: Site Assessment and Analysis **15%**
 Course Learning Outcomes Assessed: 1, 4, 5

Assignment 2: Calculating the Properties of Persistent Organic Pollutants **15%**
 Course Learning Outcomes Assessed: 1, 2, 5

Assignment 3: Transformation and Remediation **15%**
 Course Learning Outcomes Assessed: 1, 2, 3, 4, 5

Exam

Midterm Exam **25%**
 Course Learning Outcomes Assessed: 1, 2, 3

Final Exam **30%**
 Course Learning Outcomes Assessed: 1, 2, 4, 5

Final Exam

Date: Apr 21

Time: Mon 7pm-9pm

Location: TBA *Please see Web Advisor closer to the date of scheduled final for location.*

To understand rules and regulations regarding Examinations students are encouraged to read Student's Responsibilities (<https://calendar.uoguelph.ca/undergraduate-calendar/undergraduate-degree-regulations-procedures/examinations/>)

If the student is unable to meet the final exam requirements due to medical, psychological or compassionate circumstances they are encouraged to review Student's Responsibilities in the Academic Consideration, Appeals and Petitions (<https://calendar.uoguelph.ca/undergraduate-calendar/undergraduate-degree-regulations-procedures/academic-consideration-appeals-petitions/>) section of the Academic Calendar.

Last Day to Drop Course

The final day to drop Winter 2025 courses without academic penalty is the last day of classes: April 04

After this date, a mark will be recorded, whether course work is completed or not (a zero is assigned for missed tests/assignments). This mark will show on the student's transcript and will be calculated into their average.

Course Grading Policies

Assignments are reduced by 20% of their evaluated grade when over 24 hours late unless prior permission is granted by instructor. A grade of 0% is assigned for any assignment not received by the final exam.

Standard Statements for Undergraduate Courses

Academic Integrity

The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community – faculty, staff, and students – to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff and students have the responsibility of supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

The Academic Misconduct Policy (<https://calendar.uoguelph.ca/undergraduate-calendar/undergraduate-degree-regulations-procedures/academic-misconduct/>) is outlined in the Undergraduate Calendar.

Accessibility

The University promotes the full participation of students who experience disabilities in their academic programs. To that end, the provision of academic accommodation is a shared responsibility between the University and the student.

When accommodations are needed, the student is required to first register with Student Accessibility Services (SAS). Documentation to substantiate the existence of a disability is required; however, interim accommodations may be possible while that process is underway.

Accommodations are available for both permanent and temporary disabilities. It should be noted that common illnesses such as a cold or the flu do not constitute a disability. Use of the SAS Exam Centre requires students to make a booking at least 10 days in advance, and no later than the first business day in November, March or July as appropriate for the semester. Similarly, new or changed accommodations for online quizzes, tests and exams must be approved at least a week ahead of time. For students at the Guelph campus, information can be found on the SAS website. (<https://www.uoguelph.ca/sas/>)

Accommodation of Religious Obligations

If you are unable to meet an in-course requirement due to religious obligations, please email the course instructor within two weeks of the start of the semester to make alternate arrangements.

See the Academic calendar for information on regulations and procedures for Academic Accommodations of Religious Obligations (<https://calendar.uoguelph.ca/undergraduate-calendar/undergraduate-degree-regulations-procedures/academic-accommodation-religious-obligations/>).

Copies of Out-of-class Assignments

Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time.

Drop Date

Students will have until the last day of classes to drop courses without academic penalty. The deadline to drop two-semester courses will be the last day of classes in the second semester. This applies to all undergraduate students except for Doctor of Veterinary Medicine and Associate Diploma in Veterinary Technology (conventional and alternative delivery) students. The regulations and procedures for course registration are available in the Undergraduate Calendar - Dropping Courses (<https://calendar.uoguelph.ca/undergraduate-calendar/undergraduate-degree-regulations-procedures/dropping-courses/>).

Email Communication

As per university regulations, all students are required to check their <uoguelph.ca> e-mail account regularly: e-mail is the official route of communication between the University and its students.

Health and Wellbeing

The University of Guelph provides a wide range of health and wellbeing services at the Vaccarino Centre for Student Wellness (<https://wellness.uoguelph.ca/>). If you are concerned about your mental health and not sure where to start, connect with a Student Wellness Navigator (<https://wellness.uoguelph.ca/navigators/>) who can help develop a plan to manage and support your mental health or check out our mental wellbeing resources (<https://wellness.uoguelph.ca/shine-this-year/>). The Student Wellness team are here to help and welcome the opportunity to connect with you.

Illness

Medical notes will not normally be required for singular instances of academic consideration, although students may be required to provide supporting documentation for multiple missed assessments or when involving a large part of a course (e.g., final exam or major assignment).

Recording of Materials

Presentations that are made in relation to course work—including lectures—cannot be recorded or copied without the permission of the presenter, whether the instructor, a student, or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

Resources

The Academic Calendars (<http://www.uoguelph.ca/registrar/calendars/?index>) are the source of information about the University of Guelph's procedures, policies and regulations which apply to undergraduate, graduate and diploma programs.

When You Cannot Meet a Course Requirement

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons please advise the course instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact. See the Undergraduate Calendar for information on regulations and procedures for Academic Consideration. (<https://calendar.uoguelph.ca/undergraduate-calendar/undergraduate-degree-regulations-procedures/academic-consideration-appeals-petitions/>)