# ENV316H1 F: Laboratory and Field Methods in Environmental Science Fall 2024 Syllabus

**Time:** Fridays, 10:00 AM - 2:00 PM, weekly September 6 - November 29, 2024. Classes will usually consist of approximately 1 hour lecture, 1 hour tutorial, and 2 hours independent work with instructors present.

**Location:** The course meets in person. Refer to ACORN for information about the location of the course meetings. Any other meeting locations will be announced in class and through Quercus.

## Contacts
**Instructors:**
Sarah French, sarah.french@utoronto.ca (Environmental Ecology)
Emily Wei-Hsin Sun, ewh.sun@utoronto.ca (Environmental Chemistry)

**Teaching Assistants:**
Lauren Ead, lauren.ead@mail.utoronto.ca (Environmental Ecology)
Diwen Yang, diwen.yang@mail.utoronto.ca (Environmental Chemistry)

**Office or Zoom Hours:** Can be scheduled by appointment by emailing the appropriate instructor or TA. Additional office hours may be announced in class.

## Course Overview
This course focuses on methods of sampling and analysing natural air, water and solid Earth materials for physical, chemical and biological properties that are relevant to current environmental issues. It will integrate approaches from chemistry, physics, geology and biology, and cover techniques in field sampling, laboratory analyses and analyses of large environmental data sets. Basic concepts related to quality control will be emphasised throughout the course: sample collection and storage methods, calibration of field and lab instruments, analyses in complex matrices, errors (accuracy, precision), and detection limits.

**Prerequisite courses:** EEB240H1/ENV234H1, one of CHM210H1/ENV237H1/ ENV238H1, one of STA220H1/ STA288H1/ EEB225H1/ GGR270H1 (Exclusion: ESS425H1)

**Course Learning Outcomes:**
At the end of this course, students will be able to:

- Follow standardized methods for describing sampling sites and habitat, and identifying benthos and fish communities
- Perform multiple steps in data management and interpretation, including: collecting/sourcing, data, summarizing, statistical analyses, and visualization
- Communicate effectively through story maps, presentations, and reports
- Design and manage a collaborative project
- Develop an understanding of laboratory and analytical techniques used in environmental chemistry, and the results obtained from these techniques

**Website:** We will make announcements and share information using the course Quercus site. You are responsible for consulting it regularly for updates and to access course materials. Please do not include attachments in replies to Quercus system notifications received through email as they are not sent to the instructor. Note that the built-in Quercus communication tool called "Inbox" is not the same as email. Please use the emails listed above to contact us.

**Textbook:** There is no textbook for this course. We will provide resources and links to readings on the course Quercus site.

**Evaluations:**

| | |
|---|---|
| **Environmental Ecology** | **50%** |
| Two quizzes on species identification (5%, 5%) | 10% |
| Three practical assignments (R, R, GIS) | 15% |
| Field notes and data entry | 5% |
| Story map | 5% |
| Final ecology project group presentation | 5% |
| Final ecology project report | 10% |
| **Environmental Chemistry** | **50%** |
| Two assignments (5% each) | 10% |
| Final chemistry project group presentation | 15% |
| Final chemistry project individual report | 20% |
| Participation during labs/student presentations/discussions | 5% |

**Final Ecology Project:**
You will apply skills and concepts developed in the course to an ecology issue while working with a large dataset. The final project report is due on October 25, 2024.

**Final Chemistry Project:**
You will apply skills and concepts developed in chemistry and computational labs to interpret results and relate the data to background knowledge of corresponding pollutants. You will be expected to coordinate with group members to discuss the results, interpret the data, and deliver the presentations. The written component will be 2500 words maximum, in addition to the relevant tables, figures, and references. The final project report is due on December 9, 2024.

**Submission and Formatting Guidelines:** Unless otherwise specified, all assignments should be submitted electronically via Quercus. Written assignments should be submitted in PDF format, using a standard font with a size of 11–12pt and normal document margins. The cover page must contain your full name, student ID number, assignment title, and the names of the instructor and TA. If you collaborated with fellow students on an assignment or project, please include their names on the cover page as well. Additional guidelines for other assessments will be provided in class.

### Course Schedule

| Date | Week | Lecture Topics & Lab Activities | Associated Evaluation |
|---|---|---|---|
| | | **Ecology** | Final ecology project report (due October 25) |
| Sept. 6 | 1 | ● **Lecture:** Applying Ecology and Biology to Environmental Issues, Social and Cultural Considerations of Environmental Research, Project Management, Experimental Design, Data Management and Analyses <br> ● **Practical:** Project Management, Introduction to Data and R | ● Practical Assignment 1: R Data Analyses |
| Sept. 13 | 2 | ● **Lecture:** Benthic Invertebrates and Fish, Ontario Benthos Biomonitoring Network and Protocol Manual <br> ● **Practical:** Identifying Benthos and Fish | ● Species Identification Quizzes (Benthic Invertebrates and Fish) |
| Sept. 20 | 3 | ● **Field:** Field Trip to Humber River, Field Sampling using the Ontario Stream Assessment Protocol and the Ontario | ● Field Notes and Data Entry |

| Date | Week | Lecture Topics & Lab Activities | Associated Evaluation |
|------|------|-------------------------------|----------------------|
| | | Benthos Biomonitoring Network Protocol | |
| Sept. 27 | 4 | • **Lecture:** Quantifying Biological Communities (e.g., Diversity Metrics) and Animal Health (e.g., Condition Metrics)<br>• **Practical:** Calculating and Creating Metrics in R, Data Analytics<br>• **Field:** Back-up Date for Field Trip | • Practical Assignment 2: R Metrics and Analytics |
| Oct. 4 | 5 | • **Lecture:** Spatial and Temporal Data, Scientific Communication<br>• **Practical:** Introduction to GIS, Story Maps | • Practical Assignment 3: GIS<br>• Story Map |
| Oct. 11 | 6 | • **Lecture:** Applying Environmental Methods to Decision-Making<br>• **Practical:** Group Presentations | • Group Presentations |
| **Chemistry** | | | Final chemistry project report (due December 9) |
| Oct. 18 | 7 | Environmental Chemistry/Toxicology, Big Data, Analytical Techniques, Lab Experiment Design | |
| Oct. 25 | 8 | Chemistry Lab 1: Extracting and analyzing provided plastic samples, lab tour, and chromatography | Final ecology project report due |
| Nov. 1 | n/a | Reading Week (no class) | |
| Nov. 8 | 9 | Chemistry Lab 2: Student plastic product(s) extraction for final project | Assignment 1 due |
| Nov. 15 | 10 | Mass Spectrometry and Computation I Computational Lab 1: Code and software introduction and examples, getting started analyzing Chem Lab 2 samples | |
| Nov. 22 | 11 | Mass Spectrometry and Computation II Computational Lab 2: Chem Lab 2 samples analysis and troubleshooting | Assignment 2 due |
| Nov. 29 | 12 | Final group presentations | |
| Dec. 9 | n/a | Final Examination period - no final exam, only the final chemistry project report to submit | Final chemistry project report due |

**Policies & Statements**

**Late Work Policy:** The due dates of evaluations are outlined above or will be provided online on Quercus and in-person at a later date. Please contact the relevant instructor if you require accommodations such as extensions. Generally, students may submit evaluations within one week of the due date without penalty, after which the evaluation will be assigned a grade of zero.

**Use of Generative AI:** Generative Artificial Intelligence (AI), and specifically foundational models that can create writing, computer code, and/or images using minimal human prompting, are proliferating and becoming ubiquitous. This includes not only GPT-4 (and its siblings ChatGPT and Bing), but many writing assistants that are built on this or similar AI technologies. In this course, students may use generative artificial intelligence tools, including ChatGPT or UofT's approved AI tool Microsoft Co-pilot (access through 365 with optional protected mode), as learning aids to produce or debug R codes. However, all evaluations must be original work produced by the individual student alone or as part of a group. Please be cautious in using AI for grammar-related purposes, and make every effort to use your own words and phrasing in evaluations.

**Technological Requirements:** This course requires the use of computers. It is imperative that students are able to download the free statistical program R (https://www.r-project.org/); students will not be able to complete course assignments without access to R. It is also advisable that students use R studio (https://rstudio.com/products/rstudio/download/), as this program facilitates the use of R.

You are responsible for ensuring that you maintain regular backup copies of your files, use antivirus software (if using your own computer), and schedule enough time when completing an assignment to allow for delays due to technical difficulties. Computer viruses, crashed hard drives, broken printers, lost or corrupted files, incompatible file formats and similar mishaps are common issues when using technology and are not acceptable grounds for a deadline extension.

Specific guidance from the University of Toronto Vice-Provost, Students regarding student technology requirements is available here:
https://www.viceprovoststudents.utoronto.ca/covid-19/tech-requirements-online-learning

Advice for students more broadly regarding online learning is available here:
https://onlinelearning.utoronto.ca/getting-ready-for-online/

**Academic Integrity:** While discussions among classmates are encouraged, any material that you submit or present must represent your own independent work and comprehension. Information about academic integrity can be found at http://www.artsci.utoronto.ca/osai/.

Academic integrity is essential to the pursuit of learning and scholarship in a university, and to ensuring that a degree from the University of Toronto is a strong signal of each student's individual academic achievement. As a result, the University treats cases of cheating and plagiarism very seriously. The University of Toronto's Code of Behaviour on Academic Matters outlines the behaviours that constitute academic dishonesty and the processes for addressing academic offences. A copy of the University's Code of Behaviour on Academic Matters can be found at https://governingcouncil.utoronto.ca/secretariat/policies/code-behaviour-academic-matters-july-1-2019.

Helpful advice on how not to plagiarize, to learn more about how to cite and use source material appropriately, and for other writing support, see http://advice.writing.utoronto.ca/using-sources/how-not-to-plagiarize/ and http://www.writing.utoronto.ca

Students may be required to submit their course essays to the University's plagiarism detection tool for a review of textual similarity and detection of possible plagiarism. In doing so, students will allow their essays to be included as source documents in the tool's reference database, where they will be used solely for the purpose of detecting plagiarism. The terms that apply to the University's use of this tool are described on the Centre for Teaching Support & Innovation website (https://uoft.me/pdt-faq). Use of the tool is voluntary. Should students not wish to use the tool, they may be asked to provide supplementary material such as research notes, drafts, outlines, or an annotated bibliography.

**Copyright:** If a student wishes to copy or reproduce lecture presentations, course notes, or other similar materials provided by instructors, he or she must obtain the instructor's written consent beforehand. Otherwise, all such reproduction is an infringement of copyright and is prohibited. More information regarding this is available: https://teaching.utoronto.ca/resources/recording-of-lectures-and-class-sessions/

**Accessibility needs:** The University of Toronto is committed to accessibility. If you require accommodations for a disability, or have any accessibility concerns about the course, the classroom, or course materials, please contact Accessibility Services as soon as possible:

https://studentlife.utoronto.ca/task_levels/accessibility-and-academic-accommodations/
Students with diverse learning styles and needs are welcome in this course. If you have an acute or ongoing disability issue or accommodation need, you should register with Accessibility Services (AS) at the beginning of the academic year by visiting https://studentlife.utoronto.ca/department/accessibility-services/. Without registration, you will not be able to verify your situation with your instructors, and instructors will not be advised about your accommodation needs. AS will assess your situation, develop an accommodation plan with you, and support you in requesting accommodation for your course work. Remember that the process of accommodation is private: AS will not share details of your needs or condition with any instructor, and your instructors will not reveal that you are registered with AS.

**Religious Accommodations:** As a student at the University of Toronto, you are part of a diverse community that welcomes and includes students and faculty from a wide range of cultural and religious traditions. If you anticipate missing a major course activity (such as a test or in-class assignment) due to a religious observance, please let me know as early in the course as possible, and with sufficient notice (at least two to three weeks), so that we can work together to make alternate arrangements.

**Accommodations for Personal Reasons:** There may be times when you are unable to complete coursework on time due to non-medical reasons. If you have concerns, speak to the instructors or to an advisor in your College Registrar's office; they can help you to decide if you want to request an extension or other forms of academic consideration. They may be able to email your instructors directly to provide a College Registrar's letter of support and connect you with other helpful resources on campus.

**Mental Health and Well-Being:** Your mental health is important. Throughout university life, there are many experiences that can impact your mental health and well-being. As a University of Toronto student, you can access free mental health and wellbeing services at Health & Wellness such as same day counselling, brief counselling, medical care, skill-building workshops, and drop-in peer support.
https://studentlife.utoronto.ca/department/health-wellness/

You can also meet with a Wellness Navigation Advisor who can connect you with other campus and community services and support. Call the mental health clinic at 416-978-8030 ext. 5 to book an appointment or visit
https://uoft.me/mentalhealthcare to learn about the services available to you.

You can also visit your College Registrar to learn about the resources and supports available:

https://www.artsci.utoronto.ca/current/academic-advising-and-support/college-registrars-offices

If you're in distress, you can access immediate support: https://uoft.me/feelingdistressed

**Lead or Join a Recognized Study Group (RSG) for this course**
RSGs are peer-led study groups of up to 8 students enrolled in the same A&S course. Volunteering to be an RSG Leader is a great way to:
- Meet classmates and make friends in this course
- Gain new leadership and group-facilitation skills
- Increase your understanding of course material
- Prepare for test and exams
- Boost your resume
- Earn a Co-Curricular Record (CCR) credit

Over 1000 students volunteered to be an RSG Leader last year and over 3500 students joined an RSG! Volunteer to be an RSG Leader this term with the support and training of upper-year A&S students! No experience is necessary.
Sign up to be an RSG Leader:
https://sidneysmithcommons.artsci.utoronto.ca/recognized-study-groups/lead/

Looking to join an RSG? Explore all available RSGs on the Arts & Sciences Online Services. New RSGs are added daily!
https://bpm.artsci.utoronto.ca/
Find more information, visit: uoft.me/rsgs or @sidneysmithcommons

**Additional Services and Support:**
- Student life: https://studentlife.utoronto.ca/
- Library: https://onesearch.library.utoronto.ca/
- Online library research: https://onesearch.library.utoronto.ca/research
- Academic support:
  https://studentlife.utoronto.ca/department/centre-for-learning-strategy-support/
- Writing: https://writing.utoronto.ca/
- Quercus support: https://teaching.utoronto.ca/resources/quercus-support/