

**ENV 237H1S/238H1S – PHYSICS OF THE CHANGING ENVIRONMENT
DEPARTMENT OF PHYSICS, UNIVERSITY OF TORONTO
WINTER 2022**

This course will cover basic physics of environmental processes and of measurement techniques in the atmosphere, the ocean, terrestrial biosphere systems, and other biological systems. It will place its work in the context of climate change and other aspects of environmental change.

COURSE CONTACT INFORMATION:

Lecturer: Prof. Debra Wunch

Office: Room MP 707A (South side of the 7th floor of the Burton Tower, Department of Physics, 60 St. George Street)

E-mail: dwunch@atmosph.physics.utoronto.ca

I will try to reply to email inquiries from students within 2 business days (i.e., excluding weekends). I will not answer detailed questions about physics problems by e-mail, as these are best addressed by coming to see me (or your tutors) during our office hours or by appointment.

Office Hours: I will hold office hours during the Tuesday Lecture period (11am-12pm) and tutorials will be held during the Thursday Lecture period (11am-12pm)

TA: Liz Cunningham

Office: MP710

E-mail: ecunning@physics.utoronto.ca

TA: Sabrina Madsen

Office: MP710

E-mail: smadsen@physics.utoronto.ca

Marker: Lawson Gillespie

Office: MP710

E-mail: lgillespie@physics.utoronto.ca

COURSE WEBSITE:

Quercus will be used for the course website. The home page of the website will be used for all class announcements. It is your responsibility to check regularly to keep up on course announcements and assignment due dates!

COURSE MEETING TIMES:

- Meetings: 2 hours/week; Tuesdays (office hours) and Thursdays (tutorials) 3 PM - 4 PM via Zoom, starting January 11, 2022, until we transition to in-person. At that point we will meet in MP408
- Practicals: 2 hours/week; Mondays 2 PM - 4 PM via Zoom (starting **17 January 2022**). When we transition to in-person, we will meet in MP126.

COURSE OBJECTIVES:

In this course, we will be considering the physical concepts, processes and phenomena that are relevant to understanding our changing environment. We will be investigating the physical principles through practicals, tutorials, and demonstrations. We will be covering topics in areas of thermodynamics, fluid mechanics and interaction of electromagnetic radiation with matter. There will be a focus on how we measure environmental parameters in the latter part of the course. The primary goal of the course is to describe our environment and its changes quantitatively using physical concepts and models through calculations, error analysis and written descriptions. The secondary goal is to develop physics skills and intuition by making quantitative measurements, analyzing data and determining physical parameters. The balance between these goals will differ for ENV 237 and 238.

At the end of the course you will be able to:

1. Demonstrate a solid foundational understanding of the physical environment, including buoyancy, forces, thermodynamics, and electromagnetism. Mastery of these concepts will be demonstrated and evaluated as part of the problem sets, Practicals, midterm test, and exam.
2. Solve quantitative problems by applying the physical concepts developed in class. Distinguish important from extraneous information in a word problem, and solve the problem using physical concepts developed in class. This will be demonstrated and evaluated as part of the problem sets, midterm test and exam.
3. Critically evaluate and interpret datasets in order to answer questions about the physical environment. Plot digital data such that they can be usefully interpreted to describe physical phenomena. This will be demonstrated and evaluated as part of the problem sets, Practicals, and the Formal Report, where you will collect and analyse your own dataset.
4. Develop a hypothesis about an environmental property, and design and implement a measurement scheme to address that hypothesis. This will be demonstrated and evaluated as part of the Formal Report. This assignment will be a group assignment, so you will also work productively as part of a team.

COURSE MATERIAL REQUIREMENTS:

For this course, you will need a non-programmable scientific calculator (for both course work and test/exams), access to a computer with data graphing and analysis capability (such as a spreadsheet/graphing program or scientific programming suite) and internet access to view the lecture videos, and retrieve the course readings (from electronic resources at the Library and other websites).

PRACTICALS OBJECTIVES:

These are an integral part of the course and attendance at all the Practicals is expected. Throughout the term, the Practicals will be used to divide the class into smaller groups (~4 students) for a different mode of learning. During these Practicals, you will have the opportunity to perform data analysis experiments, work on problems like those that will be included on assignments and to discuss course topics in a different environment. As part of the Practicals, you will design and conduct an experiment to measure solar irradiance.

COURSE TEXTS:

This course will use one main text for the course in combination with supplementary readings (all linked on the course website). The main text is *Environmental Physics by Clare Smith, copyright 2001 (2005 electronic) by Taylor and Francis*. There are copies of the textbook at the U of T bookstore, and the text is also available online through the library. Please note that the page numbers differ between the online version and the print version. I will provide section titles for readings to avoid confusion. Additional readings will be from *Environmental Physics by Boeker and van Grondelle, copyright 2011, Third edition by Wiley* and other texts and articles.

COURSE EVALUATION (differs by course):

ENV237	ENV238	Assessment
20%	15%	Problem Sets
15%	15%	Midterm Assessment (March 7)
15%	15%	Practicals
20%	25%	Solar Irradiance Project
20%	20%	Final Assessment
7%	7%	Post-Lecture Quizzes
3%	3%	Peer Review Participation

PROBLEM SETS:

- Five problem sets will be due during the term (approximately every two weeks). The problem sets will be posted on the course website approximately a week prior to the due date. No paper copies of the problem sets will be distributed in class. Due dates for the problem sets are as follows:
 - January 21, 2022
 - February 4, 2022
 - February 18, 2022
 - March 18, 2022
 - April 1, 2022
- In preparing your answers for the problem sets, you may use your textbook and other resources and discuss the problems with your classmates. However, each student must prepare their final answers to the problem sets individually and must provide all answers and explanations using their own words. Copying from a source is plagiarism (see section on Academic Integrity)!
- Problem sets will be due through Quercus on the announced due date.

PRACTICALS:

- Your mark for the Practicals will be based on participation in experiments and activities during the sessions and correct completion of assigned work. This work will be done in groups of 3-4 students.
- Each group is responsible for writing complete records of their work in their online lab notebook and submitting it for marking at the end of the practical period. Details on marking of work will be provided in Practicals and on the course website.
- A Pre-Practical assignment to be completed by each student individually, worth 1/8 of the Practical mark, will be due at the beginning of each Practicals period.

MIDTERM TEST AND FINAL EXAM:

The Midterm and Final will both be timed written tests and will consist of calculation, definition, and explanation questions. The Midterm will be held during your Practicals session on **March 7**, and the Final will be held during the Finals period.

- You will be provided with an equation sheet and a table of constants for the Midterm and Final. The equation sheet will be provided prior to the test or examination to aid in your studying.
- You must have a non-programmable scientific calculator for the Midterm and Final.

POST-LECTURE QUIZZES

Post-lecture quizzes allow you to let me know if there's a problem with the lecture video or audio quality, to let me know if there are physics concepts about which you are still unclear, or to ask for additional information on a topic of particular interest. You will receive 0.3% for each post-lecture quiz you submit by 24-hours before our tutorials on Thursdays. We will typically cover two video lectures each tutorial, so you will need to complete 2 post-lecture quizzes.

SOLAR IRRADIANCE MEASUREMENT PROJECT:

In the latter part of the course, you will be designing and conducting your own experiment to investigate solar irradiance. You will be working with a group of classmates to formulate your hypothesis and collect your data February and March. There will be two components submitted for this project:

- An outline for your project stating your hypothesis, measurement plan and other parameters for your project will be due on **February 11, 2022**. You will develop this in collaboration with your group and one outline will be created. This outline will be submitted to Quercus by each member of the group.
- A formal lab report on your results and analyses will be due on the last day of class (**April 8, 2022**). This will be completed by you individually and must show your own work and comprehension of the project.
- Both your outline and your formal report will be due on Quercus by the time stated on the instruction sheet. You must also provide your own calculation spreadsheet for your project at the same.
- Marking rubrics and assignment expectations will be provided for both the outline and formal lab report as part of these assignment sheets.
- There will be a peer-review process that will contribute 3% to your participation grade. The peer reviews of the formal reports will occur during the Practicals session on April 4. Your draft formal reports are due through Quercus **before 2:00 pm on April 4**. To obtain the 3% participation grade, your formal report draft must be submitted on time and complete (i.e., all sections attempted), and you must read and provide helpful and encouraging comments on two other formal reports.

Academic Integrity:

All students, faculty and staff are expected to follow the University's guidelines and policies on academic integrity. For students, this means following the standards of academic honesty when writing assignments, collaborating with fellow students, and writing tests and exams. Ensure that the work you submit for grading represents your own honest efforts. Plagiarism—representing someone else's work as your own or submitting work that you have previously submitted for marks in another class or program—is a serious offence that can result in sanctions. Speak to me or your TA for advice on anything that you find unclear. To learn more about how to cite and use source material appropriately and for other writing support, see the U of T writing support website at <http://www.writing.utoronto.ca>. Consult the Code of Behaviour on Academic Matters for a complete outline of the University's policy and expectations. For more information, please see <https://www.artsci.utoronto.ca/current/academic-advising-and-support/student-academic-integrity> and <http://academicintegrity.utoronto.ca>

Policy on Late/Missed Assignments

The late penalty for assignments is a reduction in your mark of 5% per day of lateness. After one week, solutions will be posted and late assignments will not be accepted.

Make-Up Quizzes/Tests

We have one midterm test during Practicals period. If you are unable to attend, please talk to your instructor as soon as possible.

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. For my part, I will make every reasonable effort to avoid scheduling tests, examinations, or other compulsory activities on religious holy days not captured by statutory holidays. Further to University Policy, if you anticipate being absent from class or 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.

Students with Disabilities or Accommodation Requirements

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 <http://www.studentlife.utoronto.ca/as/new-registration>. 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.

Specific Medical Circumstances

For 2022 S-term, a *Verification of Illness* (also known as a "doctor's note") is temporarily not required. Students who are absent from academic participation for any reason (e.g., COVID, cold, flu and other illness or injury, family situation) and who require consideration for missed academic work should report their absence through the online absence declaration. The declaration is available on [ACORN](#) under the Profile and Settings menu. Students should also advise their instructor of their absence.

If an absence extends beyond 14 consecutive days, or if you have a non-medical personal situation preventing you from completing your academic work, you should connect with your College Registrar. They can provide advice and assistance reaching out to instructors on your behalf. If you get a concussion, break your hand, or suffer some other acute injury, you should register with Accessibility Services as soon as possible.

Accommodation for Personal Reasons

There may be times when you are unable to complete course work on time due to non-medical reasons. If you have concerns, speak to me or to an advisor in your College Registrar's office; they can help you to decide if you want to request an extension or accommodation. They may be able to provide you with a College Registrar's letter of support to give to your instructors, and importantly, connect you with other resources on campus for help with your situation.

Quercus Info

This course uses the University's learning management system, Quercus, to post information about the course. This includes posting readings, lecture videos, and other materials required to complete class activities and course assignments, as well as sharing important announcements and updates. The site is dynamic and new information and resources will be posted regularly as we move through the term, so please make it a habit to log in to the site on a regular, even daily, basis. To access the course website, go to the U of T Quercus log-in page at <https://q.utoronto.ca>. Once you have logged in to Quercus using your UTORid and password, you should see the link or "card" for ENV237. Note that **ENV238 students will also use the ENV237 link**. You may need to scroll through other cards to find this. Click on the ENV237 link to open our course area, view the latest announcements and access your course resources. There are Quercus help guides for students that you can access by clicking on the "?" icon in the left side column. **SPECIAL NOTE ABOUT GRADES POSTED ONLINE:** Please also note that any grades posted are for your information only, so you can view and track your progress through the course. No grades are considered official, including any posted in Quercus at any point in the term, until they have been formally approved and posted on ACORN at the end of the course. Please contact me as soon as possible if you think there is an error in any grade posted on Quercus.

Attendance

Attendance at Practicals is required. Attendance at Tutorials is strongly recommended, and attendance at Office Hours is encouraged.

Assignment Submission Method

All assignments should be posted to Quercus.

Online Communication

Please use your mail.utoronto.ca email address for all course-related communications.

Cell Phones and Laptop Usage

Technology can support student learning, but it can also become a distraction. Research indicates that multi-tasking (texting or going online) during class time can have a negative impact on learning. Out of respect for your fellow students in this class, please refrain from using laptops or mobile phones for entertainment during class. Do not display any material on a laptop which may be distracting or offensive to your fellow students. Laptops may be used only for legitimate classroom purposes, such as taking notes, downloading course information from Quercus, or working on an assigned in-class exercise. Checking social media, email, texting, games, and other online activities are not legitimate classroom purposes. Such inappropriate laptop and mobile phone use is distracting to those seated around you.

Privacy/FIPPA Statement

Personal information is collected pursuant to section 2(14) of the University of Toronto Act, 1971 and at all times it will be protected in accordance with the Freedom of Information and Protection of Privacy Act. Please note that this course requires presentations of one's work to the group. For more information, please refer to <http://www.utoronto.ca/privacy>.

Lecture Capture by Instructor

If lecture recordings are provided, they are only for the exclusive use of enrolled students, for their personal learning. Lecture recordings are not to be shared in any way beyond enrolled students.

Mental Health and Well-being

As a student, you may experience challenges that can interfere with learning, such as strained relationships, increased anxiety, substance use, feeling down, difficulty concentrating and/or lack of motivation, financial concerns, family worries and so forth. These factors may affect your academic performance and/or reduce your ability to participate fully in daily activities. Everyone feels stressed now and then – it is a normal part of university life. Some days are better than others, and there is no wrong time to reach out. There are resources for every situation and every level of stress.

There are many helpful resources available through your College Registrar or through Student Life (<http://studentlife.utoronto.ca> and <http://www.studentlife.utoronto.ca/feeling-distressed>). An important part of the University experience is learning how and when to ask for help. Please take the time to inform yourself of available resources.

Course Materials, including lecture notes

Course materials are provided for the exclusive use of enrolled students. Please do not share them with others. I do not want to discover that a student has put any of my materials into the public domain, has sold my materials, or has given my materials to a person or company that is using them to earn money. The University will support me in asserting and pursuing my rights, and my copyrights, in such matters.

Video recording and sharing (download and re-use prohibited)

This course, including your participation, will be recorded on video and will be available to students in the course for viewing remotely and after each session.

Course videos and materials belong to your instructor, the University, and/or other sources depending on the specific facts of each situation and are protected by copyright. Do not download, copy, or share any course or student materials or videos without the explicit permission of the instructor. For questions about the recording and use of videos in which you appear, please contact your instructor.

Equity, Diversity and Inclusion

The University of Toronto is committed to equity, human rights and respect for diversity. All members of the learning environment in this course should strive to create an atmosphere of mutual respect where all members of our community can express themselves, engage with each other, and respect one another's differences. U of T does not condone discrimination or harassment against any persons or communities.