

# Environmental Microbiology – EESC30H3

## Course information

*Instructor:* Terrence Bell, Assistant Professor, Department of Physical and Environmental Sciences

*Lectures:* Fridays 1:00-3:00 PM

*Tutorials:* Tuesdays 9:00-11:00 **OR** Wednesdays 1:00-3:00 PM (insert TA info)

*Capacity:* 40 students

## **Contact**

*Office:* TBD

*Phone:* TBD

*E-mail:* terrence.bell@utoronto.ca

## Office Hours

TBD

You can also use discussion boards...

Opportunities to raise muddy points that I can discuss with all

## Prerequisites

CHMA10H3 and CHMA11H3 and BIOB50H3 and BIOB51H3

## Course overview and goals

Microbes are everywhere and are the oldest organisms on Earth. They play key roles in many global processes, including biogeochemical cycling, primary production, and the health of plants and animals. Microbes gave us a high oxygen atmosphere and helped plants to colonize land. They are ubiquitous and essential.

In the past 10-15 years, revolutionary tools have finally allowed us to observe and appreciate the immense diversity of microbes in the environment. Through this new lens, we have seen that microbes can be both incredibly resilient and incredibly

sensitive to environmental change. Human activities are having massive impacts on microbial composition and function across the world, with hard-to-predict consequences. Industry aims to harness microbial activities for human gain. The extent to which we can control immense microbial powers in the environment remains to be seen, but it's clear that microbes hold the world in their cilia/hyphae/biofilms/etc...

*Students in this course will be introduced to:*

1. What microbes do and why it matters
2. Classical and emerging methods for studying microbes
3. Microbial diversity and microbial roles across environments
4. The potential for managing microbes and microbial functions in the environment
5. Careers and desired skills in environmental microbiology
6. Critical analysis of papers in environmental microbiology
7. How to use freely available bioinformatics tools for exploring microbiome data

### **Course materials**

- Suggested textbook is *Environmental Microbiology: From Genomes to Biogeochemistry* (Eugene L. Madsen). We will draw from this book and I will indicate helpful readings that elaborate on what we cover in class.
- Additional assigned readings will be made available on Quercus. This is a quick-moving field and cannot be covered entirely with a textbook.

### **Grading**

<b>Assessment Title</b>	<b>Percent (%)</b>	<b>Date(s)</b>
Tutorial Worksheets	20	No Specific Due Date
Midterm	25	2023-02-17
Term Assignment	15	2023-04-06
Final Exam	40	
<b>Total Percentage</b>	<b>100</b>	

## **Tutorial worksheets**

**TBD**

## **Midterm**

This exam will happen in-class on February 17<sup>th</sup>, 2022. Material will be based on lecture and required reading content from Weeks 1-5.

## **Final Exam**

This exam will be cumulative, covering lecture and required reading content from the entire term.

## **Term assignments**

**TBD**

## **Extensions**

Do your best to stay on top of assignments so that work doesn't pile up, as that can be a source of stress. At the same time, I know this isn't your own class or commitment. For all worksheets, you can automatically get a 5-day extension by simply e-mailing to let me know that you're taking it. You don't need to explain why.

Accommodations for missed exams and the term assignment are more involved and will need to follow standard university protocols. Please contact me as far in advance as possible if you have a conflict.

## **Recording of course material**

This course, including your participation, *may* at times be recorded on video for use within the course. Videos and materials belong to the 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.

## **Academic integrity**

All suspected cases of academic dishonesty will be investigated following procedures outlined in the Code of Behaviour on Academic Matters. If you have questions or concerns about what constitutes appropriate academic behaviour or appropriate

research and citation methods, please reach out to me. Note that you are expected to seek out additional information on academic integrity from me or from other institutional resources (for example, the University of Toronto website on Academic Integrity).

### **Accessibility**

I look forward to working with students with diverse learning needs in this course. I strive to create a classroom environment that is welcoming and inclusive and have considered this as I designed the course. However, I can always do better and benefit from feedback I receive from students. If there are specific things that I can improve to help you or your peers in learning, please let me know. Keep in mind that there are sometimes tradeoffs, so I do my best to balance different needs. For instance, sans serif fonts (like the one used in this syllabus) are often considered to be more broadly readable, although some have an easier time reading Comic Sans or fonts specialized for reading with dyslexia. I provide this syllabus as a Word document so that you can modify the font as needed.

If you need additional accommodations due to a disability/health consideration please feel free to approach me and/or the AccessAbility Services Office as soon as possible. AccessAbility Services staff (located in Rm AA142, Arts and Administration Building) are available by appointment to assess specific needs, provide referrals and arrange appropriate accommodations 416-287-7560 or email [ability.uts@utoronto.ca](mailto:ability.uts@utoronto.ca). The sooner you let me know your needs, the quicker I can assist you in achieving your learning goals in this course.

### **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.

### **Religious observances**

The University provides reasonable accommodation of the needs of students who observe religious holy days other than those already accommodated by ordinary scheduling and statutory holidays. Students have a responsibility to alert members of the teaching staff in a timely fashion to upcoming religious observances and anticipated absences and instructors will make every reasonable effort to avoid scheduling tests, examinations or other compulsory activities at these times.

Please reach out to me as early as possible to communicate any anticipated absences related to religious observances, and to discuss any related implications for course work.

## **Family care responsibilities**

The University of Toronto strives to provide a family-friendly environment. I am also a parent and have worked with a number of students who are balancing school and family life. You may wish to inform me if you are a student with family responsibilities. If you are a student parent or have other family responsibilities, you also may wish to visit the Family Care Office website at [familycare.utoronto.ca](http://familycare.utoronto.ca).

## **Land acknowledgement**

*We wish to acknowledge this land on which the University of Toronto operates. For thousands of years it has been the traditional land of the Huron-Wendat, the Seneca, and the Mississaugas of the Credit. Today, this meeting place is still the home to many Indigenous people from across Turtle Island and we are grateful to have the opportunity to work on this land.*

For more information about the land acknowledgement and its use, visit:

<https://indigenous.utoronto.ca/about/land-acknowledgement/>

## **Mental health resources**

If you are experiencing distress, please make use of the mental health resources at

UTSC: <https://www.utsc.utoronto.ca/home/mental-health-resources>

## **Disclaimer**

I am still developing this course. All material, aside from the grading scheme, is subject to change at the instructor's discretion. Adjustments may be made through the term to help better reach course goals.

## **Lectures**

<b>Week</b>	<b>Topic</b>	<b>Date</b>
1	Course introduction and concepts	13-Jan
2	Microbial metabolism and functions	20-Jan
3	Microbes and global change	27-Jan
4	How we measure microbes	3-Feb
5	Microbial diversity and what it means + Meta-omics	10-Feb
6	<b>Midterm</b>	17-Feb
7	READING WEEK	24-Feb
8	Terrestrial microbiomes + Aquatic microbiomes	3-Mar
9	Extreme microbiomes + Microbiomes in and around living organisms	10-Mar
10	Nutrient flux + Bioremediation	17-Mar
11	Applying Ecological Concepts to Microbiomes + Career panel, including needed skills	24-Mar
12	Managing microbiomes	31-Mar
13	GOOD FRIDAY	7-Apr
	<b>FINAL EXAM</b>	Unknown

## **Tutorials**

<b>Week</b>	<b>Topic</b>
1	NONE
2	Initiating enrichments and decomposition study; How to read a scientific paper
3	Critiquing a scientific paper as a group (think-pair-share) + how to search for papers
4	Understanding microbiome data and analysis of pre-processed microbiome data in R
5	Microbiome data in R
6	Initial data processing
7	Reading week
8	Genomes and meta-omes
9	Data analysis pitfalls
10	Assignment plan due, workshopping ideas, decomposition data collection
11	Assignment Work (groups)
12	Assignment Work (groups)
13	Term assignment due: Extension OR academic paper on data analysis OR decomposition study