ENVS*2080 - Introduction to Environmental Microbiology

Winter 2024 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 will introduce students to environmental microbiology, with a focus on the important roles of microorganisms in various environments such as soil, water and sediments. Discussion will emphasize the physiology, biochemistry, molecular biology and ecology of microorganisms, and how a good understanding of these microbial processes can enable beneficial applications of microorganisms in biotechnology and bioremediation.
Prerequisite(s): BIOL*1070, BIOL*1090
Restriction(s): ENVM*1020, ENVS*2320
Department(s): School of Environmental Sciences

Course Description

This course will introduce students to Environmental Microbiology, focusing on the interaction between microorganisms in the environment. We will investigate the physiology, biochemistry and ecology of microorganisms using theory and labs and relate these to the roles and applications of microorganisms in biotechnology and bioremediation.

Lecture Schedule

MonWedFri 3:30pm-4:20pm in MINS*300 (1/8 to 4/23)

Lab Schedule

Times and Location: **GRHM 3308, see times below.**

Lab classes will be in person only - there is no hybrid option available. Please email your TA (and cc me) in the event that you miss a lab section. TAs assigned to each lab section will be posted on Courselink. See webadvisor for your lab sections schedule.

Instructor Information

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Learning Resources

Recommended Resources

Textbook: Manual of Environmental Microbiology (http://www.asmscience.org/content/book/10.1128/9781555818821/) (4th Edition)

Teaching Labs

For each laboratory experiment, introductory materials, lab notebook templates, and lab report questions will be provided on CourseLink at least one week before the respective lab. Students may be required to utilize additional resources, such as journal articles, websites or textbook chapters, not provided on CourseLink to complete pre-lab and/or final lab reports.

Required additional costs for the teaching labs: lab notebook. Materials for a Winogradsky column - Soda bottle/ mason jar/glass bottle, baking soda, Epsom salts or egg yolks, plastic wrap, newspaper or scrap paper, access to mud or sediments where you are located. You likely have materials at home already, and we will discuss setting up a column during Week 1 labs. Please contact the instructor if there are difficulties in acquiring these materials.

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.

Course Learning Outcomes

1. Gain an awareness of the importance, and ubiquitous nature of microorganisms in the environment.
2. Comprehend the general properties of microorganisms that limit their growth, survival, and proliferation in the environment.
3. Learn the basic interactions between (a) microorganisms and their environments, and (b) microorganisms and chemicals in the environment.
4. Grasp the general strategies and considerations for isolating microorganisms from the environment.
5. Learn principles of aseptic techniques and safety while doing laboratory research involving microorganisms.
6. Describe several microbial adaptations to adverse conditions.
7. Describe examples of the application of microorganisms towards environmental issues (for ex. bioremediation)
8. Describe how to use genomic tools to identify microorganisms and their potential roles in the environment

Teaching and Learning Activities

Lectures

Microorganisms are ubiquitous in the environment and are the most diverse organisms on Earth, influencing nearly all natural systems such as soils, sediments, streams, lakes, rivers and oceans. A good understanding of environmental microbial processes can enable beneficial applications of microorganisms in biotechnology and bioremediation. In this course, I will introduce students to the fascinating field of environmental microbiology through selected topics:

1. General roles of microorganisms in the environment
2. Some general properties of microorganisms in relation to environmental science
3. Microbial growth, dormancy and death
4. Isolation, screening and preservation of microorganisms from the environment
5. Utilization of substrates by microorganisms
6. How do microorganisms cope with adversity in the environment?
7. Environmental cleanup and application to industry - selected examples of microbial biotechnology and bioremediation

Labs

Lab attendance is mandatory.

The labs will provide some experience on the techniques and methodology involved in working with microorganisms. The following labs will be conducted:

1. Lab Orientation and Safety (in theory) , Set-up Winogradsky columns
2. Enumeration and disinfection of microorganisms
3. Isolation and microscopic observations
4. DNA extractions from environmental samples and cultures, PCR, and DNA sequencing
5. Winogradsky column observations and conclusions

Lab Schedule and Assignments

Labs will occur the following weeks, with lab reports for each lab due before the next lab (with the exception of lab 1 which is due in April). Some lab experimentation results require an 'incubation' period. You will have to come into the lab to observe your experiments if applicable, or for in some cases these results will be made available via courselink the week after the lab. Schedule is subject to change according to public health directives related to COVID.

Week #	Date	Lab #	Lab content	Work due
1	Week Jan 8	0	no labs - ensure you take requisite online biosafety training this week	
2	Week Jan 15	1	Introduction to Winogradsky column experiment and home set-up	Lab report 1 due April 2nd (12%)
3	Week Jan 22	2	Microbial microscopy and gram stains	Lab report 2 due in lab, week Feb 5th (8%)
4	Week Jan 29		no lab	
5	Week Feb 5	3	Isolation, enumeration and disinfection of microbes	Lab 2 due this week. Lab report 3 due in lab week of Feb 26 (8%)
6	Week Feb 12		Results of lab 3 available - visit lab to check.	
7	Week Feb 19		BREAK	
8	Week Feb 26	4	DNA extraction and DNA sequencing	Lab report 4 due in lab week of March 19 (12%)
9	Week March 5	4	Results of lab 4 available - online	
10	Week March 12	4	Lab session - Bioinformatic analysis of DNA sequences help.	
11	Week March 19	1	Winogradsky column results and discussion (Lab 1)	Lab report 1 due April 2nd (12%)
12	Week March 26		No lab.	
13	Week April 2			
16	April 16		Final Exam	

Assessment Breakdown

Description	Weighting (%)	Due Date
Midterm	30%	February 28 2024
Lab Report 1	12%	Week April 2nd before lab
Lab Report 2	8%	Week February 5th before lab
Lab Report 3	8%	Week of February 26th before lab

Lab Report 4	12%	Week of March 19th before lab
Final Exam	30%	See Final Exam on webadvisor

Assessment Details

Midterm

Midterm — 30%

Course Learning Outcomes Assessed: 1, 2, 3, 4

Lab Reports

Lab Report #1 — 12%

Lab #1: Winogradsky Columns

Course Learning Outcomes Assessed: 4, 5

Lab Report #2 — 8%

Lab #2: Microscopy and gram stains

Course Learning Outcomes Assessed: 4, 5

Lab Report #3 — 8%

Lab report #3: **ISOLATION, ENUMERATION AND DISINFECTION OF MICROBES**

Course Learning Outcomes Assessed: 4, 5

Lab Report #4 — 12%

Lab #4: DNA extraction, PCR and DNA sequencing

Course Learning Outcomes Assessed: 4, 5, 8

Exam

Final Exam — 30%

Course Learning Outcomes Assessed: 1, 2, 3, 4, 5, 6, 7, 8

Final Exam

Date: Apr 16

Time: Tu 11:30am-1:30pm

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 2024 courses without academic penalty is the last day of classes: April 08

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

Grading Policy

Dr. Goordial will grade all your midterms and final exams. The TAs will grade all your lab reports.

In this course, your instructor and TAs will be using Turnitin, integrated with the CourseLink Dropbox tool, to detect possible plagiarism, unauthorized collaboration or copying as part of the ongoing efforts to maintain academic integrity at the University of Guelph.

All submitted assignments will be included as source documents in the Turnitin.com reference database solely for the purpose of detecting plagiarism of such papers. Use of the Turnitin service is subject to the Usage Policy posted on the Turnitin site (https://www.turnitin.com/).

Policy on late assignments and group work

Students will submit individual lab reports for grading, however, will work on collaborative data for some labs.

10% of the lab report marks are deducted on a daily basis after the due date.

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/)