



# **ENVS\*2080 Introduction to Environmental Microbiology**

Winter 2023

Section(s): 0101

School of Environmental Sciences

Credit Weight: 0.50

Version 1.00 - January 03, 2023

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## **1 Course Details**

### **1.1 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.

**Pre-Requisites:** BIOL\*1070, BIOL\*1090

**Restrictions:** ENV\*1020, ENVS\*2320

### **1.2 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.

### **1.3 Timetable**

Lectures:

Times and Location: **MCKN 115, Mondays, Wednesdays and Fridays: 10:30 am - 11:20 am**

Information: Classes will be in person. This may be subject to change according to public health directives and will be communicated to students. We will have a hybrid option on Zoom (accessed through courselink) for students who must miss class due to illness.

Laboratory sections:

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 Counselink.

**Section 1: Tuesday 2:30pm - 5:20pm**

**Section 2: Thursday 2:30pm - 5:20pm**

**Section 3: Thursday 8.30am - 11.20am**

**Section 4: Friday 11:30 - 1:30 pm**

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 counselink the week after the lab. Schedule is subject to change according to public health directives related to COVID.

<b>Week #</b>	<b>Date</b>	<b>Lab #</b>	<b>Lab content</b>	<b>Work due</b>
1	Week Jan 9	0	no labs - ensure you take requisite online biosafety training this week	
2	<b>Week Jan 16</b>	1	<b>Introduction to Winogradsky column experiment and home set-up</b>	<b>Lab report 1 due April 3th (12%)</b>
3	<b>Week Jan 23</b>	2	<b>Microbial microscopy and gram stains</b>	<b>Lab report 2 due in lab, week Feb 6 th (8%)</b>
4	Week Jan 30		Results of lab 2 available - visit lab to check.	
5	<b>Week Feb 6</b>	3	<b>Isolation, enumeration and disinfection of microbes</b>	<b>Lab report 3 due in lab week of Feb 27 (8%)</b>

<b>Week #</b>	<b>Date</b>	<b>Lab #</b>	<b>Lab content</b>	<b>Work due</b>
6	Week Feb 13		Results of lab 3 available - visit lab to check.	
7	Week Feb 20		BREAK	
<b>8</b>	<b>Week Feb 27</b>	<b>4</b>	<b>DNA extraction and DNA sequencing</b>	<b>Lab report 4 due in lab week of March 20 (12%)</b>
9	Week March 6	<b>4</b>	Results of lab 4 available - online	
10	Week March 13	4	Optional lab session - Bioinformatic analysis of DNA sequences help.	
11	Week March 20	1	<b>Winogradsky column results and discussion (Lab 1)</b>	<b>Lab report 1 due April 3rd (12%)</b>
<b>12</b>	<b>Week March 27</b>		No lab.	
13	Week April 3			
14	April 14	course final exam	EXAM Friday 11:30 AM - 1:30PM (2023/04/12) Room TBA	

## 1.4 Final Exam

April 14, 11:30 - 1:30 pm	course final exam
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Exam time and location is subject to change. Please see WebAdvisor for the latest information.

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## 2 Instructional Support

### 2.1 Instructional Support Team

**Instructor:** Jackie Goordial  
**Email:** goordial@uoguelph.ca

### 2.2 Teaching Assistants

**Teaching Assistant (GTA):** Lexi Mollica`  
**Email:** lmollica@uoguelph.ca

**Teaching Assistant (GTA):** Yaryna Kudla  
**Email:** ykudla@uoguelph.ca

**Teaching Assistant (GTA):** Charles Chettleburgh  
**Email:** cchettle@uoguelph.ca

**Teaching Assistant (GTA):** Alexis De Laronde  
**Email:** delarona@uoguelph.ca

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## 3 Learning Resources

Resources, including book chapters, journal articles and websites, for lecture content and information for assignments will be made available to students on the ENVS\*2080 Courselink site. The resources indicated below are not required, but can be consulted to aid in understanding some of the lecture or lab material.

### 3.1 Recommended Resources

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

### 3.2 Other book chapters, journal articles and websites

These resources will be provided to the class via the ENVS\*2080 Courselink site.

### 3.2 Teaching Labs

For each laboratory experiment, introductory materials, lab notebook templates, and lab report questions will be provided on Counselink 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 Counselink 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.

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## 4 Learning Outcomes

### 4.1 Course Learning Outcomes

By the end of this course, you should be able to:

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
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# 5 Teaching and Learning Activities

## 5.1 Lecture

<b>Topics:</b>	<b>Lecture Content:</b>
	<p>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:</p> <ol style="list-style-type: none"> <li>1. General roles of microorganisms in the environment</li> <li>2. Some general properties of microorganisms in relation to environmental science</li> <li>3. Microbial growth, dormancy and death</li> <li>4. Isolation, screening and preservation of microorganisms from the environment</li> <li>5. Utilization of substrates by microorganisms</li> <li>6. How do microorganisms cope with adversity in the environment?</li> <li>7. Environmental cleanup and application to industry - selected examples of microbial biotechnology and bioremediation</li> </ol>

## 5.2 Lab

<b>Topics:</b>	<b>Teaching Lab Content</b>
	<p>Lab attendance is mandatory.</p> <p>The labs will provide some experience on the techniques and methodology involved in working with microorganisms. Though the labs are held virtually this year, there will be an 'at home' microbiologist component and some on-line tools to practice some nuances of the techniques. The following labs will be conducted:</p> <ol style="list-style-type: none"> <li>1. Lab Orientation and Safety (in theory) , Set-up Winogradsky columns</li> <li>2. Enumeration and disinfection of microorganisms</li> <li>3. Isolation and microscopic observations</li> <li>4. DNA extractions from environmental samples and cultures, PCR, and DNA sequencing</li> <li>5. Winogradsky column observations and conclusions</li> </ol>

# 6 Assessments

## 6.1 Assessment Details

### Midterm (30%)

**Date:** Mon, Feb 27, 10:30 AM - 11:20 AM, tbd

**Learning Outcome:** 1, 2, 3, 4

### Lab Report #1 (12%)

**Due:** Mon, Apr 3

**Learning Outcome:** 4, 5

Lab #1: Winogradsky Columns

### Lab Report #2 (8%)

**Due:** Due week of Feb 6th, depending on lab section

**Learning Outcome:** 4, 5

Lab #2: Microscopy and gram stains

### Lab Report #3 (8%)

**Date:** Due Week of February 27, depending on lab section

**Learning Outcome:** 4, 5

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

### Lab Report #4 (12%)

**Date:** Due Week of March 20, depending on lab section

**Learning Outcome:** 4, 5, 8

Lab #4: DNA extraction, PCR and DNA sequencing

### Final Exam (30%)

**Date:** Fri, Apr 14, 11:30 AM - 1:30 PM, TBA

**Learning Outcome:** 1, 2, 3, 4, 5, 6, 7, 8

# 7 Course Statements

## 7.1 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.com service is subject to the Usage Policy posted on the Turnitin.com site.

## **7.2 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.

# **8 University Statements**

## **8.1 Email Communication**

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

## **8.2 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. The grounds for Academic Consideration are detailed in the Undergraduate and Graduate Calendars.

Undergraduate Calendar - Academic Consideration and Appeals

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml>

Graduate Calendar - Grounds for Academic Consideration

<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml>

Associate Diploma Calendar - Academic Consideration, Appeals and Petitions

<https://www.uoguelph.ca/registrar/calendars/diploma/current/index.shtml>

## **8.3 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 students (undergraduate, graduate and diploma) 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 their respective Academic Calendars.

Undergraduate Calendar - Dropping Courses

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-drop.shtml>

Graduate Calendar - Registration Changes

<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/genreg-reg-regchng.shtml>

Associate Diploma Calendar - Dropping Courses  
<https://www.uoguelph.ca/registrar/calendars/diploma/current/c08/c08-drop.shtml>

## **8.4 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.

## **8.5 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 14 days in advance, and no later than November 1 (fall), March 1 (winter) or July 1 (summer). Similarly, new or changed accommodations for online quizzes, tests and exams must be approved at least a week ahead of time.

For Guelph students, information can be found on the SAS website  
<https://www.uoguelph.ca/sas>

For Ridgetown students, information can be found on the Ridgetown SAS website  
<https://www.ridgetownc.com/services/accessibilityservices.cfm>

## **8.6 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 encourages academic integrity. 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.

Undergraduate Calendar - Academic Misconduct

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-misconduct.shtml>

Graduate Calendar - Academic Misconduct

<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml>

## **8.7 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.

## **8.8 Resources**

The Academic Calendars are the source of information about the University of Guelph's procedures, policies, and regulations that apply to undergraduate, graduate, and diploma programs.

Academic Calendars

<https://www.uoguelph.ca/academics/calendars>

## **8.9 Disclaimer**

Please note that the ongoing COVID-19 pandemic may necessitate a revision of the format of course offerings, changes in classroom protocols, and academic schedules. Any such changes will be announced via CourseLink and/or class email.

This includes on-campus scheduling during the semester, mid-terms and final examination schedules. All University-wide decisions will be posted on the COVID-19 website (<https://news.uoguelph.ca/2019-novel-coronavirus-information/>) and circulated by email.

## **8.10 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).

## **8.11 Covid-19 Safety Protocols**

For information on current safety protocols, follow these links:

- <https://news.uoguelph.ca/return-to-campuses/how-u-of-g-is-preparing-for-your-safe-return/>

- <https://news.uoguelph.ca/return-to-campuses/spaces/#ClassroomSpaces>

Please note, these guidelines may be updated as required in response to evolving University, Public Health or government directives.

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