



ENVS*4320 Laboratory and Field Methods in Soil Biodiversity

Winter 2022

Section(s): 01

School of Environmental Sciences

Credit Weight: 1.00

Version 1.00 - December 15, 2021

1 Course Details

1.1 Calendar Description

This course will use a hand-on approach to investigate concepts and develop skills needed for understanding key soil functions. Emphasis will be on the transformation of nutrients and contaminants in soils and groundwater by microorganisms. Approaches for analyzing microbial populations and activities in the environment, including molecular techniques will be covered.

Pre-Requisites: ENVS*3200 or ENVS*3310

1.2 Course Description

Same as Calendar Description.

1.3 Timetable

Timetable is subject to change. Please see WebAdvisor for the latest information.

Lecture: Mon 1:30 - 2:20, Alex 030

Lab: Wed 2:30 - 5:30, Alex 030

1.4 Final Exam

Exam time and location is subject to change. Please see WebAdvisor for the latest information.

No final exam

2 Instructional Support

2.1 Instructional Support Team

Instructor:	Paul Voroney
Email:	pvoroney@uoguelph.ca
Telephone:	+1-519-824-4120 x53057
Office:	ALEX 217

3 Learning Resources

3.1 Required Resources

Soil microbiology, ecology and biochemistry (Textbook)

Soil microbiology, ecology and biochemistry, 4th Edition. (2014) Edited by E.A. Paul, Elsevier.

* text available online from the library

Global Soil Biodiversity Atlas (Other)

<https://www.globalsoilbiodiversity.org/atlas-introduction>

3.2 Recommended Resources

Microbiological methods for assessing soil quality (Textbook)

Microbiological methods for assessing soil quality. (2006). Edited by J. Bloem, D.W. Hopkins and A. Benedetti

Soil ecology and management (Textbook)

Soil ecology and management. 1st Edition. (2009). Joann Whalen and Luis Sampedro, CABI.

3.3 Additional Notes

Lab Manual: N/A

Other Resources: N/A

Field Trips: N/A

Additional Costs:

Lab note book; lab coat

4 Learning Outcomes

4.1 Course Learning Outcomes

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

1. By the end of this course students will know the current methods used for studies of soil microbial activity.
2. By the end of this course students will know the current methods used for studies of soil microbial biomass and number.
3. By the end of this course students will know the current methods used for studies of soil microbial diversity and community structure.
4. By the end of this course students will have acquired laboratory skills for soil sample collection and preparation for studies of soil organisms.
5. By the end of this course students will have acquired research skills for conducting an experiment to study soil microbial biomass and activity related to a current issue in environmental microbiology.
6. By the end of this course students will have acquired technical skills for performing analytical methods in soil microbiology, including elemental analysis, gas chromatography, microscopy, and DNA/RNA analysis.
7. By the end of this course students will have acquired the skills for collecting, organizing and interpreting data acquired from conducting research experiments in soil microbiology.
8. By the end of this course students will have acquired formal scientific oral presentation skills in the preparation and presentation of in-class seminars of current methods in soil

microbiology and in describing their component of the research conducted during the course.

9. By the end of this course students will have acquired formal scientific writing skills in the preparation of a scientific article based on the research conducted during the course.
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5 Teaching and Learning Activities

5.1 Lecture Content

Students will review journal articles from the scientific literature and critically review methods used to study soil microbiology. Students will prepare two seminars based on this review and present them to the class. Key soil processes and methods include: soil organic matter and plant residue decay, nutrient (N and P) mineralization, symbiotic relationships (N_2 fixation, AMF/EMF) rhizosphere, plate counting, direct microscopy, ATP, chloroform fumigation extraction, enzyme assays, incubation studies, substrate utilization-Biolog plates, molecular techniques-DNA and RNA analysis, phospholipid fatty acid analysis.

5.2 Labs

1. Soil sample preparation for laboratory studies. Adjustment of soil moisture content for aerobic incubation studies.
 2. Plate counting techniques for assessing soil microorganisms/Biolog plates.
 3. Measurement of soil respiration and N mineralization.
 4. DNA/RNA extraction and analysis.
 5. Direct microscopic measurements of soil bacteria and fungi.
 6. Measurement of soil microbial biomass C and N.
 7. Measurement of nitrification.
 8. Measurement of denitrification.
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6 Assessments

6.1 Marking Schemes & Distributions

Name	Scheme A (%)
Seminar	10
Laboratory results (5)	40
Research project-oral	10
Research project-written article	40
Total	100

6.2 Assessment Details

Seminar (10%)

Date: Jan 31, In-class

Learning Outcome: 1, 2, 3

Laboratory results (5) (40%)

Due: Jan 26, Feb 9, Feb 16, Mar 2, Mar 9, In-class

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

Research project-oral (10%)

Due: Mar 30, In-class

Learning Outcome: 8

Research project-written article (40%)

Due: Apr 4

Learning Outcome: 9

6.3 Additional Notes

Additional Notes (if required): N/A

Final examination date and time: N/A

Final exam weighting: N/A

7 Course Statements

7.1 Grading Policies:

Students will receive grades for their oral presentations within 1 week of delivery. Grades for laboratory exercises will be given within 1 week of submission.

Assignments and written articles should be submitted either during class time or delivered to instructor offices. Late submission of assignments will be docked 5% per day for each day past the due date.

7.2 Course Policy on Group Work:

Students will work in groups of 2-3 students in preparation and in conducting the laboratory exercises. Individual students will be responsible for their own oral presentation and for preparation of their component of the research project in the final written article.

7.3 Course Policy regarding use of electronic devices and recording of lectures:

Electronic recording of classes is expressly forbidden without consent of the instructor. When recordings are permitted they are solely for the use of the authorized student and may not be reproduced, or transmitted to others, without the express written consent of the instructor.

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-regchg.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-amisconduct.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-campusess/how-u-of-g-is-preparing-for-your-safe-return/>
- <https://news.uoguelph.ca/return-to-campusess/spaces/#ClassroomSpaces>

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