

Course Outline Form: Winter 2020

General Information

Course Code: ENVS*4320

Course Title: Laboratory and field methods in soil biodiversity

Course 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.

Credit Weight: 1.0

Academic Department (or campus): School of Environmental Sciences

Campus: Guelph

Semester Offering: Winter 2020

Class Schedule and Location:

Mon 1:30-2:20, AH 030

Wed 2:30-5:20, AH 030

Instructor Information

Instructor Name: Dr. Paul Voroney

Instructor Email: pvoroney@uoguelph.ca

Instructor Phone and Extension: 519-824-4120 Extension: 53057

Office location and office hours: AH 217; TBA

GTA Information

GTA Name: TBA

GTA Email: TBA

GTA office location and office hours: TBA

Course Content

Specific Learning Outcomes:

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.

Lecture Content:

Students will review journal articles from the scientific literature and critically review methods used to study soil microbiology. Students will prepare 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.

Labs:

1. Soil sample preparation for laboratory studies. Determine soil moisture content. Adjustment of soil moisture content for aerobic incubation studies. Air dry samples for measurement of soil chemical properties.
2. Measurement of soil C, N and P mineralization. Measurement of decomposition of organic substrates varying in C/N ratio.
- 3.. Plate counting techniques for assessing soil microorganisms/Biolog plates

4. Measurement of soil microbial biomass C and N.
5. Direct microscopic measurements of soil bacteria and fungi.
6. DNA/RNA extraction and analysis.

Seminars: N/A

Course Assignments and Tests:

| Assignment or Test | Due Date | Contribution to Final Mark (%) | Learning Outcomes Assessed |
|----------------------------------|--|--------------------------------|----------------------------|
| Seminars (1) | In-class (Jan 27, Feb 3) | 15 | 1,2,3 |
| Laboratory results (6) | In-class (Jan 15, Jan 22, Jan 29, Feb 12, Mar 4, Mar 11) | 30 | 1,2,3,4,5,6,7 |
| Research project-oral | Mar 25 | 15 | 8 |
| Research project-written article | Apr 1 | 40 | 9 |

Additional Notes (if required): N/A

Final examination date and time: N/A

Final exam weighting: N/A

Course Resources

Required Texts:

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

* text available online from the library

Recommended Texts:

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

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

Lab Manual: N/A

Other Resources: N/A

Field Trips: N/A

Additional Costs:

Lab notebook; lab coat

Course Policies**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.

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.

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.

University Policies**Academic Consideration:**

The University of Guelph is committed to supporting students in their learning experiences and responding to their individual needs and is aware that a variety of situations or events beyond the student's control may affect academic performance. Support is provided to accommodate academic needs in the face of personal difficulties or unforeseen events in the form of Academic Consideration.

Information on regulations and procedures for Academic Consideration, Appeals and Petitions, including categories, grounds, timelines and appeals can be found in [Section VIII \(Undergraduate Degree Regulations and Procedures\) of the Undergraduate Calendar](#).

Academic Misconduct:

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.

Detailed information regarding the Academic Misconduct policy is available in [Section VIII \(Undergraduate Degree Regulations and Procedures\) of the Undergraduate Calendar](#).

Accessibility:

The University of Guelph is committed to creating a barrier-free environment. Providing services for students is a shared responsibility among students, faculty and administrators. This relationship is based on respect of individual rights, the dignity of the individual and the University community's shared commitment to an open and supportive learning environment. Students requiring service or accommodation, whether due to an identified, ongoing disability or a short-term disability should contact the Student Accessibility Services (SAS), formerly Centre for Students with Disabilities (CSD), as soon as possible.

For more information, contact SAS at 519-824-4120 ext. 56208 or email sas@uoguelph.ca or visit the [Student Accessibility Services website \(http://www.uoguelph.ca/csd/\)](http://www.uoguelph.ca/csd/).

Course Evaluation Information:

End of semester course and instructor evaluations provide students the opportunity to have their comments and opinions used as an important component in the Faculty Tenure and Promotion process, and as valuable feedback to help instructors enhance the quality of their teaching effectiveness and course delivery.

While many course evaluations are conducted in class others are now conducted online. Please refer to the [Course and Instructor Evaluation Website](#) for more information.

Drop period:

The drop period for single semester courses starts at the beginning of the add period and extends to the Fortieth (40th) class day of the current semester (the last date to drop a single semester courses without academic penalty) which is listed in [Section III \(Schedule of Dates\) of the Undergraduate Calendar](#).

The drop period for two semester courses starts at the beginning of the add period in the first semester and extends to the last day of the add period in the second semester.

Information about Dropping Courses can be found in [Section VIII \(Undergraduate Degree Regulations and Procedures\) of the Undergraduate Calendar](#).

Additional Course Information