



# **ENVS\*3310 Soil Biodiversity and Ecosystem**

## **Function**

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**

Soils are the site of complex interactions between minerals, water, air, organic matter and living organisms. This course will focus on the organisms that live in the soil and their activities in soil ecosystems, soil as a habitat for organisms, the key role of microorganisms in nutrient cycles and plant-microbe relationships and will review basic soil microbial and ecological principles.

**Pre-Requisites:** 10.00 credits including (1 of AGR\*2320, ENVS\*2060, SOIL\*2010)

**Equates:** ENVS\*3200, SOIL\*3200

### **1.2 Course Description**

Same as calendar description

### **1.3 Timetable**

Lectures: Tuesday and Thursday 11:30-12:50; MCKN 307

Tutorial: Thursday 2:30-3:20; AH 030.

### **1.4 Final Exam**

No final exam.

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## **2 Instructional Support**

**Instructor:** Dr. Adam Gillespie

**Email:** agilles@uoguelph.ca

**Telephone:** +1-519-824-4120 x52075

**Office:** ALEX 225

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## 3 Learning Resources

### 3.1 Required Resources

Soil microbiology, ecology and biochemistry, 4th Edition. (2015) Edited by E.A. Paul, Elsevier. \* text available online from the library (Textbook)

Global Soil Biodiversity Atlas (Other)

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

Digging into Canadian Soils (Textbook)

<https://openpress.usask.ca/soilscience/>

### 3.2 Recommended Resources

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

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## 4 Learning Outcomes

### 4.1 Course Learning Outcomes

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

**1. On completion of this course students will be able to:**

1. Understand terms associated with the soil microbial environment.
2. Identify types and interactions of organisms in the soil food web.
3. Interpret and integrate modern concepts about soil microorganisms and nutrient cycles.
4. Understand the importance of soil microbial communities to environmental

sustainability and function.

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## 5 Teaching and Learning Activities

### 5.1 Seminar

#### Scheduled

##### Topics:

#### **ASSIGNMENT: MICROBES IN THE NEWS**

**ASSIGNMENT PURPOSE:** News about major breakthroughs or applications in microbiology and related fields is discussed in the popular news, including online publications, newspapers and periodicals. The purpose of this assignment is to encourage you to find an article that fits your interests and to discuss these contemporary issues in microbiologically related sciences.

**Task:** Students will find a pop news article that highlights a key scientific publication in environmental and/or soil microbiology. Please verify the paper with the instructor and provide the link for the class to read a week ahead of time. Students will prepare a 10-12 minute presentation for the class, which will be followed by a student-led class discussion (2-5 minutes) about the news topic, and the selected publication. This exercise will encourage independent research, develop critical thinking skills, foster class discussion, reinforce public speaking skills and promote collegiality.

**CONTENT FOR THE PRESENTATION.** Regardless of design, make certain that the presentation is informative. Anyone listening to your talk should learn about your event easily without needing additional resources. Questions to address in your talk may include:

- What is the news?
- What is the scientific publication associated with this news?
- Where did it occur?
- What organism(s) are involved?

- What is it significant?
- What experiments were involved?
- Why did you select this topic?
- Please prepare 2 questions to discuss with the class.

### **FORMAT FOR THE ORAL PRESENTATION.**

- Regardless of design, make sure that the presentation is informative. Anyone listening should learn all about your selected topic without requiring additional resources.
- Powerpoint presentation can be used. If powerpoint, bring a USB key class, or email it to me ahead of time.
- Presentation should be 10-12 min long. Keep an additional 2-5 minutes will be given for discussion.
- Keep visual aids simple and straightforward
- Eliminate all elements that are not essential to the communication of the idea, and present only 1 idea at a time.
- Highlight important cues with bright colors
- Lettering: for best legibility use lowercase letters, only use capitals where normally required.
- Use large font to be seen on screen (minimum 24 point)

### **Oral presentation grading will be based on these items:**

- Prepared and knowledgeable.
- Presentation creative and effort obvious
- Presentation within the time limit
- Displays enthusiasm and expression
- Clear introduction and conclusion
- Organized and good use of A/V aids
- Appropriate gestures and eye contact
- Clear voice, good speed and volume.

**LISTENING TO OTHER STUDENT PRESENTATIONS.** Just as your classmates will listen respectfully to you, you are

asked to listen to them with attentiveness and courtesy. After hearing about each news story, you will have ample time to ask additional questions and discuss the assigned paper.

**GRADES:** Marks will be given for the quality and content of the oral presentation and for the participation in the discussion.

## 5.2 Lab

Topics:

**Assignment: Term Paper on Fabric Decomposition Experiment**

### **Introduction:**

This experiment is based on an outreach initiative from the National Soil Conservation called 'Soil your Undies'

<https://soilcc.ca/soilyourundies/2017/soil-your-undies.php>

From the website:

*Soil Your Undies is a fun soil science experiment that investigates biological activity in farm fields, backyard gardens or anywhere soil is found. To get started, all you need is a pair of new, 100% white cotton undies, a shovel, and a flag to mark the site. After a couple months buried, there shouldn't be much left of your undies if there is good biological activity in your soil.*

### **Our Experiment:**

We are going to set up an experiment to run for the first 6 weeks of class to compare the decomposition of different fabrics. We have three different kinds of cloth: cotton, linen and rayon. Look them up, and research from what materials they are made!

We will cut and weigh squares of fabric, and bury them in soil with 3 different treatments:

- a. Control
- b. Grass seeds
- c. Nitrogen fertilizer

After 6 weeks (after reading week) we will disassemble the pots, examine, weigh and compare the fabric remnants.

### **Term Paper:**

Due: April 7 2023 (end of term)

Your term paper will be in the form of a scientific report where you will report on, and discuss the results you have found. You will use what you have learned in the course and you will be expected to find research and journal articles to help explain the results.

Your term paper should be 8-10 pages long (excluding tables and figures). Use 12-point font, 2 line spacing. Include a title page, table of contents, page numbers, headings and subheadings, and reference list. You should have at least 6 references, not including web sources.

### **Tips for writing a technical paper:**

#### **Introduction:**

Introduce subject

Indicate why the subject is important.

Preview the topics in order they will be presented.

Obvious thesis statement

Make a hypothesis!

### **Materials and Methods**

Describe the setup of the experiment

Include how the data was collected

### **Results and Discussion**

Present results in graph or table format

Discussion should relate to existing knowledge and highlight any differences.

### **Conclusion:**

Summarize points in the text

Ensure points appear chronologically

No new material presented

### **References:**

Acknowledge all new facts or ideas in the text

Prepare a complete reference list.

### **FORMAT FOR THE PAPER.**

- The paper must be a 8-10-page document (8.5" by 11"). You should print the paper single sided. Carefully consider appearance, design, organization, and content.
- Keep the text brief but informative.
- Review your work to make certain no grammatical or spelling errors are present.
- Read your work or have a friend read it before you submit it!
- DO NOT PLAGIARIZE. You will receive a ZERO for this assignment if you plagiarize work from another source.

### REFERENCES.

Use the Canadian Journal of Soil Science (this is an 'author-year' system for references, also known as the Harvard format):

## 5.3 Lecture content

|                 |                              |          |                                |                |
|-----------------|------------------------------|----------|--------------------------------|----------------|
|                 |                              |          | Chapin,                        |                |
|                 |                              |          | Paul Textbook Matson, Vitousek |                |
|                 |                              | Chapters | Chapters                       | Papers         |
| <b>Module 1</b> | <b>Microbial Environment</b> | 2,8      | 3,4                            | Six 2000       |
| Weeks 1-3       | Soil Habitat                 |          |                                |                |
|                 | Water                        |          |                                |                |
|                 | Aggregation                  |          |                                |                |
| <b>Module 2</b> | <b>Energy</b>                | 9        | 3                              | Miransani 2012 |



|                 |                            |           |         |                 |
|-----------------|----------------------------|-----------|---------|-----------------|
| Weeks 4, 5      | Redox                      |           |         |                 |
|                 | Metabolism                 |           |         |                 |
|                 | Respiration                |           |         |                 |
| <b>Module 3</b> | <b>Soil organic matter</b> | 12-16     | 5,6,7,9 | Cotrufo 2013    |
| Weeks 6-8       | What is it                 |           |         | DeNobili 2020   |
|                 | Development                |           |         | Janzen 2006     |
|                 | Stability                  |           |         | Lehmann 2015    |
|                 | Nitrogen, Phosphorous      |           |         | Richardson 2009 |
|                 |                            |           |         | Pages from      |
|                 |                            |           |         | Schmidt 2011    |
| <b>Module 4</b> | <b>Ecology</b>             | 3-6,10,11 | 8,10    | Bonfante 2010   |
| Weeks 9,10      | Ecology                    |           |         | Gaiero 2013     |
|                 | PGPR                       |           |         | Kuzyakov 2015   |
|                 | Mycorrhizae                |           |         | Oberger 2018    |
|                 | Rhizosphere                |           |         |                 |
| <b>Module 5</b> | <b>Applications</b>        | 17,18     |         | Sanderman 2017  |
| Weeks 11, 12    | Models                     |           |         | Factsheet       |

Soil Health

Composting

## 6 Assessments

### 6.1 Assessment Details

**Quiz 1 (15%)**

**Date:** Thu, Jan 26, In-class

**Quiz 2 (15%)**

**Date:** Thu, Feb 16, In-class

**Quiz 3 (15%)**

**Date:** Thu, Mar 16, In-class

**Quiz 4 (15%)**

**Date:** Thu, Apr 6, In-class

**Microbe in the news (20%)**

**Date:** Scheduled

**Paper on fabric decomposition experiment (20%)**

**Date:** Fri, Apr 7

Term paper

## 7 University Statements

### 7.1 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.

### 7.2 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>

### 7.3 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>

### 7.4 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.

### 7.5 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>

## 7.6 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>

## 7.7 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.

## 7.8 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>

## 7.9 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.

## **7.10 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).

## **7.11 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.

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