

**University of Manitoba
Faculty of Agricultural and Food Sciences
SOIL 7270 Advanced Soil Ecology**

**Course Outline Winter 2019/20
Instructor: Prof. Mario Tenuta
Department of Soil Science**

Introduction

Soil ecology is the study of interactions between soil organisms and the soil environment. The field is of interest to a broad range of scientists including environmentalists, agronomists, plant pathologists, food scientists and ecologists. The need to understand the relation of the soil environment to the presence and functioning of species and communities of soil organisms unifies studies in soil ecology. A theme throughout this course will thus be the complexity of the soil environment is reflected in the kinds and functions of organisms from the individual to community level of organization. Our goal in this course is to develop a level of comprehension at the graduate level in how soil biological communities respond to soil environmental conditions, plants, and land management. The course is tailored to the interests of the students. The topic areas to be covered will be developed with consultation of students. This course is offered in the winter term if there are more than 4 students enrolled. The course structure has usually been a mix of lectures by the instructor and students. Discussion and analysis of research papers is also done to obtain depth in understanding in key topics. Students have been graded based on their lecture presentation, a major report reviewing the subject area of their presentation, short assignment for each paper discussed in class, and class participation.

Instructor

Prof. Mario Tenuta
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Lectures

3 hours / week (M W 8:30-9:45 but check with class)
Soil Science (room 342)

Textbook

None
required

Course Materials

Suggested books as general references
Fundamentals of Soil Ecology 3rd Edition, Elsevier Academic Press (Coleman et al. 2017)
The Living Soil, Science Publishers Inc. (Gobat et al. 2004)
Soil Microbiology, Ecology, and Biochemistry 4th Edition, Academic Press (ed. E. Paul 2015)

Website

Course materials will be posted at the following website (material password protected)
[http://home.cc.umanitoba.ca/~tenutam/SoilEcology/Soil Ecology Home Page.html](http://home.cc.umanitoba.ca/~tenutam/SoilEcology/Soil_Ecology_Home_Page.html)

Menu tabs also provide further information contained in the Soil Ecology SOIL 4400 website.

Prerequisites

Any of the following at the undergraduate level: soil microbiology, plant pathology, senior undergraduate level course in microbiology, food microbiology, environmental chemistry, or soil ecology

Course Evaluation

Student Presentation.....	20%
Major Report	30%
Reading Assignments.....	30%
Group Assignments.....	20%

Student Presentation

Students will prepare and deliver a 50 minute lecture to the class on a topic of relation to their graduate program and their major report in consultation with Dr. Tenuta. This will be followed by a discussion on the topic. Grading will be based upon the quality of the lecture content, delivery, and success in engaging the class to participate with questions and comments. Students are to meet with Dr. Tenuta a minimum of 3 weeks before their lecture to establish the subject topic and areas to be covered in the presentation and major research report. A draft of the presentation is to be provided to Dr. Tenuta at least 7 days in advance to the student presentation and the final version of the presentation 1 day before the presentation.

Major Report

Students will prepare a review paper synthesizing the important literature and topic areas of the research field they gave their Student Presentation on. The paper is to be no longer than 25 pages double spaced. Students will prepare:

- Outline of their paper due Feb 3
- Draft of paper due March 26
(marked draft will be available April 6)
- Final Revised Paper due April 20

Reading Assignments

Associated with instructor lead classes, one or two original research papers will be given as readings. Readings will be posted on the web under the Courses/SOIL 7270 menu tab on the www.soilecology.ca website. Students must have read and analyzed the readings before coming to class. Further, students are required to actively participate in discussion of the readings. Students are to prepare a max 3 page response to the following questions:

- a) What ecological principles or understanding does the paper set out to challenge or substantiate?
- b) What are the novel point(s) of the paper?
- c) What did you learn most from the paper?
- d) How would you have done the study differently? For review articles discuss how you would have structured the paper differently, included different topics or had a different emphasis. Explain why you would make the differences.
- e) How would you have analyzed the results differently or altered the discussion? Do not answer this question for review papers but elaborate on a) instead.

Group Assignments: Space – The Final Frontier?

Students are to form groups of three for two assignments. The student composition of groups is to vary between assignments.

Group Assignment 1: Methods of Extraterrestrial Detection of Soil Organisms – due February 10. Each group is to provide a 10 page report and a 20 minute presentation.

Group Assignment 2: What is the Role of Soil Microorganisms in Growing Plants and Living in Space and Other Planets? – due March 9. Each group is to provide a 10 page report and a 20 minute presentation.

Instructor Lead Classes

Dr. Tenuta will lead the class in the following lectures and discussions:

Date	Lecture/topic	Leader
Jan 6	General Introduction	Mario
Jan 8	The Soil Environment	Mario
Jan 13	The Soil Environment	Mario
Jan 15	The Soil Environment	Mario
Jan 20	The Soil Environment	Mario
Jan 22	Methods in Soil Ecology	Mario
Jan 27	Methods in Soil Ecology	Mario
Jan 29	Methods in Soil Ecology	Mario
Feb 3	Methods in Soil Ecology	Mario
Feb 5	Methods in Soil Ecology	Mario
Feb 10	Group Presentations #1	Students
Feb 12	Methods in Soil Ecology	Mario
Feb 17	Break	
Feb 19	Break	
Feb 24	Soil Biological Diversity	Mario
Feb 26	Soil Biological Diversity	Mario
March 2	Soil Biological Diversity	Mario
March 4	Papers Metagenomics	Mario
March 9	Group Presentations #2	Students
March 11	Soil Organic Carbon Cycling	Mario
March 16	Soil Organic Carbon Cycling	Joanne
March 18	Legume N Fixation	Ambihai
March 23	Free Living N Fixation	Kaylin
March 25	Papers N Fixation	Mario
March 30	Nitrate Leaching	Kody
April 1	N Oxide Reductions	Victor
April 6	Papers N Cycling	Mario
April 8	Rhizosphere	Mario
April 13	Rhizosphere P Dynamics	Michelle
April 15	Papers Rhizosphere	Mario
April 20	Soil Health Indicators	Chathuri
April 22	System Design and Soil Health	Katherine

Student Presentation Topics:

Each student will choose one lecture to give after Feb 12. Topics are to be developed with Mario and to suite the student's thesis topic or interests.

Late Submissions

10% will be deducted per day for late submissions. Let's not need to go there.