

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

**Course Outline Winter 2021/2022  
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.

<b>Instructor(s) Name &amp; Preferred Form of Address:</b>	Mario Tenuta, Senior Industrial Research Chair, Department of Soil Science, University of Manitoba
<b>Office Hours or Availability:</b>	Rm 360, Ellis Building Currently my office is under renovation and I am working from home. See below in how to contact me.
<b>Office Phone No.</b>	204-290-7827 (cellular)
<b>Email:</b>	mario.tenuta@umanitoba.ca <i>Note:</i> All email communication must conform to the <a href="#">Communicating with Students</a> University policy.
<b>Contact:</b>	You can contact me by email anytime and by phone on weekdays 8:30am to 5pm. As well I am available for discussions after class on Zoom.

***Lectures***

3 hours / week (M W 8:30-10:00)

Online <https://us02web.zoom.us/j/85820519449?pwd=d3hVcS94L2ljTnpFU0JUQ2RYeTlQdz09>

<b>Textbook</b> Required	<b>Course Materials</b> Chapters will be assigned from Soil Microbiology, Ecology, and Biochemistry 4 <sup>th</sup> Edition, Academic Press (ed. E. Paul 2015). Digital available from library. Can read the whole book online and can download up to 121 pages to your computer. \$150 hardcover from Amazon.
Additional	Fundamentals of Soil Ecology 3 <sup>rd</sup> Edition, Elsevier Academic Press (Coleman et al. 2017) The Living Soil, Science Publishers Inc. (Gobat et al. 2004)

**Website**

Course materials will be posted at the following website (material password protected)  
<https://soilecology.ca/soil-7270-advanced-soil-ecology/>

The same password will get you into the Soil Ecology SOIL 4400 materials posted at  
<https://soilecology.ca/soil-4400-soil-ecology/>

**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.....	25%
Minor Reports.....	25%

Letter Grade	% out of 100	Final Grade Point
A+	90-100	4.5
A	80-89	4.0
B+	76-79	3.5
B	70-75	3.0
C+	66-69	2.5
C	60-65	2.0
D	50-59	1.0
F	<49	0.0

**Student Presentations**

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 (major headings and points) of paper due Feb 9

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 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 5 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.

## Minor Reports

Students are to submit two reports from the topics given below. The reports are to be a maximum of 10 pages. Each report is to be accompanied by a 15 minute recorded video presentation summarizing the report.

Topic	Student	Due Date and Presentation
Quantitative PCR		
Biological N Fixation by <sup>15</sup> N Natural Abundance		
Static Vented Chamber gas Flux Determinations		
CASH Test		
AMF Scoring of Root Colonization		
Light Fraction Determination of Soil Organic Matter		
Total Nitrogen Determination of Soil		
Soil Enzyme Potential Assays		
Soil Respiration Determinations		
Wet Aggregate Stability		
Dissolved Organic Matter		
Two-pool Decomposition Model		

Total Carbon Stock Determination of Soil		
Extremophiles		
Psychrophiles		
Nitrifier-Denitrification		
Soil Phosphatase Determination		
Nitrification Inhibitors		
Microbiology of Serpentine Soils		
<i>Pseudomonas fluorescens</i>		
16S rRNA Phylogenetic Analysis		
Indirect Emissions of N <sub>2</sub> O		
Heterotrophic Nitrification		

### Schedule

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

Date	Lecture/topic	Leader
Jan 24	General Introduction	Mario
Jan 26	The Soil Environment	Mario
Jan 31	The Soil Environment	Mario
Feb 2	Methods in Soil Ecology	Mario
Feb 7	Methods in Soil Ecology	Mario
Feb 9	Methods in Soil Ecology	Mario
Feb 14	Student Minor Report Presentations	Students
Feb 16	Student Minor Report Presentations	Students
Feb 21	Method Articles	Whole Class
Feb 28	Method Articles	Whole Class
March 2	Soil Biological Diversity	Mario
March 7	Soil Biological Diversity	Mario
March 9	Soil Biological Diversity	Mario
March 14	Diversity Articles	Whole Class
March 16	Diversity Articles	Whole Class
Feb 26	Soil Organic Carbon Cycling	Mario
March 2	Soil Organic Carbon Cycling	Mario
March 7	Carbon Articles	Mario
March 9	Nitrogen Cycling	Mario
March 14	Nitrogen Cycling	Mario
March 21	Nitrogen Articles	Whole Class
March 23	Student Minor Report Presentations	Students
March 28	Student Minor Report Presentations	Students
March 30	Papers N Fixation	Whole Class
April 4	Student Major Presentation	Student

April 6	Student Major Presentation	Student
April 11	Student Major Presentation	Student
April 13	Student Major Presentation	Student
April 18	Student Major Presentation	Student
April 20	Student Major Presentation	Student
April 25	Student Major Presentation	Student

### **Student Presentation Topics:**

Each student will present one lecture on the topic of their major report. Topics are to be developed with Mario and to suit the student's thesis topic and interests.

### **Late Submissions**

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

### **Respectful Environment**

I will treat you with respect and would appreciate the same courtesy in return and treatment of each other. See [Respectful Work and Learning Environment Policy](#).

### **Email Communication**

You are required to obtain and use your University of Manitoba email account for all communication between yourself and the University, including me. All communication must comply with the Electronic Communication with Student Policy:

[http://umanitoba.ca/admin/governance/governing\\_documents/community/electronic\\_communication\\_with\\_students\\_policy.html](http://umanitoba.ca/admin/governance/governing_documents/community/electronic_communication_with_students_policy.html)

*I expect you to follow these policies around Class Communication and Academic Integrity.*

### **Student Accessibility Services:**

The University of Manitoba is committed to providing an accessible academic community. [Students Accessibility Services \(SAS\)](#) offers academic accommodation supports and services such as note-taking, interpreting, assistive technology and exam accommodations. Students who have, or think they may have, a disability (e.g. mental illness, learning, medical, hearing, injury-related, visual) are invited to contact SAS to arrange a confidential consultation.

Student Accessibility Services

520 University Centre

Phone: (204) 474-7423

Email: [Student\\_accessibility@umanitoba.ca](mailto:Student_accessibility@umanitoba.ca)

### **Recording Synchronous Sessions/Online Lectures**

Lectures and presentations will not be recorded.

### **Copyright and Ownership**

No audio or video recording of class material, lectures, or presentations is allowed in any format, openly or surreptitiously, in whole or in part without permission of Mario Tenuta. Course materials (both paper and digital) are for the participant's private study and research, and must not be shared. Violation of these and other Academic Integrity principles, will lead to serious disciplinary action.

### **Voluntary Withdrawal**

February 4 is the last day to voluntarily withdraw without penalty.

### **Referencing Style**

We will use the style for the Canadian Journal of Soil Science. This journal uses the Harvard citation style. In-text citations take the form (author, year). References must be listed in alphabetical order according to the name of the first author and not numbered. References with the same first author are listed in the following order.

- Papers with one author only are listed first in chronological order, beginning with the earliest paper.
- Papers with dual authorship follow and are listed in alphabetical order by the last name of the second author.
- Papers with three or more authors appear after the dual-authored papers and are arranged chronologically.

Include DOIs and hyperlinks whenever possible, and do not number the references. If your article is accepted for publication, we will format the list for you.

## **Academic Integrity**

Each student in this course is expected to complete their coursework and programs of study with integrity by making a commitment to the six fundamental values of honesty, trust, fairness, respect, responsibility, and courage.

<http://umanitoba.ca/student-supports/academic-supports/academic-integrity>

Academic integrity looks like referencing the work of others that you have used and completing your assignments independently unless otherwise specified

If you are encouraged to work in a team, ensure that your project is completed with integrity. You must also do your own work during exams. Plagiarism, duplicate submission, cheating on quizzes, tests, and exams, inappropriate collaboration, academic fraud, and personation are in violation of the Student Discipline Bylaw and will lead to the serious [disciplinary action](#). Visit the [Academic Calendar](#), [Student Advocacy](#), and [Academic Integrity](#) web pages for more information and support.

Refer to specific course requirements for academic integrity for individual and group work such as:

- I. Study groups are allowed for discussion of articles but assignments must be done individually;
- II. Assignments can not be done together or shared;
- III. All work should be completed independently;

## **Learner Support**

University support to students is outline in [Schedule "A"](#).

### **Schedule "A"**

**Section (a) sample** re: A list of academic supports available to Students, such as the Academic Learning Centre, Libraries, and other supports as may be appropriate:

#### **Writing and Learning Support**

The Academic Learning Centre (ALC) offers writing and learning supports to help you throughout your academic program. These supports are offered online during the Covid-19 pandemic.

Make an appointment with an ALC writing tutor who can give you feedback at any stage of the writing process, whether you are just beginning to work on a written assignment or already have a draft. The ALC also has an English as an Additional Language (EAL) specialist available to work with students on improving their English-language academic writing skills.

Consult an ALC learning specialist or attend an academic skills workshop to improve your time management, learning strategies and test-taking strategies. Get support in select courses by making an appointment with an ALC content tutor. The ALC also offers peer-facilitated study groups called Supplemental Instruction (SI) for certain courses that students have typically found difficult. In SI study groups, students ask questions, compare notes, discuss content, solve practice problems, and develop new study strategies in a group-learning format.

In addition to one-to-one and group sessions, you can also find writing and study tip sheets and videos on the ALC website.

Academic Learning Centre services are free for U of M students. For more information, please visit the Academic Learning Centre website at: <http://umanitoba.ca/student/academiclearning/>

Contact the Academic Learning Centre by calling 204-480-1481 or emailing [academic\\_learning@umanitoba.ca](mailto:academic_learning@umanitoba.ca). Bannatyne students can contact the Bannatyne Student Services office at

204-272-3190.

### **University of Manitoba Libraries (UML)**

Research begins at [UM Libraries](#). [Learn at the Libraries](#) is a great place to start, with information for students on academic writing, how to search the library, evaluating resources, and writing citations. As the primary contact for all research needs, your [liaison librarian](#) can play a vital role when completing academic papers and assignments. Liaisons can answer questions about locating appropriate resources or managing citations, and will address any other concerns you may have regarding the research process. Liaisons can be contacted by email or phone, and are also available to meet with you online. When working remotely, students can also receive help online through [Ask Us!](#) chat. For further detail about the libraries' services and collections, [visit the Libraries' web site](#). Regularly check our [COVID-19 Update](#) page for available library services and access to resources for Fall 2020

**For 24/7 mental health support, contact the Mobile Crisis Service at 204-940-1781.**

### **Student Counselling Centre**

Contact SCC if you are concerned about any aspect of your mental health, including anxiety, stress, or depression, or for help with relationships or other life concerns. SCC offers crisis services as well as individual, couple, and group counselling. *Student Counselling Centre:*

<http://umanitoba.ca/student/counselling/index.html>

474 UMSU University Centre or S211 Medical Services Building  
(204) 474-8592

### **Student Support Case Management**

Contact the Student Support Case Management team if you are concerned about yourself or another student and don't know where to turn. SSCM helps connect students with on and off campus resources, provides safety planning, and offers other supports, including consultation, educational workshops, and referral to the STATIS threat assessment team.

<http://umanitoba.ca/student/case-manager/index.html>

520 UMSU University Centre  
(204) 474-7423 (Student Support Intake Assistant)

### **University Health Service**

Contact UHS for any medical concerns, including mental health problems. UHS offers a full range of medical services to students, including psychiatric consultation. Note that due to fire displacement, UHS is unable to provide in-person medical care on the Fort Garry Campus until October, 2020.

*University Health Service* <http://umanitoba.ca/student/health/>

(204) 474-8411 (Business hours or after hours/urgent calls)

### **Health and Wellness**

Contact our Health and Wellness Educator if you are seeking information on health topics, including physical and mental health concerns, alcohol and substance use harms, or sexual violence. You can also access peer support from a *Healthy U* peer health educator.

*Health and Wellness Educator*

<https://umanitoba.ca/student/health-wellness/welcome-about.html>

[britt.harvey@umanitoba.ca](mailto:britt.harvey@umanitoba.ca)

469 UMSU University Centre  
(204) 295-9032

### **Sexual Violence Resource Centre**

Contact SVRC if you have experienced sexual violence or are seeking information about how to help somebody else. SVRC provides inclusive, survivor-centred, trauma-informed services, such as consultation, referrals, safety planning, and a range of on-site supports, including counselling by Klinik.

*Sexual Violence Resource Centre*

<https://umanitoba.ca/student-supports/sexual-violence-support-and-education>

[svrc@umanitoba.ca](mailto:svrc@umanitoba.ca)

537 UMSU University Centre

(204) 474-6562 (Sexual Violence Intake and Triage Specialist)

### Student Services at Bannatyne Campus

Contact SS@BC to access a full range of resources and supports for learners at the Rady Faculty of Health Sciences. Services are provided through a one-stop hub that includes a range of supports for personal and academic success, including counselling, mental health consultation, and spiritual care.

*Student Services at Bannatyne Campus*

<https://umanitoba.ca/student-supports/student-services-bannatyne-campus>

[bcss@umanitoba.ca](mailto:bcss@umanitoba.ca)

**S211 Medical Services Building**

**(204) 272-3190 (Intake and Triage Specialist)**

### Copyright

All students are required to respect copyright as per Canada's *Copyright Act*. Staff and students play a key role in the University's copyright compliance as we balance user rights for educational purposes with the rights of content creators from around the world. The Copyright Office provides copyright resources and support for all members of the University of Manitoba community.

Visit <http://umanitoba.ca/copyright> for more information.

### Your rights and responsibilities

As a student of the University of Manitoba you have rights and responsibilities. It is important for you to know what you can expect from the University as a student and to understand what the University expects from you. Become familiar with the policies and procedures of the University and the regulations that are specific to your faculty, college or school.

The [Academic Calendar](http://umanitoba.ca/student/records/academiccalendar.html) <http://umanitoba.ca/student/records/academiccalendar.html> is one important source of information. View the sections *University Policies and Procedures* and *General Academic Regulations*.

While all of the information contained in these two sections is important, the following information is highlighted.

- If you have questions about your grades, talk to your instructor. There is a process for term work and final **grade appeals**. Note that you have the right to access your final examination scripts. See the Registrar's Office website for more information including appeal deadline dates and the appeal form <http://umanitoba.ca/registrar/>
- You are expected to view the General Academic Regulation section within the Academic Calendar and specifically read the **Academic Integrity** regulation. Consult the course syllabus or ask your instructor for additional information about demonstrating academic integrity in your academic work. Visit the Academic Integrity Site for tools and support <http://umanitoba.ca/academicintegrity/> View the **Student Academic Misconduct** procedure for more information.
- The University is committed to a respectful work and learning environment. You have the right to be treated with respect and you are expected to conduct yourself in an appropriate respectful manner. Policies governing behavior include the:

#### Respectful Work and Learning Environment

[http://umanitoba.ca/admin/governance/governing\\_documents/community/230.html](http://umanitoba.ca/admin/governance/governing_documents/community/230.html)

#### Student Discipline

[http://umanitoba.ca/admin/governance/governing\\_documents/students/student\\_discipline.html](http://umanitoba.ca/admin/governance/governing_documents/students/student_discipline.html) and,

#### Violent or Threatening Behaviour

[http://umanitoba.ca/admin/governance/governing\\_documents/community/669.html](http://umanitoba.ca/admin/governance/governing_documents/community/669.html)



- If you experience **Sexual Assault** or know a member of the University community who has, it is important to know there is a policy that provides information about the supports available to those who disclose and outlines a process for reporting. The **Sexual Assault** policy may be found at: [http://umanitoba.ca/admin/governance/governing\\_documents/community/230.html](http://umanitoba.ca/admin/governance/governing_documents/community/230.html)  
More information and resources can be found by reviewing the Sexual Assault site <http://umanitoba.ca/student/sexual-assault/>

For information about rights and responsibilities regarding **Intellectual Property** view the policy: [https://umanitoba.ca/governance/sites/governance/files/2021-06/Intellectual%20Property%20Policy%20-%202013\\_10\\_01%20RF.pdf](https://umanitoba.ca/governance/sites/governance/files/2021-06/Intellectual%20Property%20Policy%20-%202013_10_01%20RF.pdf)

For information on regulations that are specific to your academic program, read the section in the Academic Calendar and on the respective faculty/college/school web site <http://umanitoba.ca/faculties/>

Contact an **Academic Advisor** within our faculty/college or school for questions about your academic program and regulations <http://umanitoba.ca/academic-advisors/>

### **Student Advocacy**

Contact Student Advocacy if you want to know more about your rights and responsibilities as a student, have questions about policies and procedures, and/or want support in dealing with academic or discipline concerns.

<http://umanitoba.ca/student/advocacy/>

520 University Centre

204 474 7423

[student\\_advocacy@umanitoba.ca](mailto:student_advocacy@umanitoba.ca)

### **Copyright Yet Again**

Please respect copyright. We will use copyrighted content in this course. I have ensured that the content I use is appropriately acknowledged and is copied in accordance with copyright laws and university guidelines. Copyrighted works, including those created by me, are made available for private study and research and must not be distributed in any format without permission. Do not upload copyrighted works to a learning management system (such as UM Learn), or any website, unless an exception to the *Copyright Act* applies or written permission has been confirmed. For more information, see the University's Copyright Office website at <http://umanitoba.ca/copyright/> or contact [um\\_copyright@umanitoba.ca](mailto:um_copyright@umanitoba.ca).

### **COVID and Possible In-person Instruction**

The course is planned to be remotely taught but if in-person instruction is allowed by the University please read over the following very carefully.

The University of Manitoba (the "UM") is committed to maintaining a safe learning environment for all students, faculty, and staff. Should campus operations change because of health concerns related to the COVID-19 pandemic or other campus-wide emergency, it is possible that this course will move to a fully remote delivery format. Should the instructor be required to stay at home for an extended period and an alternate instructor not be available, the course may move temporarily to a remote delivery format. In that instance, you may be provided with an asynchronous option to minimize the impact the change may have on your schedule.

### **PPE and Mask Wearing**

In a face-to-face environment, our commitment to safety requires students to observe all physical distancing (2m) and personal protective equipment (PPE) guidelines set by the University (<https://umanitoba.ca/coronavirus> )

**While on campus and in class, you must wear PPE (Personal Protective Equipment)** as stipulated in current [University policies, procedures, and guidelines](#). Students who fail to comply are subject to disciplinary action in accordance with the [Student Discipline Bylaw](#) and the [Non-Academic Misconduct and Concerning Behaviour Procedure](#).

Medical-grade 3-ply masks are available at many locations on campus, including specific classroom locations, designated by your unit, the Elizabeth Dafoe Library (Fort Garry Campus) and the Brodie Centre main doors (Bannatyne Campus). Additional PPE, if necessary for a specific learning environment, will be provided to you by the teaching unit.

If you do not follow masking and other requirements you will be asked to leave the learning space and may only return to the class already in progress when you have complied with these requirements. Repeated issues will result in disciplinary action as previously noted.

## **Students should not eat or drink during class time.**

### **Illness**

Remember: **STAY HOME IF YOU HAVE SYMPTOMS OR ARE ILL**. If you become sick or are required to self-isolate you should notify your instructor by email so you can develop a plan to complete the course learning outcomes while you are absent.

If you have symptoms, do not come to campus or any UM facilities. Complete the [selfassessment](#) on the Manitoba Public Health site and follow the guidelines, which may include booking a COVID-19 test.

What to do if you become ill while at UM:

1. Leave the classroom, lab or workspace immediately. Continue to wear your mask while leaving the premises and/or while waiting for transportation.
2. Perform hand hygiene (soap and water or hand sanitizer) and avoid contact with others, and minimize contact with the physical environment.
3. Once at home, complete the [MB self-assessment](#) and follow the directions that are provided.
4. Inform your supervisor(s), instructor(s) or, if in residence, the appropriate individual.
5. You must remain off campus and all UM facilities until cleared to return in accordance with self-assessment, testing results, or MB Health requirements.

### **Recommended transportation options (in order):**

1. Drive yourself home.
2. Pick-up by family or friend – remember to keep your mask on and to distance as much as possible, and where possible, open a window to improve ventilation.
3. Pickup by taxi/Uber:
  - Remain masked and perform hand hygiene before entering the vehicle.
  - o Avoid touching the inside of the vehicle
  - o Keep your mask on for the duration of the ride
  - o Where possible, open a window to improve ventilation.
4. Winnipeg Transit buses - Winnipeg Transit has indicated that individuals that are ill **must not use Transit**.