

SOIL ECOLOGY

11:375:453 and 16:375:573

Fall, 3 credits

Instructor: Dr. Jeffra Schaefer

Office Location: Room 356, Environmental & Natural Resource Sciences Building (ENR)

Email: jschaefer@envsci.rutgers.edu (include “Soil Ecology” in subject line)

Office Hours: email for appointment

Class Meets: 80-min lectures, 2x per week

Location: Cook/Douglass Campus

Textbook: There is no textbook in this course.

Canvas: All course materials are on Canvas: canvas.rutgers.edu

Course Description:

This course will introduce the field of soil microbiology and provide an understanding of how microbial processes in soil impact ecosystem sustainability and resilience.

Our specific course objectives are for students to be able to:

1. describe the major types of soil microorganisms, their unique physiology, and how they interact with the soil environment and other soil organisms.
2. explain the role that soil microbes play in improving soil structure, decomposing organic matter, recycling nutrients, and increasing water infiltration.
3. critically analyze and evaluate the design and interpretation of scientific experiments in soil ecology and microbiology.
4. apply knowledge gained from soil ecology and microbiology to current global concerns, such as climate change, soil degradation, and food production
5. demonstrate an understanding of how soil biological processes can influence ecosystem stewardship and management of soil ecosystems.

Environmental Science Learning Goals:

This class will contribute toward students’ ability to:

1. apply knowledge from the sciences and mathematics to environmental problems and solutions
3. think critically about how to design and conduct experiments, and analyze and interpret data
7. understand contemporary environmental science issues and the impact of environmental science in a global and societal context

Assignments & Assessments:

	Points:
Quizzes (5 x 50 pts each)	250
Problem Sets (3 x 50 pts each)	150
Class Activities and Participation*	~200
Final Exam	200
TOTAL:	~800

**total points available in the semester may change depending upon the number of class activities*

Letter grades will be assigned based on the Rutgers grade scale.

Quizzes:

There will be 5 quizzes throughout the semester (in lieu of mid-term exams), averaging every two weeks. All Quizzes will take place on **Fridays** on Canvas. Each quiz will be cumulative and composed of multiple-choice and short answer/fill-in-the blank. Each student will have 20 minutes to complete the quiz (please email me if accommodations are needed). One make-up quiz will be allowed for 50% credit without a university approved excuse.

Problem Sets (11:375:453 only):

Problem Sets will focus primarily on topics covered recently (current and previous week's material), it may also include content from the beginning of the semester. Assigned Problem Sets should be submitted on Canvas on **Friday**. A rubric is provided for short-answer questions on Canvas. Late problem sets will be accepted through the next Sunday (2 days later) for 50% credit. Extended time (>2 days) will not be accommodated without a university-approved excuse.

Critical Reviews (16:375:573 only):

Graduate students are expected to attend one scientific seminar (virtual is fine) and read two primary research articles in fields related to topics covered in this course. Approved list of seminars and research articles will be provided on Canvas. Students will write a critical review article for each – details are provided on Canvas. Each Critical Review is worth 50 points and will be in lieu of Problem Sets. Due dates for each paper are posted on Canvas. Each critical review paper can be written in any order but students should plan ahead which seminars they wish to attend – these are planned in advance and posted online. If extra time is needed due to cancellation or rescheduling of seminars, contact the instructor.

Discussion and Activities:

A variety of in-class and online activities will be incorporated throughout the semester. These will include Polls/Quizzes, Jigsaw, discussion questions, and a variety of problem-solving and critical-thinking activities. Reading quizzes are assigned each week to test your understanding of the assigned material. You have two attempts at each Reading Quiz - only the highest score will count toward your Participation grade. Exit tickets are assigned after Thursday's lecture to assess student learning and allow students to ask questions about the material. Exit tickets will include: Muddiest Point, Summarizing the Big Ideas, and Writing Test Questions. Other assignments and discussion questions will be assigned occasionally to promote class engagement.

Final Exam:

The final exam will be cumulative and have a similar format as the quizzes. Students should prepare for the final exam by reviewing quizzes, problem sets, discussion questions, in addition to course material.

Late Assignments and Make-Ups:

Meeting deadlines and completing assignments on time are important parts of this class. Problem Sets can be turned in the immediate Sunday (2 days late) for 50% credit, if extra time is needed. Additional time will not be accommodated. Students can request one make-up quiz for 50% credit. Other assignments and in-class activities must be completed on-time and will not be accepted late. Exceptions to this policy will be made only for students with a University-approved excuse or prior approval by the instructor. Students must give instructor **one-month** advanced notice for any expected absences from exam/quiz days – contact professor immediately to schedule the quiz or exam. Contact Dean of Students if you have missed course assignments due to illness or other University approved reason.

Absence Policy:

Attendance will be collected at the beginning of each class. Students are expected to attend all classes on-time. Tardiness will be considered as absent, although students are welcome to attend class even if late.

Students may not “sign-in” other classmates on the attendance sheet.

If you miss a class, you are responsible for all materials, including announcements. I recommend exchanging email addresses with at least 2-3 other students to ensure that you can acquire any missed information.

If you expect to miss one or two classes, please use the University absence reporting website <https://sims.rutgers.edu/ssra/> to indicate the date and reason for your absence. An email is automatically sent to me.

Course Schedule:

Tentative course schedule is included in this syllabus. Check Canvas course website regularly for any changes.

Accommodations for Students with Disabilities:

Students with a disability: please see me immediately so that we may make any necessary arrangements to support a successful learning experience. For more information, please follow the procedures outlined at <https://ods.rutgers.edu/>. Full policies and procedures are at <https://ods.rutgers.edu/>

Academic Integrity:

Cheating will be taken very seriously in this class. Homework are all individual assignments and must be written in your own words. All suspected cases of cheating will be automatically referred to the Office of Judicial Affairs, and we will recommend penalties appropriate to the gravity of the infraction.

The university's policy on Academic Integrity is available at <http://academicintegrity.rutgers.edu/academic-integrity-policy>. The principles of academic integrity require that a student:

- properly acknowledge and cite all use of the ideas, results, or words of others.
- properly acknowledge all contributors to a given piece of work.
- make sure that all work submitted as his or her own in a course or other academic activity is produced without the aid of impermissible materials or impermissible collaboration.
- obtain all data or results by ethical means and report them accurately without suppressing any results inconsistent with his or her interpretation or conclusions.
- treat all other students in an ethical manner, respecting their integrity and right to pursue their educational goals without interference. This requires that a student neither facilitate academic dishonesty by others nor obstruct their academic progress.
- uphold the canons of the ethical or professional code of the profession for which he or she is preparing.

Adherence to these principles is necessary in order to ensure that

- everyone is given proper credit for his or her ideas, words, results, and other scholarly accomplishments.
- all student work is fairly evaluated and no student has an inappropriate advantage over others.
- the academic and ethical development of all students is fostered.
- the reputation of the University for integrity in its teaching, research, and scholarship is maintained and enhanced.

Failure to uphold these principles of academic integrity threatens both the reputation of the University and the value of the degrees awarded to its students. Every member of the University community therefore bears a responsibility for ensuring that the highest standards of academic integrity are upheld.

Student Wellness Services:

Just In Case Web App <http://codu.co/cee05e>

Access helpful mental health information and resources for yourself or a friend in a mental health crisis on your smartphone or tablet and easily contact CAPS or RUPD.

Counseling, ADAP & Psychiatric Services (CAPS)

(848) 932-7884 / 17 Senior Street, New Brunswick, NJ 08901 / www.rhscaps.rutgers.edu/

CAPS is a University mental health support service that includes counseling, alcohol and other drug assistance, and psychiatric services staffed by a team of professional within Rutgers Health services to support students' efforts to succeed at Rutgers University. CAPS offers a variety of services that include: individual therapy, group therapy and workshops, crisis intervention, referral to specialists in the community and consultation and collaboration with campus partners.

Violence Prevention & Victim Assistance (VPVA)

(848) 932-1181 / 3 Bartlett Street, New Brunswick, NJ 08901 / www.vpva.rutgers.edu/

The Office for Violence Prevention and Victim Assistance provides confidential crisis intervention, counseling and advocacy for victims of sexual and relationship violence and stalking to students, staff and faculty. To reach staff during office hours when the university is open or to reach an advocate after hours, call 848-932-1181.

Disability Services

(848) 445-6800 / Lucy Stone Hall, Suite A145, Livingston Campus, 54 Joyce Kilmer Avenue, Piscataway, NJ 08854 / <https://ods.rutgers.edu/>

Rutgers University welcomes students with disabilities into all of the University's educational programs. In order to receive consideration for reasonable accommodations, a student with a disability must contact the appropriate disability services office at the campus where you are officially enrolled, participate in an intake interview, and provide documentation: <https://ods.rutgers.edu/students/documentation-guidelines>. If the documentation supports your request for reasonable accommodations, your campus's disability services office will provide you with a Letter of Accommodations. Please share this letter with your instructors and discuss the accommodations with them as early in your courses as possible. To begin this process, please complete the Registration form on the ODS web site at: <https://ods.rutgers.edu/students/registration-form>.

Scarlet Listeners

(732) 247-5555 / <http://www.scarletlisteners.com/>

Free and confidential peer counseling and referral hotline, providing a comforting and supportive safe space.

Tentative Class Schedule, subject to change

Week	Topic	Problem Set (PS) or Quiz
1	Introduction to Soils and Soil Properties	
2	Soil Properties and Water/Air Movement	
3	Field Trip: Soil Pits (meet behind ENR) The Soil Habitat	PS1
4	Soil Life – overview of soil organisms Jigsaw Activity	
5	Microbial Metabolism and Enzymes	Quiz 1 (week 1 – 4)
6	Microbial Growth Methods in Soil Microbiology	PS2
7	General Microbial Interactions	Quiz 2 (week 1 – 5)
8	Rhizosphere and Mycorrhizae	
9	Soil Fauna and Trophic Interactions	Quiz 3 (week 1 - 7)
10	Carbon Cycle	
11	Nitrogen Mineralization and Immobilization	Quiz 4 (week 1 - 9)
12	Nitrogen Inputs Soil Crusts and Soil Formation	PS3
13	Nitrification and Denitrification	
14	Soil Degradation	Quiz 5 (week 1 – 12)
15	Soil Restoration and Sustainable Management Practices Jigsaw Activity	

*Final Exam – see Rutgers Final Exam Schedule