

SOIL ECOLOGY

11:375:453 and 16:375:573

Fall 2023, 3 credits

Class Meets: Mondays & Thursdays 12:10 – 1:30 pm

Location: 101 IFNH Building, Cook Campus

Instructor: Dr. Jeffra Schaefer

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

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

Office Hours: email for appointment.

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 Sciences Learning Goals:

This class will contribute toward students’ ability to:

1. apply knowledge, skills, and techniques from the sciences and mathematics to identify, characterize, and provide solutions to environmental problems
2. design and conduct experiments, and analyze and interpret data to draw informed conclusions
3. communicate technical information effectively (orally, in writing, and through electronic media)
4. function effectively on teams to accomplish collaborative tasks

Assignments & Assessments:

Quizzes (in class)	20%
Midterm Exam (online - Canvas)	20%
Jigsaw Group Projects (2 total)	25%
Participation (453 students) or Term Paper (573 students)	15%
Cumulative Final Exam (in class)	20%

Letter grades will be assigned based on the Rutgers grade scale: A $\geq 90\%$; B+ = 85.0 – 89.9%; B = 80.0 – 84.9%; C+ = 75.0 – 79.9%; C = 70.0 – 74.9%; D = 60.0 – 69.9%; F < 60%

Quizzes:

There will be a series of short quizzes throughout the semester. The majority of these quizzes will take place in the first 10 min of class. **Latecomers will not be accommodated.** There are no make-up quizzes without a university-approved excuse. The last quiz, Quiz 8, will be online through Canvas. This last quiz is designed as practice and review for the cumulative Final Exam.

Jigsaw Projects:

There will be 2 mandatory in-class group assignments (a.k.a. Jigsaw Projects) during the semester. They are clearly indicated on the class schedule and on Canvas. Attendance and in-class participation are mandatory. Please arrive on time as students will be marked absent 10 min after class starts and you will lose credit for the assignment that day. Instructions for these group in-class assignments are provided on Canvas. Please plan accordingly so you do not lose points unnecessarily.

Term Paper (16:375:573 only):

Graduate students have one additional assignment in lieu of the Participation points assigned for 453 students. The term paper should focus on a specific soil ecology topic highlighting the interaction between two or more organisms, citing primary research articles as much as possible. Instructions, due dates, and a list of suggested topics are all available on Canvas.

Participation Activities (11:375:453 only):

A variety of in-class and online activities will be incorporated throughout the semester. These will include reading assessments and discussion questions. Reading assessments: “Test Your Knowledge” on Canvas are assigned each week to test your understanding of the assigned material. These assessments are typically due on Friday, but they will remain available on Canvas through the weekend. You have two attempts at each Test Your Knowledge Assessment: only the highest score will count toward your Participation grade. Additional assignments and discussion questions will be assigned occasionally to promote class engagement and promote learning (see Schedule and Canvas for due dates and instructions). I encourage graduate students to participate in these activities, but they will not factor into the grade for 573 students at the end of the semester.

Midterm Exam:

The midterm exam is scheduled for **Friday Oct. 13 – Sunday Oct 15 on Canvas**. The mid-term exam will be available for 72 hours from 12:00 am Friday through 11:59 pm on Sunday. The midterm is open book and open note; however, you must complete the exam on your own without the help from anyone else. The exam will cover material from Week 1 through Week 6.

Final Exam:

The final exam is scheduled for **Thursday Dec. 21 at 12:00 – 3:00 pm**. The exam will be on paper in our normal classroom. The final exam will be cumulative and have a similar format as the Quizzes and Problem Sets. Students should prepare for the final exam by reviewing quizzes, problem sets, discussion questions, and course material. Email the instructor immediately if you have a time conflict and want to reschedule it for an earlier time.

Late Assignments and Make-Ups:

Meeting deadlines and completing assignments on time are important parts of this class. The Due Dates for all assignments are posted on Canvas. Make-up assignments, quizzes, and exams will not be allowed without a university-approved excuse or by approval by the instructor. If you have a time conflict with one of the activities, quizzes or exams, email the instructor immediately to see if any accommodation can be made. Note that accommodations for non-university-approved excuses are not guaranteed.

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 absent, although students are encouraged to attend class even if late.

Course Schedule:

Tentative course schedule, dates of all assignments and assessments are provided on Canvas.

Discussion and Communication Guidelines:

The following are my expectations for how we should communicate as a class. Above all, please remember to be respectful and thoughtful.

- **Writing style:** While there is no need to participate in class discussions as if you were writing a research paper, you should remember to write using standard grammar, spelling, and punctuation. Informality (including an occasional emoticon) is fine for non-academic topics. Please also refrain from using all CAPITAL LETTERS, as this is often interpreted as shouting.
- **Tone and civility:** Let's maintain a supportive learning community where everyone feels safe and where people can disagree amicably. Remember that sarcasm can easily be misinterpreted. Always treat your instructor and fellow students with respect whether in-class, online, or through email.
- **Citing your sources:** When having academic discussions, please cite your sources to back up what you say.
- **Backing up your work:** Consider composing any long-form discussion or homework posts in a word processing program (e.g. Word, Pages, Open Office), where you can save your work, and then copying and pasting into the online discussion or just upload your Word document in the Assignment on Canvas.

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:

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, please complete the Registration form on the ODS web site at: <https://ods.rutgers.edu/students/registration-form>.

Tentative Class Schedule 2023

Mon & Thurs

Week	Lecture	Topic
1	9/7	Introduction
2	9/11	Soil Properties
	9/14	Soil Structure Soil Textures activity
3	9/18	Water/Air Movement
	9/21	Soil Habitat & Soil Life Quiz 1 – Soil Properties Introduce Jigsaw Project 1
4	9/25	Soil Life – Jigsaw Project Jigsaw Project 1 group work
	9/28	Soil Life – Presentations Jigsaw Project 1 presentations
5	10/2	Microbial Metabolism Quiz 2 on Soil Life
	10/5	Soil Enzymes In-class Activity: ChatGPT
6	10/9	Microbial Growth – part 1 Quiz 3 on Microbial Metabolism
	10/12	Microbial Growth – part 2
Friday-Sunday Oct 13-15: MIDTERM EXAM on Canvas		
7	10/16	General Microbial Interactions
	10/19	Microbial Competition
8	10/23	Rhizosphere
	10/26	Fungi and Mycorrhizae
9	10/30	Carbon Transformations Quiz 4 on Rhizosphere/Fungi
	11/2	Soil Carbon Cycle Discussion: Write an Exam Question 1
10	11/6	Nitrogen Mineralization and Immobilization Nitrogen Inputs
	11/9	Exit Ticket: Summarize Big Ideas
11	11/13	Nitrification

	11/16	Quiz 5 on N mineralization/immobilization Denitrification Discussion: Write an Exam Question 2
12	11/20	Soil Formation and Ecological Succession Quiz 6 on Nitrification/Denitrification
	11/21	Soil Greenhouse Gas Emissions & Climate Change
13	11/27	Science Research Article Quiz 7 on research article
	11/30	No Class -- Happy Thanksgiving!
14	12/4	Jigsaw Project 2: Soil Degradation and Sustainable Management
	12/7	Jigsaw Project 2: Presentations
15	12/11	Review Quiz 8 online – preparation for Final Exam

*Cumulative Final Exam – Thursday Dec. 22, open 24 hours