

**SOIL MICROBIOLOGY – SOIL 476**  
**COURSE SYLLABUS**  
**SPRING SEMESTER 2021**

Instructor: Dr. Nicole Pietrasiak  
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Office-hours: Virtually using the ZOOM link posted at our CANVAS Homepage  
**Mo 4.30 – 5.30 pm** or by appointment

**CLASS SCHEDULE:**

**When:** M, W, F, Jan 25 - May 3 at 11:30 - 12:20 am – with both asynchronous and synchronous content.

**Delivery method:** Hybrid (more than 80% of face-to-face instruction is replaced with virtual content)

**Where:** Class meets during assigned class time virtually at least once a week on ZOOM (synchronously). Very occasionally we will meet in person in outdoor classrooms in small groups (not more than 6 people at a time). There always will be alternative options for these selected few “in person” meetings to accommodate everybody taking this class. Please check the CANVAS calendar and CANVAS announcements for specifics.

**PREREQUISITE:**

There are no prerequisites for this class. A basic understanding of soils is recommended (e.g., from taking ES 110 or at best SOIL 252). To be completely prepared for this class a course taken in Microbiology (BIOL 311) is also useful but not required. Because this is a senior/graduate level course, I will expect students to study, on their own, those concepts that are new to them. However, I will explain and review particular concepts in class if asked to do so. Also, I can refer students to various texts for clarification.

**COURSE OVERVIEW AND OBJECTIVES:**

Microbes are the hidden players in the environment. They are numerous and encompass highly diverse lineages. Microbes play crucial roles in biogeochemical cycling, nutrient status, food web interactions, soil aggregation, soil and plant health, and many more important functions. The goal of SOIL 476 is to present a broad overview of the microbial diversity, physiology, ecology, and ecosystem functions in soils. The course content will mainly be geared towards general ecological phenomena of soil microbes and associated processes rather than targeting specific aspects of microbiology in agronomy or plant pathology (if you are interested in those topics then see classes in the EPPWS Department such as Fungal Biology, Diagnosing Plant Disorders, Plant Pathology).

*Specific learning goals:*

- 1) Distinguish major groups of microbial organisms.
- 2) Gain a basic understanding of the current methodologies used for surveying soil microbial diversity.
- 3) Understand the environmental factors influencing microbial distribution and abundance.
- 4) Describe intra-specific interactions of microbes as well as inter-specific relationships with other organismal groups.
- 5) Gain knowledge of the most important microbial roles in elemental cycling and transformation, with a particular focus on carbon, nitrogen, and phosphorus cycling.
- 6) Obtain, read, understand, and critically evaluate primary literature on diverse topics related to Soil Microbiology.

7) Develop and practice advanced skills in oral and written communication.

**REQUIRED TEXTBOOK, READING MATERIAL AND SUPPLEMENTAL MATERIAL:**

Unfortunately, because soil microbiology advances increasingly fast, there still is no perfect textbook to rule them all. Thus, we have no required textbook. All the reading material will be posted on CANVAS. If you are interested in a good reference book I recommend:

- *Soil Microbiology, Ecology, and Biochemistry*, Paul, E.A., 4<sup>th</sup> ed.

The following textbooks are useful to understand basic concepts of soil science or microbiology:

- *Introduction to Soil Science: Elements of the Nature and Properties of Soils*. Brady, N.C. and R.R. Weil (3<sup>rd</sup> edition preferred but accept any edition) Prentice Hall.
- Any general and current microbiology book, for example: *Introduction to Microbiology: Brock Biology of Microorganisms*. Madigan, M.T. et al. (14<sup>th</sup> edition preferred) Prentice Hall.

You are responsible for regularly checking CANVAS for course material. I will post lectures, reading assignments, assignment guidelines, links to useful sites and tutorials, as well as other material.

**ATTENDANCE AND PARTICIPATION:**

This class will be offered as a hybrid course (HY) with lecture content being posted as online learning modules in CANVAS. Additionally, we will meet once a week synchronously. During these weekly class meetings, I will apply active learning activities and a flipped classroom approach. Thus, working through the lecture modules and subsequently attending and participating in our weekly class meeting are vital if you want a good grade. My goal is to keep you engaged and learning. In order to accomplish this, everyone has to come to each class meeting prepared having reviewed the assigned material in advance. The benefits of active learning exercises depend on your showing up, participating and being prepared. I also encourage you to ask questions pertaining to the content especially when something is unclear. I may not always have an answer, but will try my best to point you in the right direction or refer you to pertinent resources.

**QUIZZES AND EXAMINATIONS:**

THERE WILL BE NO TRADITIONAL EXAMS AND QUIZZES IN THIS CLASS!!! YAY! Your final exam is your **final class project**: A professional poster presentation on a chosen subject in Soil Microbiology. This presentation will be evaluated by official PES poster judges. There will be several short take-home exercises, which will have an assortment of questions including compare/contrast, interpreting graphs, and/or short answer essays. Since I will administer **take-home exercises**, no make-up assignments will be given. I must be able to read your writing, so please **write neat and legibly**. If I am unable to read your writing you may not obtain all points. You will also obtain points towards your grade from your involvement in various discussion topics in CANVAS. Because we are still amidst a pandemic all work in this course will need to be submitted electronically through CANVAS.

**READING ASSIGNMENTS:**

A flipped class approach requires you to study the reading material and complete the recorded lecture content, so that you have the necessary background information to build on during the synchronous in-class activities. The reading assignments are designed to guide your reading and focus you on the essential content. Reading assignments are due before the next module and before our weekly synchronous class meeting. They are to be submitted via CANVAS. Reading assignments will be announced in CANVAS.

### CLASS PROJECT ASSIGNMENTS:

Class project assignments will focus on strengthening your oral and written communication skills. Specifically, assignments will involve: 1) Reading and assessing primary literature of current topics in Soil Microbiology and discussing the content during our biweekly “Zoom a Soil Microbiologist” session.

2) A **final class project** that concludes in presenting a poster on a chosen subject in Soil Microbiology.

### LATE ASSIGNMENT POLICY:

My goal is to give you adequate time and instructions to complete your assignments and take-home exercises. Take note however: Before-class reading are critical for our classroom activities and discussions. You will receive **zero points if you fail to submit** the material on time. I may accept a late submission of components of assignment 2 **up to 4 days after the due date** unless other arrangements are made. However, **20% will be deducted for each day any assignment is handed in late.**

### EXTRA CREDIT:

Occasionally there will be additional opportunities to present fun facts on a topic in class, attend seminars, help with outreach activities, etc., that may provide some learning opportunities and “extra credit”. These will be announced in class and if necessary, posted on CANVAS along with the requirements needed to receive credit. If you have ideas for suggesting such activities, please let me know via email and include any details. Cumulative extra credit can comprise up to 5% of your total points.

### GRADING & POINT BREAKDOWN:

Reading Assignments & Take Home Exercises	20%
Zoom a Soil Microbiologist Paper Discussions	25%
Final Class Project - Poster Presentation	30%
In-Class Activities and Participation	15%
Discussion Forum Postings	10%
<b>Total</b>	<b>100%</b>
Extra credit	5%

A+	>99%	B+	87-89.95%	C+	77-79.95%	D+	67-69.95%
A	93-98.95%	B	83-86.95%	C	73-76.95%	D	63-66.95%
A-	90-92.95%	B-	80-82.95%	C-	70-72.95%	D-	60-62.95%
						F	<60%

If you feel that graded material (assignment, quiz, in-class activity) has been incorrectly *tallied*, please bring it to my attention immediately. If you have a disagreement with the amount of credit you receive on an assignment, quiz, or during an activity **explain your case in writing** and submit it to me by email **within one week** of the return of your assignment. Include your original assignment work.

### CLASSROOM COVID-19 SAFE PRACTICES

COVID-19 is a disease that spreads primarily from person to person. Therefore, all employees, students and visitors are expected to take personal responsibility for their own health, help protect the health of others, and keep the Aggie community safe from the spread of COVID-19 and other infections. To minimize the risk to public health presented by the spread of COVID-19 while working

and learning at NMSU, students are expected to adhere to the expectations outlined in the Crimson Commitment Classroom COVID-19 Safe Practices Acknowledgement form signed in [My.NMSU.edu](https://my.nmsu.edu).

### **SYLLABUS STUDENT RESOURCES & POLICIES**

Please visit <https://provost.nmsu.edu/faculty-and-staff-resources/syllabus/policies> for university policies and student services, including Discrimination and Disability Accommodation, academic misconduct, student services, final exam schedule, grading policies and more.

### **ANTICIPATED LECTURE TOPICS**

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#### **Topics**

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*Introduction to the course*  
*Introduction to Soil Microbiology and History*  
*Soil as Habitat*  
*Microbial Metabolism & Physiology*  
*Microbial Genetics*  
*Microbial Diversity: Bacteria*  
*Microbial Diversity: Cyanobacteria*  
*Microbial Diversity: Archaea*  
*Microbial Diversity: Eukaryotic Algae*  
*Microbial Diversity: Fungi*  
*Microbial Diversity: Fauna*  
*Microbial Ecology – Basics, Communities*  
*Microbial Ecology – Intraspecific Interactions*  
*Microbial Ecology – Interspecific Interactions*  
*Elemental transformation and cycling: Carbon*  
*Elemental transformation and cycling: Nitrogen*  
*Elemental transformation and cycling: other elements*  
*Management of Soil Microbes*  
*Class synthesis and review*

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Disclaimer: I may modify this syllabus and lecture topics during the semester as necessary to maintain the course objectives.

#### **SOIL 476L:**

The lab is a separate 1 credit course. It's a fun hands-on experience that helps explain many of the lecture concepts and provides you with an opportunity to examine actual examples of key specimens, methods and processes. The lab class complements and solidifies topics covered in the lecture class and can be taken in parallel.