

# SOIL MICROBIOLOGY LAB – SOIL 476L

## 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

TA: Jessica Mikenas  
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Office-hours: Virtually using the ZOOM link posted in CANVAS **Th 2-3pm** or by appointment

### CLASS SCHEDULE:

**When:** Tuesdays at 1:30 - 4:00 pm as well as during individual set times

**Delivery method:** Hybrid

**Where:** Class research activities will occur in small teams of two students outdoors as well as in Skeen Hall W129, W229, and/or W329.

### PREREQUISITE:

Prerequisite of this course is a concurrent enrollment in SOIL/BIOLOG 476. 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 read, 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 evolutionary lineages. Microbes play crucial roles in biogeochemical cycling, soil gas exchange, nutrient status, food web interactions, and ecosystem health. The objectives of SOIL 476L is to train you how to 1) observe, isolate, grow, describe, and quantify soil microorganisms, 2) study their diversity and importance, and 3) investigate environmental factors that may affect their abundance and distribution. The course will teach you a selection of traditional and basic modern methods in soil microbiology.

If you are interested in advanced techniques such as next gen sequencing, genetics, genomics, or bioinformatics, then see classes in the BIOL Department or course work offered in the GENE program. Courses of interest may be: BIOL 302 Techniques in Molecular Biology, BIOL451 Physiology of Microorganisms, BIOL 446 Bioinformatics, BIOL 477 Applied Microbiology, GENE 305L Genetic techniques, GENE 315 Molecular Genetics, GENE 486 Gene and Genomes. Additional classes of interest in soil microbiology are: SOIL450 Special Topics: Biocrust; and SOIL 650: Advanced Soil Microbiology.

#### *Specific learning goals:*

- 1) Collect, store, and characterize soil samples using appropriate and sterile techniques of soil microbiology.
- 2) Observe, describe, and recognize major groups of microbial organisms.
- 3) Develop skills in basic microscopy, isolation, and culturing of soil microbes.

- 4) Acquire basic DNA-based molecular skills in soil microbiology.
- 5) Compare and evaluate soil samples from different microhabitats regarding their soil microbiota.
- 6) Apply the scientific method including the following steps: developing a research question, constructing a testable hypothesis, design a research study to test the hypothesis, perform the experiment and collect data, analyze the results, evaluate the results and support/reject the hypothesis, and report the results.
- 7) Develop critical thinking and advanced written communication skills.

**REQUIRED TEXTBOOK:**

There is no textbook for this lab course. All material will be posted to CANVAS. You are responsible for regularly checking CANVAS for course material. For technical help see <https://learn.nmsu.edu>.

**ATTENDANCE, QUIZZES, LAB REPORTS, AND EXAMINATION:**

Attendance is vital to obtain a good grade. There will not be any formal quizzes or exams. However, your understanding of the material relevant to the lab will be evaluated in the content of your lab report. The lab report assignments will have questions pertaining to the lab material for a specific day, but can also include a few questions about previous lab periods. Lab reports are due at the beginning of the following week’s lab unless specified otherwise. Missed labs cannot be made up, unless you prove that your absence had a valid reason. Also, lab reports need to be provided as an electronic lab report submitted via CANVAS. No handwritten reports will be accepted. A manuscript style report on the results gathered throughout the semester will function as the basis for your final exam grade. This manuscript will be peer reviewed by two of your classmates. I and one additional soil ecology professor will function as editors also reviewing the content. There are strict deadlines associated with the manuscript development and submission. Failure to submit on time will result in a major point drop (20% deduction each day submission is late).

Occasionally, you will be required to put in some additional hours to complete an experiment for some weeks. However, towards the end of the semester you will need less time for any hands-on parts of the official lab period as you will be writing and peer-reviewing lab manuscripts on your own time.

**EXTRA CREDIT:**

Occasionally there will be additional opportunities to earn “extra credit”. These will be announced in class and if necessary, posted on Canvas along with the requirements needed to receive credit. Cumulative extra credit can comprise up to 5% of your total points.

**POINT BREAKDOWN:**

|  |             |
|--|-------------|
| Lab Reports  | 25%         |
| Peer review  | 10%         |
| Manuscript draft submission                            | 15%         |
| Final Manuscript submission                            | 25%         |
| <u>In-lab, out-of-lab activities and participation</u> | <u>25%</u>  |
| <b>Total</b>   | <b>100%</b> |
| Extra credit   | 5%          |

**GRADING:**

|    |           |    |           |    |           |    |           |
|----|-----------|----|-----------|----|-----------|----|-----------|
| 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 has been incorrectly tallied, please bring it to our attention immediately. If you have a disagreement with the amount of partial credit you receive on an assignment, **explain your case in writing** and submit it to me by email **within one week** of the return of your work. Include your original assignment work. You only get full credit if you answer the entire question.

**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 video 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 LAB SCHEDULE\***

| <b>Week</b> | <b>Topic</b>   |
|-------------|--|
| 26 January  | Introduction to the course; safety guidelines                                      |
| 2 February  | Soil collection and field notes; prepare and determine soil moisture determination |
| 9 February  | Dilution series and plating – soil algae, fungi, bacteria                          |
| 16 February | Observations and counting of soil fungi and bacteria, set-up moistened soil method |
| 23 February | Soil pH and E.C., [Extra Credit: soil texture], score moistened soil method        |
| 2 March     | DNA extraction from soil algae cultures  |
| 9 March     | 16s rRNA PCR, PFLA data  |
| 16 March    | Gel electrophoresis, PCR cleanup, PFLA data cont'd                                 |
| 23 March    | <b>SPRING BREAK DAY</b>  |

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|                 |   |
|-----------------|---|
| <i>30 March</i> | <i>Observation of soil algae, algae isolation and description</i>                               |
| <i>6 April</i>  | <i>Ask a statistician – analyze your data in teams</i>  |
| <i>13 April</i> | <i>Present first data results, Q&amp;A, continued analysis of your data, manuscript writing</i> |
| <i>20 April</i> | <i>Microbial ecosystem function, draft manuscript due, assign peer review</i>                   |
| <i>27 April</i> | <i>Peer review due, address comments and edits</i>  |
| <i>4 May</i>    | <i>Write</i>  |
| <i>11 May</i>   | <i>Final manuscript submitted</i>   |

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*\* Lab schedule is subject to change.*