

**Florida International University**  
**Department of Earth and Environment**

**SWS 4303L – SOIL MICROBIOLOGY LAB**  
**Syllabus - Fall 2017 (1 credit)**

---

**Class Time:** Tuesday 5:00 PM to 7:00 PM  
**Class Room:** Owa Ehan OE-161

Instructors:

**Mr. Ganesh Khadka MS**

(305)898-0708

E-mail: Contact through course Blackboard message system.

Course Objectives

1. To provide students with a basic appreciation for the little that is known about soil microorganisms in their natural environment.
2. Develop a working knowledge of Laboratory methods required by professionals to (1) request soil microbial characterization, (2) supervise or perform laboratory operations, and (3) interpret the results and be familiar with the limitations of testing methods.
3. Understand procedures and principles involved in soil microbial characterization from hands-on laboratory experience.
4. Report laboratory procedures and results in concise written reports.

Student Learning Outcomes

Students successfully completing this course will be able to:

- 1) Characterize soil microbial processes.
- 2) Recognize the importance of soil microorganisms in soils.
- 3) Good Laboratory Practices.
- 4) Utilize critical thinking principles for soil microbial characterization.
- 5) Develop writing skills by producing written laboratory reports.

Course Description

This course will examine biology of soil microorganisms and biologically mediated chemical transformations occurring in soil ecosystems. Standard soil biology technique will be conducted. With a laboratory segment, the exercise provides a diverse yet balanced mixture of scientific rigor and hands-on laboratory work. Understanding soil microbial role as a natural resource with investigative experience can complement the lectures in soil microbiology.

### **Prerequisites/Corequisites**

SWS 4303 (Soil Microbiology) or permission of the instructor.

### **Departments consulted**

Biology, Chemistry and Biochemistry

### **Justification**

A working knowledge of laboratory methods is essential for professionals whether they are 1) requesting soil microbial characterization to be conducted, 2) supervising or conducting laboratory operations, or 3) interpreting and evaluating soil processes. This laboratory course serves as a valuable reference for agricultural, horticultural, environmental and forestry applications where an understanding of soil microbial process is important. And also this laboratory course serves as a bridge among several departments such as earth and environment, biology and chemistry and biochemistry. Understanding soil organisms and their activities will benefit students from several disciplines.

### **Course Syllabus**

Lab Exercise 1: Introduction, Best Laboratory Practices, Planning day for Labs, Autoclave and Media preparation for students who need it. (August 22<sup>nd</sup>)

Lab Exercise 2: Gram's staining procedure for bacteria. Alternative KOH-string test. (August 29<sup>th</sup>)

Lab Exercise 3: Enumeration of heterotrophic soil microbial population using serial dilution and spread plate method. Start recording observations. (September 5<sup>th</sup>)

Lab Exercise 4: Complete all observations, tabulate and analyze serial dilution experiment results. (September 12<sup>th</sup>)

**Lab Exam-1** (September 19<sup>th</sup>)

Lab Exercise 5: Microbial Cellulose biodegradation. (September 26<sup>th</sup>)

Lab Exercise 6: Isolation of *Rhizobium spp.* from leguminous root nodules. (October 3<sup>rd</sup>)

Lab Exercise 7: Isolation of antibiotic producing microorganisms from the soil samples. Nitrification process in soils. (October 10<sup>th</sup>)

Lab Exercise 8: Nitrification, ammonification and denitrification process in soils. (October 17<sup>th</sup>)

**Lab Exam-2** (October 24<sup>th</sup>)

Lab Exercise 9: Mycorrhizal symbiosis - wet sieving technique, and Tryphan Blue root staining. (October 31<sup>st</sup>)

Lab Exercise 10: Xenobiotics and bioremediation – Enrichment techniques. (November 7<sup>th</sup>)

Lab Exercise 10: Isolation of *Azotobactor sp.* *Azospirillum sp.* from soil and plant root samples. (November 14<sup>th</sup>)

Lab Exercise 11: Isolation of phosphate solubilizing bacteria from the soil samples. (November 21<sup>st</sup>)

Lab Exercise 12: Soil Enzymes: Dehydrogenase, Urease, phosphatases. (November 28<sup>th</sup>)

**Final Lab Exam:** (December 5<sup>th</sup>)

**Examinations, Assignments and Grading Procedure:**

Exam 1	20 points
Exam 2	20 points
Final Exam	30 points
Laboratory	30 points (Lab reports)
Total	100 points

Grading:	A	95% to 100%
	A-	90 % to 94 %
	B+	85% to 89%
	B	82% to 84%
	B-	80% to 81%
	C+	77% to 79%
	C	70 % to 76%
D	60% to 69%	
F	0% to 59%	

**Textbook**

Soil Microbiology – Laboratory Manual: Protocols and Techniques. Subhashini Vallabhaneni, Lambert Academic Publishing. ISBN 3659195782, 2012.

***Note: This syllabus and lab exercise schedule may be updated, if needed. An announcement of changes will be made in class and in Blackboard Learning class webpage.***