

**Soil Biology (Biol 596)
Spring 2013**

Lecture: T Th 12:30-1:45pm, Laboratory: Th 2:00-4:40pm

Prerequisites: Upper division standing in a biological science, completion of BIOL 201A, 201B, 354

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Office: PS241C, Phone: (619) 594-4460

Office hours: Tuesday after class, or by appointment

This class covers biological, chemical and physical properties of soils, with special emphasis on soils as a medium for plant growth and as a habitat for diverse biological communities. Other key topics include plant-microbe interactions, soil conservation and the role of soils in global change.

Required textbook: Elements of The Nature and Properties of Soils, 3rd Ed., Brady and Weil, Prentice Hall. (Supplemental articles will be made available through the class' blackboard site.)

Point breakdown:

Lecture

Examinations (3 X 100pts) 300

Laboratory

Attendance 30

Notebook 20

Soil report 50

Lab assignments 20

Group oral presentation 30

TOTAL 450

Examinations

The three midterm and final examinations will each be worth 100 points, and will include short answer, multiple choice, and essay questions (Scantrons are not required). Students will be allowed to drop one exam grade. The final exam will be cumulative. No make-up exams will be given, but you may miss any one exam, including the final. Any disputes regarding grading must be made within one week of receiving your graded exam.

Attendance

Laboratory attendance is obviously required, as this class is based on active participation. Attendance will also be necessary to complete the lab assignments.

Lab notebooks

Each student will keep a lab notebook, in which all methods and results are recorded during each lab session. (The composition notebooks available at the Campus bookstore are recommended.) The goal is to produce a complete and accurate record of your activities and results, as you work. You will use your notebook for preparing your soil report.

Soil report and other lab assignments

Early in the semester you will be assigned a soil sample that you will thoroughly analyze throughout the rest of the semester. You will prepare a brief but detailed report presenting your findings, along with background information about the soil in question. There will also be small number of minor assignments related to the laboratory exercises.

Group presentation

Groups consisting of 3-4 students each will form to combine the results from the individual students' soil reports into an analysis that compares the soils to answer an interesting scientific question. For example, what is the effect of vegetation, parent material, relief or disturbance on soil development? This analysis will be presented to the class in a brief oral presentation (each student will speak for approximately 5 minutes).

Student Learning Outcomes

After taking this class, students should be able to:

Describe how soil properties affect the growth of plants and microorganisms, and the biogeochemical cycling of C, N and other elements.

Describe what forces contribute to the degradations of soils, and what actions can be taken to protect soil quality

Be proficient in measuring soil chemical, physical and biological properties of soils in the field and laboratory.

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Date	Lecture topic	assigned reading	Lab activity
1/17	Course introduction	Ch 1	
1/22	Factors of soil development	Ch 1, 2	Limiting nutrients: set up greenhouse expt.
1/24	Soil taxonomy	Ch 3	
1/29	Soil texture and structure	Ch 4	Field trip: collect soils at MTRP
1/31	Soil water	Ch 5, 6	
2/5	Soil atmosphere	Ch 7	Soil water & atmosphere
2/7	Soil colloids (minerals, OM)	Ch 8, 11	
2/12	Soil fertility	Ch 8, 9	Organic matter, texture, structure, color
2/14	Plant macronutrients	Ch 12	
2/19	Plant micronutrients	Ch 12	Cation exchange capacity, base saturation, pH
2/21	Midterm Exam #1		
2/26	Soils and plant species distributions: serpentine soils, etc.	*supplemental online articles	Nitrogen and Phosphorus cycles
2/28	How deep is the soil? Deep roots	Ch 5.9, 6.3, 10, *	
3/5	Rhizosphere	Ch 10, *	
3/7	Mycorrhizae	Ch 10	Plant-microbe interactions
3/12	N fixation	Ch 10	N cycle continued, Soil microbial communities
3/14	Plant diseases	Ch 10	
3/19	Bacterial and fungal communities	Ch 10	Microbial communities continued; soil animals
3/21	Trophic interactions in soils: protozoa, nematodes, viruses, etc.	Ch 10	
3/26	Soil animals (earthworms, microarthropods, etc.)	Ch 10	Harvest greenhouse experiment
3/28	Midterm Exam #2		
4/1-4/5	Spring Break		
4/9	Soil carbon and climate change	Ch 11, *	Soil organic matter, revisited: fractionation and analysis
4/11	Stable isotopes and soil C	Ch 11	
4/16	Soil erosion	Ch 14	NRCS Web Soil Survey
4/18	Agriculture and soils	Ch 13, 14,*	
4/23	Overgrazing/desertification	Ch 9, 14, *	
4/25	Bioremediation of contaminated soils	Ch 15	Work on presentations
4/30	GIS and soils	TBD	Group presentations
5/2	Extraterrestrial soils	TBD	
5/7	Midterm Exam #3		Notebooks, Soil reports due
5/16	Final Exam (10:30-12:30pm)		