

**Soil Ecology  
SOCR 441**

**Plant Science W212, MWF 10:00 – 10:50 am (+ arranged hours)  
Spring 2013**

Course Description

This course will provide students with an integrative, hands-on experience in the theory and application of ecological principles to the soil environment. Relevant topics in soil ecology will be covered, including microbial ecosystem services, soil carbon, and global change effects. Lectures will be enhanced by laboratory exercises and discussions of current literature. This course will also emphasize the development of scientific writing skills, through lecture, practice, and the culmination of a scientific paper in soil ecology.

Instructional Methodology

Three-credit course, consisting of two 50-minute lectures and one discussion or laboratory per week for 16 weeks. To be taught annually in Spring semesters.

Prerequisite

SOCR 455, Soil Microbiology

Objectives

A successful student will be able to:

- 1) Describe the diversity, ecology and functions of the main groups of soil organisms
- 2) Explain ecological interactions in soils
- 3) Critically review original research papers on soil ecological topics
- 4) Practice experimental methods to gather and analyze data, and prepare a report.
- 5) Conduct independent literature reviews, synthesize material, and write a scientific paper.

Instructors

Dr. Mary Stromberger, Soil Microbial Ecology, Department of Soil and Crop Sciences  
Dr. Francesca Cotrufo, Soil Isotope Ecology, Department of Soil and Crop Sciences  
Dr. Keith Paustian, Ecosystem Modeling, Department of Soil and Crop Sciences  
Dr. Gene Kelly, Pedology and Biogeochemistry, Department of Soil and Crop Sciences  
Dr. John Moore, Soil Ecology, Department of Ecosystem Science and Sustainability

## Assessment

Grades will be distributed as follows: 90% and above= A; 80-89% = B; 70-79% = C; 60-79% = D; below 60% = F. Grades will be based upon performance in four areas:

### 1. Paper discussions 10%

Students will lead and participate in active discussions of current topics. This will involve selecting a paper that complements the general topic covered in the lectures, reading the paper and facilitating a discussion based on its content and relevance. The paper will be selected and made available to the class one week prior to the discussion.

### 2. Research methods 40%

Each student will be responsible for participating in all laboratory sessions, taking measurements and analyzing data, and presenting the results in a laboratory report.

### 3. Research paper 40%

Students will individually develop a 10-15 page (excluding bibliography) research paper focused on an important topic in soil ecology. Papers should describe the topic's relevance, present sufficient background information, discuss the current state of understanding, and identify knowledge gaps and future research needs.

### 4. Oral presentation 10%

Each individual or team will give an oral powerpoint presentation summarizing their research paper.

## Reading Materials and Assignments:

Required reading materials will be provided to students. The reading list is a guided exploration of different topics and viewpoints related to soil ecology. Each reading assignment features a different perspective in areas directly or closely related to issues and applications of ecology to the soil environment. Throughout the course students will also encounter additional reading materials that will be utilized to support the overall course objectives.

## Attendance Policy

This course's attendance policy is the same as what is reflected in the general university catalog.

### Statement Regarding Academic Integrity

(modified from SPCM 201 Fall 2011 Syllabus of Professor Greg Dickinson)

Academic integrity means that no one will use another's work as their own. One part of academic integrity is avoiding plagiarism. Plagiarism is the unauthorized or unacknowledged use of another person's academic or scholarly work. It is a theft of intellectual property and a violation of an ironclad rule demanding "credit be given where credit is due."

**Source:** (Writing Guides: Understanding Plagiarism.

<http://writing.colostate.edu/guides/researchsources/understandingplagiarism/plagiarismoverview.cfm>).

If you plagiarize in your work you could lose credit for the plagiarized work, fail the assignment, or fail the course. Plagiarism could result in expulsion from the university. Each instance of plagiarism, classroom cheating, and other types of academic dishonesty will be addressed according to the principles published in the CSU General Catalog (see page seven, column two:

<http://www.catalog.colostate.edu/FrontPDF/1.6POLICIES1112f.pdf>).

Academic integrity means **more** than just avoiding plagiarism. It also involves doing your own reading and studying. It includes ***regular class attendance, careful consideration of all class materials, and engagement with the class and your fellow students***. Academic integrity lies at the core of our common goal: to create an intellectually honest and rigorous community. Because academic integrity, and the personal and social integrity of which academic integrity is an integral part, is so central to our mission as students, teachers, scholars, and citizens, we will ask to you sign the CSU Honor Pledge as part of completing the scientific paper. While you will not be required to sign the honor pledge, we will ask each of you to write and sign the following statement on your paper:

***"I have not given, received, or used any unauthorized assistance."***

## Course Outline

### **Introduction and Overview (Stromberger)**

- Week 1 (1/23-25) Lecture: Intro; soil ecology overview  
Laboratory: Methods of study litter decomposition: from litterbags to stable isotope approaches
- Week 2 (1/28-2/1) Lectures: Experimental design and methods overview  
Laboratory: Set up litter decomposition experiment
- Week 3 (2/4-8) Scientific writing  
Discussion: The good, the bad and the ugly of writing

### **Module 1: Ecosystem Services of Soil Organisms (Stromberger)**

- Week 4 (2/11-15) Lectures: Soil and ecosystem services  
Laboratory: Culturing of soil bacteria  
***Research paper title due***
- Week 5 (2/18-22) Lectures: Rhizosphere ecology  
Laboratory: Microbial biomass
- Week 6 (2/25-3/1) Lectures: Methods of study – rhizosphere ecology  
Laboratory: Microbial biomass  
***Research paper outline due***

### **Module 2: Carbon and Energy Flows (Cotrufo, Moore)**

- Week 7 (3/4-8) Lectures: Soil respiration  
Laboratory: Measure litter respiration rates by IRGA
- Week 8 (3/11-15) Lectures: The litter decomposition process  
Laboratory: Harvest the experiment and measure of litter mass loss and C and N dynamics
- Week 9 (3/18-22) SPRING BREAK – NO CLASS
- Week 10 (3/25-29) Lectures: Soil fauna and the role of soil organisms in decomposition  
Laboratory: demonstration of soil fauna extractions  
***Research paper 1<sup>st</sup> draft due***

### **Module 3: Soil Organic Matter and Greenhouse Gases (Cotrufo, Paustian)**

- Week 11 (4/1-5) Lectures: Greenhouse gases  
Laboratory: Model exercise or paper discussion
- Week 12 (4/8-12) Lectures: Soil Organic Matter dynamics  
Laboratory: SOM physical fractionation demonstration
- Week 13 (4/15-19) Lectures: Stable Isotopes in soil ecology  
Laboratory: Elemental and isotopic analyses of litter and soils

**Module 4: Global Soil Ecology (Kelly, Stromberger, Cotrufo)**

- Week 14 (4/22-26) Lectures: The Role of Soil Biota in Weathering  
Laboratory: Soil biota and pedogenesis  
***Research paper 2<sup>nd</sup> draft due***
- Week 15 (4/29-5/3) Lectures: Global Soil Biodiversity  
Discussion: Microbial biogeography
- Week 16 (5/6-10) Lectures: Global Change and Soil Biota  
Discussion: Global change impacts on soil ecological processes
- Week 17 (5/13-17) Research paper due and oral presentations (final)