

SOIL FERTILITY AND PLANT NUTRITION

PSSC 453, Fall 2010

Lecture: MW 11-12:50 PM in Plumas 312

Laboratory: Monday 2-5 PM in Plumas 333

Instructor

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Office hours: Tuesday 11-4 PM or by appointment (if my door is open please inquire)

Prerequisites to take this course

CHEM 107 General Chemistry for Applied Sciences

PSSC 250 Introduction to Soils

Course Approach

The overall goal of this course is for students to attain a fundamental understanding of plant nutrition, soil fertility, and nutrient management. My instructional approach is that students need a fundamental understanding relative to managerial positions in crop/forage production, agricultural services, PCA related careers, nursery operations, landscape design, and land resource management.

Course Objectives

The course objectives include:

1. A background in the essential plant nutrients that includes their behavior in soil and water.
2. An emphasis on quantitative and chemical factors that control and measure soil and plant nutrient content, and soil nutrient availability.
3. An emphasis on what soil, climate, and water quality properties influence nutrient availability and plant health.
4. A background in plant nutrient deficiency symptoms.
5. A background in prescriptive fertilizer or amendment recommendations to increase nutrient availability.
6. A basic understanding of the environmental implications of fertility management and operations.

Specific Student Learning Expectations

1. Recognize nutrient deficiencies for N, P, K, Ca, Mg, and S.
2. Predict from soil pH, organic matter content, and soil texture the availability of specific macro- and micro-nutrients.
3. Read and interpret a soil test.
4. Key in on specific soil and water properties that influence the availability of an important plant nutrient.
5. Make fertility recommendations for specific crops and plants.
6. Make a recommendation to correct a nutrient deficiency.

Required Textbook:

Introduction to Soil Fertility and Plant Nutrient Availability (2010) Draft textbook (Chapters 1-6) by Mitchell Johns. Chapters 7-9 are on the Portal.

Recommended textbooks as references:

1. *Western Fertilizer Handbook* (9th edition). 2002. California Plant Health Association, Sacramento, Ca.
2. Brady, N.C. and R.R. Weil. 2005. *The Nature and Properties of Soils* (14th ed.) Prentice-Hall, Inc. The 13th or 12th editions are suitable as well.

Laboratory manual and lecture outline:

- ❖ The syllabus, lecture outlines, homework questions, laboratory exercises, and any PowerPoint lectures will be placed on the CSU course portal.

General course requirements:

- Participation and discussion in lecture and lab are highly recommended, encouraged, and can have a major effect on your final grade. I would appreciate questions on the subject matter from you.
- Respect your fellow students and instructor, anything less will be unacceptable! I will dismiss any individual disrupting the lecture or lab.
- Attendance in lecture and labs is mandatory. More than 50% absence will result in a failing grade. In lecture, I will take attendance. Leaving during laboratory exercises without prior instructor approval will count as an absence.
- Be consistent in readings, homework, and review of lecture notes. You will be at a great disadvantage if you get behind.
- Read the assigned textbook pages but if you cannot comprehend certain statements, move on and ask the instructor for clarification.
- **Students may not read other materials (newspapers, magazines) during class.**
- **Please turn off your cell phones.**
- Students are to remain in class during the entire session with the exception of breaks.
- **The class follows the standards set in the California State University Code of Students Rights and Responsibilities (EM 08-40) and students are subject to disciplinary action for violation of that code.**

Please refer to: <http://www.csuchico.edu/prs/EMs/2008/08-040.shtml>

Students will follow CSU standards of academic integrity. There will be no tolerance of plagiarism, unauthorized collaboration of assignments, and any forms of cheating in tests.

Written lab assignments, homework questions, subject paper, textbook readings, and exams:

- You are required to read the laboratory exercises before coming to lab. You will be required to do several laboratory reports. The assignments and format for doing these reports will be announced.
- Absence from laboratory periods or field trips will result in loss of grade points (30 points).
- All subjects presented in lectures and laboratory exercises can be in the exams.

- Handing in late homework or lab. exercises will be penalized by deducting 20% off the grade points for each day late.
- **You may bring to the laboratory any soil of interest to you to perform the experiments.**

Any problems, questions, or other concerns during the semester?

- ❖ I am flexible and fair regarding your ability to perform the requirements for the course, but I will not be aware of any problems, etc you may have.
- ❖ Please inform me of any problems or disability in advance (if possible) that may arise that will affect your ability to attend or perform in the course. I will accommodate all disabilities.
- ❖ You may visit me at my office hours that are listed at the top of the first page. If these hours are not possible, then visit me whenever possible and when I am available. You might consider making an appointment with me to discuss your concerns especially if it will take considerable time. Likely, I will respond within 24 hours if you e-mail me as I check my mail daily.
- ❖ You can e-mail me for any issues that may arise or questions you may have.

Grading of PSSC 453

- 400 points in class exams; 2 semester exams (100pts each) and 200 pts Final (comprehensive)
 250 points for five homework problem sets (50 pts each).
 120 points two laboratory reports at 60 pts each.
 100 points for lecture attendance.
 150 points class presentation and one-page report (I will give you a rubric)
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- 1020 total points in calculating final grade.

**Extra credit --- more points for class participation and identifying errors in my textbook .*

Grading:	100-95%	A	94-90	A-	
	89-85%	B+	84-80%	B	
	79-75%	B-	74-70%	C+	
	69-65%	C	64-60%	C-	
	59-55%	D+	54-50%	D	
	< 50%	F			

(Percentage rounded to closest whole number)

Homework Questions Format

1. Homework questions must be submitted on date due indicated by instructor.
2. Homework answers must be typed, 12 point font, and double spaced.
3. Homework Question Sets due TBA to coincide with lecture subject matter.

In-Class Presentation

- ❖ A 10-15 minute talks on the nutrition of a specific crop or plant. Power-Point slides are recommended. Presentations will be early in the semester.
- ❖ I will provide a rubric informing you about the grading attributes.
- ❖ I will provide more detail and format regarding his talk.
- ❖ I will schedule a time for each student.

Laboratory Report Format

1. Reports must be typed.
2. I will provide further detail as to the content and format of the reports.

PSSC 453- Lecture Schedule Fall 2010

Weeks	Topics	Textbook readings
1 -2	INTRODUCTION TO ESSENTIAL PLANT NUTRIENTS	Chapter 1 (you have)
3-4	QUANTITATIVE RELATIONSHIPS IN SOIL FERTILITY AND PLANT NUTRITION	Chapter 2 (you have)
5-6	SOIL PROPERTIES THAT CAN BE USED TO ESTIMATE THE PLANT NUTRIENT SUPPLYING POTENTIAL OF A SOIL	Chapter 3 (you have)
7-8	<i>Exam 1 Monday September 27, 2010</i> NUTRIENT UPTAKE BY PLANT ROOTS GROWING IN SOIL	Chapter 4 (you have)
9	NITROGEN (N) – VITAL NUTRIENT	Chapter 5 (you have)
10	PHOSPHORUS	Chapter 6 (you have)
11	POTASSIUM	Chapter 7 (on Portal)
12	SULFUR, CALCIUM, & MAGNESIUM	Chapter 8 (on Portal)
13	<i>Exam 2 Monday November 15, 2010</i> MICRONUTRIENTS	Chapter 9 (on Portal)
14-15	SOIL AMENDMENTS	To Be Announced
16	Final Exam on Monday, December 15, 12-1:50AM	

PSSC 453 (Tentative) Laboratory Schedule Monday 2-5PM Fall 2010

<u>When</u>	<u>Topic</u>	<u>Where</u>
Aug 23, 2010	No laboratory meeting	
August 30	Meet in Plumas 333 with your soil samples for grinding, sieving, drying. Set up samples for pH and electrical conductivity, organic matter determination. Collect saturation extract for soluble cations.	Plumas 333
September 6	Labor Day, No Lab	
September 13	Soil Texture and organic matter calculations.	Greenhouse TBA
September 20	Set-Up Pot Experiment either at Campus or Farm Greenhouse. Details & location to be announced.	Plumas 333
September 27	Cation Exchange Capacity and Exchangeable Cations by Sodium Saturation (Week 1)	Plumas 333
October 4	Cation Exchange Capacity and Exchangeable Cations by Sodium Saturation (Week 2)	Plumas 333
October 11	Visit to Worm Farm, Durham with Manager (Mark)	1 st & Ivy Bus Stop
October 18	Using Atomic Absorption Spectrometer continued. (CEC, Exchangeable cations, soluble cations)	Plumas 333
October 25	Visit at Fertilizer Company Location TBA	1 st & Ivy Bus Stop
November 1	Using Atomic Absorption Spectrometer continued. (CEC, Exchangeable cations, soluble cations)	Plumas 333
November 8	Visit to Pot Experiment in Greenhouse	
November 15	TBA Field Trip to Orchard or Nursery	1 st & Ivy Bus Stop
November 29	Soil Phosphorus by Mehlich Soil Calcium	Plumas 333
December 6	No Lab	Plumas 333