SOIL FERTILITY AND PLANT NUTRITION
PLSC 305 – SPRING 2019
Syllabus

Instructor: Dr. Jarrod O Miller (jarrod@udel.edu)

Instructor’s Office: Carvel Research and Education Center, 16483 County Seat Highway, Georgetown, DE (Call or email for an appointment on campus)

Lectures: Townsend Hall Room 006; 9:30-10:45, Tu, Thurs.

Laboratory: WOR 105 (Worrilow Hall), 020L 12:30-2:30 pm Thurs.

Instructor Office Hours: Before class mostly, but as of the writing of this syllabus, I have no campus office.

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I. Catalogue Description:

Practical application of the basic principles of soil chemistry, physics and microbiology to modern land use programs. Covers basic principles of nutrient management (availability and cycling in soils, roles in plant nutrition), soil acidity and liming, soil testing, environmental fate of non-essential elements and organic chemicals, and role of risk assessment in soil management.

[Prerequisites: CHEM 102, PLSC 204]
1. Justification for the Course:

Knowledge of the fundamental relationships involved in furnishing essential elements for plant growth is basic for students of agriculture, forestry, aquaculture, and environmental sciences. Students in all areas concerned with land application of nutrients, wastes, and other nutrient containing products and who are concerned about the impact of these practices on soil, air, and water quality need knowledge of these fundamental relationships between life and mineral and non-mineral elements. The ability to determine and/or predict the fate of nutrients in soil and plant systems is necessary for students who will be making important economic and environmental decisions or advising other individuals or corporations on such decisions.

In 2019, this course will be oriented more specifically toward soil fertility. Soil fertility is the study of the interaction between the physical, chemical and biological reactions of essential plant nutrients with the soil, and the effects of these reactions on nutrient availability for plant growth and quality. It is a discipline that encompasses many basic areas of science including soils, chemistry, physics, plant physiology, microbiology, and environmental studies, yet ultimately deals with the application of the principles of these sciences to food, fiber, and crop production. This applies whether the crop is a grain crop, nursery crop, tree crop, turf, or other horticultural crop. The interactions of nutrients and soil tilth and other soil-plant relationships affect the availability of nutrients and plant uptake of these nutrients. To fully appreciate all concepts in soil fertility, students are expected to be familiar with the basic concepts of soils having to do with formation and classification, physical properties, composition, biological and cultural processes, and soil and water conservation.

- Educational Objectives:

Upon completion of this course, students should be able to:

Define plant growth and name the factors affecting it.

Name the essential elements for plant nutrition.

Understand the approaches to identifying nutrient deficiencies for major crops.

Develop an understanding of soil fertility and its role in soil productivity.

Understand the transformation of applied N, P, and K in soil.

Evaluate and understand the appropriate use of manure, compost, and biosolids as sources of crop nutrients.

Understand the relationships between fertilizer use and environmental quality.

Know the basic concepts of soil testing and plant analysis.

Name and discuss factors determining soil productivity and fertilizer responses.
Understand how to calculate fertilizer rates from soil test recommendations.
Review soil and plant tissue sampling techniques for analysis of crop nutrients.
Know the components of a nutrient management plan.
Understand and evaluate the need/use of micronutrients.
Discuss the merits of different application methods for fertilizers.

COURSE POLICIES

1. There will be two lectures per week. Attendance to lectures will count towards the grade. There will be one laboratory each week.

2. Unannounced quizzes will be a part of the course.

3. You are responsible, on exams, for all material presented in class, as well as all reading assignments.

Grades for PLSC 305 will be assigned as follows:

- 2 Class and one final exam @ 15 percent each 45 percent
- Lecture Problem sets and other homework 15 percent
- Class Quizzes 15 percent
- Laboratory Grade (lab rpts, problems, presentation) 15 percent
- Class attendance 10 percent

A : 93-100  C+ : 77-79  D- : 60-62
A- : 90-92  C : 73-76  F : 59 & below
B+ : 87-89  C- : 70-72
B : 83-86  D+ : 67-69
B- : 80-82  D : 63-66

4. Exam Policies: Exams will consist of essay questions, multiple-choice questions, work problems (relevant equations and some conversion factors may be supplied) or a combination of these that will cover both material from the lectures and any relevant assigned outside reading. Make-up examinations will be given only in the event of an illness or family emergency and must be scheduled within two weeks of the original exam. A grade of zero will be assigned for any examination that is missed without an approved excuse.
5. **Academic Honesty:** You are encouraged to become familiar with the University’s Policy of Academic Dishonesty found in the Official Student Handbook. The Handbook is available on the University’s website (http://www.udel.edu/stuhb/). The content of the Handbook applies to this course.

6. **Supplemental References:**


*Soils and Soil Fertility.* 1952. L. M. Thompson,


*Hunger Signs in Crops.* 1949. F. E. Bear and R. Coleman

7. **Lab Writeups, Quizzes, Soil Management Report:**

For the laboratory grade, the Teaching Assistant will use weekly quizzes, written lab reports, your participation in lab, the oral presentation of your soil nutrient management report, and the written report to determine your grade. The soil management report should be based on the Delaware Nutrient Management Law and will use the analytical results you obtain on the assigned soil. Beginning in May, you will be asked to present your soil management report orally as a PowerPoint presentation to the class during the laboratory period. Class members will be expected to ask questions concerning your plan so you can determine if you have adequately covered all the components needed in a nutrient management plan and make the correct recommendation for your soil in the laboratory management report. Your lab manual has more details about the management report. The Delaware Nutrient Management Law and planning materials for those involved in nutrient management planning are on reserve in the library.

**TENTATIVE LECTURE SCHEDULE (subject to change)**

**Date:**

March 5 Test 1
April 2  Spring Recess
April 4  Spring Recess
April 11 Test 2

May 22 Final exam will be comprehensive—to include all material covered in class or in reading assignments. Exam will be 10:30 to 12:30 am.