SWS 5115 – Environmental Nutrient Management (3 credits)
Fall 2025

Course description

Catalog description: Consumption, existing reserves, formulation, chemical and physical properties, and manufacture of commercial fertilizers; basic chemical reactions of fertilizer materials with the soil and the fate of the nutritional elements whether it be loss by leaching, plant uptake, fixation or soil retention.

This course focuses on how plant nutritional requirements can be satisfied to maximize yields, maintain soil fertility and soil health, and minimize environmental impacts. We will examine the role essential nutrients play in plant nutrition and how key biogeochemical reactions affect their availability in soils. We will cover how different fertility sources – primarily fertilizers but also manures, composts, etc. – supply nutrients to plants as well as challenges associated with their use. This course will present tools to manage soil nutrients sustainably, including soil and plant tissue testing, criteria to determine nutrient input requirements, and best management practices.

Prerequisites

SWS 3022 – Introduction to Soils in the Environment, SWS 5050 – Soils for Environmental Professionals or consent from instructor

Instructor

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Office hours: by appointment (don't be shy to request an appointment!)

Chat session meeting times: Tuesday, 5:30-6:30 PM, Eastern time

Course objectives

At the end of this class, students will be able to:

1. Describe nutrient cycles for nitrogen, phosphorus, and potassium in detail, including how they are measured in soils and their effect on crop production;
2. Compare the effects of different fertility sources (e.g., fertilizers vs. manures) and different forms of a given source (e.g., urea vs. ammonium nitrate fertilizers) on nutrient cycling;
3. Quantify crop nutrient demand and fertilizer/manure input rates to meet that demand;
4. Identify and evaluate the efficiency of different best management practices (BMPs);
5. Contrast different approaches used to manage soil fertility (e.g., conventional and organic);
6. Interpret soil testing results and nutrient input recommendations.

Textbook

There is no textbook requirement of this class, but the following textbook is highly recommended for students that envision a career where soil fertility plays a large role (e.g., crop consultant, extension agent), including D.P.M. students. A copy of the book should be available on course reserve.

Soil Fertility and Fertilizers (8th Ed.) by John Havlin et al. 2013; ISBN 013503373X, Pearson.

Course format

The class is all-online, asynchronous, with a combination of pre-recorded lectures, a discussion board, and a weekly chat. The weekly chat will occur via zoom, using the URL provided on the canvas page. Log in to http://elearning.ufl.edu/.

The course is structured in three modules, with materials becoming available one week at a time. At the end of each module, students will complete an exam. All students must do the exam within a specific 4-day window, but they may go through the materials of that module at their own pace, once each week is online. The first two exams will only cover the materials presented in the module whereas the final exam will be cumulative. Note: all exams will be delivered online in canvas, except for exam #1 for students located at RECs and in Gainesville – these students will complete the first exam in-person, at the REC where they are located or in Gainesville (more details provided in canvas).

Chat sessions will have both audio and video recorded for students in the class to refer later and for enrolled students who are unable to attend live. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. Likewise, students who un-mute during class and participate are agreeing to have their voices recorded. Students unwilling to consent to have their profile image, video or voice recorded must keep their camera and mic off and not use a profile image. Students that prefer to remain muted can use the "chat" feature in zoom, which allows students to type questions and comments live.

Make-Up Policy

Late assignments (problem sets, discussions) will get a 20% deduction for each late day, up to 2 days; if submitted on or after the 3rd day, the student will be assigned the grade 0. Exams must be completed during the allocated period (no late submissions accepted).

Please refer the official University policy for additional details: https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx.

Grading system

Item	Points	Percentage
Exam 1 (Soils and crops review, N and P cycles) *Online for all students except for students at RECs and in Gainesville that must take it in person*	125	12.5%
Exam 2 (Other macronutrients, micronutrients, acidity, salinity)	125	12.5%
Cumulative final exam (covers **all** material from the class)	250	25%
6 problem sets (5% each)	300	30%
5 discussions (4% each)	200	20%

Grade scale

Letter	Points	Percentage
A	≥ 940	94 - 100
A-	≥ 900	90 - 94.9
B+	≥ 850	85 - 89.9
B	≥ 800	80 - 84.9
B-	≥ 760	76 - 79.9

Letter	Points	Percentage
C+	≥ 720	72 - 75.9
C	≥ 680	68 - 71.9
C-	≥ 640	64 - 67.9
D	≥ 600	60 - 63.9
E	< 600	< 60

For information on current UF policies for assigning grade points, see: https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx.

Group work

It is assumed that you will complete all work independently in this course unless the instructor provides explicit permission for you to collaborate on course tasks. **All assignments in this class are individual assignments; collaboration in doing assignments is therefore prohibited.**

Use of Generative AI

The work you submit in this class must be your ownthus the use of generative AI is prohibited to produce final products submitted for grading, such as discussion posts and replies, problem sets, and exam questions. However, you may use generative AI tools to help you survey the literature and produce a first rough draft of your work. It is your responsibility to ensure that any draft generated by AI is substantially modified by you prior to submission, otherwise this will be considered as an Honor Code violation and treated as such. If you have doubts/questions about using AI, feel free to email the instructor prior to using these tools, to avoid any violation of the Honor Code.

Additional academic policies and resources can be found here.

Tentative schedule (updates and changes will be posted on the class Canvas page)

Week	Topic	Readings	Assignments due
1 (8/21-8/22)	Introduction Optional: review of crop physiology/nutrition, soil science	Chapter 1 Chapter 2 (optional)	Bonus discussion – Introduce yourself
2 (8/25-8/29)	Nitrogen cycle	Chapter 4 (117-161)	
3 (9/2-9/5)	Nitrogen inputs	Chapter 4 (161-183)	Problem set #1 – N fertilizers
4 (9/8-9/12)	Phosphorus cycling	Chapter 5 (185-208)	Discussion #1 – Enhanced efficiency fertilizers
5 (9/15-9/19)	Phosphorus inputs	Chapter 5 (208-221) Chapter 10 (409-420)	Problem set #2 – P fertilizers and organic amendments
9/20-9/23	**Exam # 1: Soil and crop nutrition review, N & P cycles (weeks 1-5)**		
6 (9/22-9/26)	Potassium cycling and inputs	Chapter 6	Discussion #2 – P cycling
7 (9/29-10/3)	Sulfur, calcium, and magnesium	Chapter 7	
8 (10/6-10/10)	Micronutrients	Chapter 8	Problem set #3 – Other nutrients and fertilizers
9 (10/13-10/16)	Soil acidity/alkalinity Soil salinity/sodicity	Chapter 3	Discussion #3 – K in agriculture
10/18-10/21	**Exam # 2: K, Ca, Mg, S, micronutrients, soil acidity/salinity (weeks 6-9)**		
10 (10/20-10/24)	Nutrient management & 4Rs 5th R: irrigation management	Chapter 10 (all but 409-420) Chapter 11	Problem set #4 – soil pH
11 (10/27-10/31)	Soil and plant nutrient testing	Chapter 9 (307-362)	
12 (11/3-11/7)	Environmental impacts of agriculture	Chapter 12 (476-501)	Problem set #5 – Soil testing
13 (11/10-11/14)	BMPs		
14 (11/17-11/21)	Soil health, crop rotations & cover crops	Chapter 12 (451-476)	Discussion #4 – BMPs & environmental impacts Problem set #6 – BMPs & environmental impacts
11/24-11/28	**Spring break (no class)**		
15 (12/1-12/3)	Organic and conventional agriculture		Discussion #5 – Soil health
12/6-12/9	**Final cumulative exam (weeks 1-15)**		