SWS 4116 – 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

Instructor

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Teaching Assistant

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Course meeting time

Tuesday & Thursday, Periods 4 and 5 (10:40-12:35), McCarty Hall B, Room 3108

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. However, 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).

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

Course format

A combination of teaching methods will be used for this class: lectures and short in-class activities that focus on the general principles of nutrient management and a semester-long soil fertility trial at the Field and Fork gardens (FFG) on campus. All activities will take place on campus and students must use their own means to get to FFG on time; there is a bus stop nearby.

Students will work in small groups (3-4 students) for the trial and for the first two reports and the final oral presentation. Participation will be assessed and graded. This trial involves outside work where there is a large density of insects, including bees – dress according to weather conditions and let me know of any relevant medical condition (e.g., bee allergy).

Despite being a 3-credit class, there are 4 periods per week allocated to this class. We will use them according to this approach:

- On days devoted to lectures, we will typically not use the two periods completely. We will aim for two 40-minute slots with a 10-minute break; we should be done by 12:15.
- When doing field activities related to the fertility trial, students will again need to attend for less than 2 periods. The attendance period will vary based on activities to be done.
- On days with in-class activities, we will use both 50-minute periods.

Class attendance

Attendance to all class meetings is highly encouraged, including for field activities (participation is graded for field trips). Students who miss class will be responsible to cover the material missed on their own. Lectures will be recorded and posted on canvas for students who miss class occasionally. Please turn off your cell phones or put them in silent mode during class.

Make-Up Policy

Students need to request a permission to take a make-up exam before missing the exam, otherwise the student will be assigned the grade 0. Absences for health and personal reasons will typically be accommodated, but not requests based on a pre-planned trips or vacation.

Late assignments will get a 25% deduction for each late day, up to 2 days. If the assignment is submitted on or after the 3rd day, the student will be assigned the grade 0.

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

Grading system

Grade breakdown

Item	Points	Percentage
Exam 1 (Soils and crops review, N and P cycles)	125	12.5%
Exam 2 (Other macronutrients, micronutrients, acidity, salinity)	125	12.5%
Cumulative final exam (covers **all** material from the class)	250	25%
4 problem sets (5% each)	200	20%
Fertility trial	300	30%
1. 1st report – soil tests, input recommendations	75	7.5%
2. 2nd report – tissue sampling, crop health	75	7.5%
3. Final presentation – yields, soil tests, partial nutrient budgets	125	12.5%
4. Participation to fertility trial	25	2.5%

The final cumulative exam will be held during the official final exam time, i.e., Thursday December 11, 2025, between 10:00 AM and 12:00 PM, in McCarty Hall B, Room 3108.

Grade scale

Letter	Points	Percentage
A	≥ 940	94 - 100
A-	≥ 900	90 - 93.9
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/inf~o/grades.aspx.

Individual vs. group work

All work for problem sets and exams is individual (i.e., collaboration is not allowed), while collaboration is assumed and mandatory for all work related to the fertility trial.

Use of Generative AI

The work you submit in this class must be your own, thus using generative AI is prohibited to produce final products submitted for grading. 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.

Additional academic policies and resources can be found here.

<u>Tentative</u> schedule (subject to change due to crop growth, hurricanes, etc.)

Date	Topic	Reading from Havlin et al.	Assignments
Aug. 21	Introduction, class logistics Soil sampling basics & experiment description	Chapter 1 Chapter 9 (336-344)	
Aug. 26	Review of crop physiology/nutrition & soil properties	Chapter 2	
Aug. 28	***Field trip: Soil sampling & tour at FFG***		
Sept. 2	Nitrogen cycle	Chapter 4	
Sept. 4	Nitrogen inputs	Chapter 4	
Sept. 9	Phosphorus cycle & inputs Problem set (PS) demo	Chapter 5	
Sept. 11	***Field trip: Fertilization and planting at FFG***		
Sept. 16	Soil test interpretation In-class activity: Soil test analysis for FFG trial Exam 1 preparation	Chapter 9 (344-366)	
Sept. 18	**Exam # 1: Soil and crop review, N & P cycles (up to 9/9)**		
Sept. 23	Plant nutrient sampling approaches and methods Potassium cycling and inputs Exam 1 review	Chapter 9 (311-335) Chapter 6	Due: PS1
Sept. 25	***Field trip: Crop health sampling at FFG (SPAD, sap)***		
Sept. 30	Sulfur, calcium, and magnesium	Chapter 7	
Oct. 2	***Field trip: Crop health sampling at FFG (SPAD, sap)***		
Oct. 7	Micronutrients	Chapter 8	
Oct. 9	***Field trip: Harvest and crop nutrient sampling at FFG***		Due: 1st fertility trial report
Oct. 14	In-class activity: crop health analyses for FFG trial		Due: PS2

Oct. 16	Soil acidity & alkalinity	Chapter 3	
Oct. 21	Nutrient management principles & 4Rs	Chapter 10 (369-413)	
Oct. 23	**Exam # 2: K, Ca, Mg, S, micronutrients, soil acidity/salinity**		**(9/23 to 10/16)**
Oct. 28	Irrigation management In-class activity: analysis of yields for FFG trial Exam 2 review	Chapter 11 (431-446)	
Oct. 30	Organic amendments & livestock integration Soil health	Chapter 10 (413-424)	Due: 2nd fertility trial report
Nov. 4	Soil conservation and management Crop rotation and cover crops	Chapter 12 (455-480)	Due: PS3
Nov. 6	Environmental impacts Introduction to Best Management Practices (BMPs)	Chapter 12 (480-505) Chapter 10 (426-429)	
Nov. 11	**No class / Veterans Day**		
Nov. 13	BMPs in Florida		
Nov. 18	Organic systems Other alternative systems		
Nov. 20	**Final oral presentations for fertility trial**		Due: Final fertility trial presentation
Dec. 2	Review session for final exam		Due: PS4
Dec. 11	**Final cumulative exam (official exam period) 10:00-12:00, MCCB 3108**		