

SWS 4116/5115 – Environmental Nutrient Management (3 credits)
Fall 2023

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 4116: SWS 3022 – Introduction to Soils in the Environment

SWS 5115: SWS 5050 – Soils for Environmental Professionals

Instructor

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

Teaching Assistant

Yaz Gonzalez – Ph.D. student, Soil, Water, and Ecosystem Sciences (yaslinngonzalez@ufl.edu)

Course meeting time

Tuesday & Thursday, Periods 4 and 5 (10:40-12:35), McCarty Hall B, G108

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 undergraduate and graduate students that envision a career where soil fertility plays a large role (e.g., crop consultant, extension agent), including D.P.M. students.

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 (4-5 students) for the trial and for the first two reports, although the final report is individual. 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 only need to attend for 1h instead of two periods. The period attended will depend on your group.
- On days with guest speakers or 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 20% 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. 1 st report – soil tests, input recommendations	60	6%
2. 2 nd report – tissue sampling, crop health	60	6%
3. Final report – yields, soil tests, partial nutrient budgets	150	15%
4. Participation to fertility trial (0.5 pt. per field trip)	30	3%

The grade breakdown is identical for both undergraduate and graduate sections, however the difficulty of problem sets and exams will be higher for the graduate section.

The final exam will take place during the period allocated for finals, not during our regular class meeting time. **The final cumulative exam will be held on Thursday December 14, 2023, between 3:00 PM and 5:00 PM, in McCarty Hall B G108.** If this changes throughout the semester, you will be notified in class and on canvas.

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/info/grades.aspx>.

Additional information

Online Course Evaluation Process

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on

how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/students/>. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>.

There will be time allocated in class to complete online evaluations on the last day of classes, on December 5.

Academic Honesty

As a student at the University of Florida, you have committed yourself to uphold the Honor Code, which includes the following pledge: *We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity.* You are expected to exhibit behavior consistent with this commitment to the UF academic community, and on all work submitted for credit at the University of Florida, the following pledge is either required or implied: *"On my honor, I have neither given nor received unauthorized aid in doing this assignment."*

It is assumed that you will complete all work independently in each course unless the instructor provides explicit permission for you to collaborate on course tasks. **The problem sets and exams are individual assignments whereas the fertility trial is partially a group project. Hence, you may collaborate with your peers only for the first two reports of the fertility trial (the final report is individual).** Furthermore, as part of your obligation to uphold the Honor Code, you should report any condition that facilitates academic misconduct to appropriate personnel. It is your individual responsibility to know and comply with all university policies and procedures regarding academic integrity and the Student Honor Code. Violations of the Honor Code at the University of Florida will not be tolerated. Violations will be reported to the Dean of Students Office for consideration of disciplinary action. For more information regarding the Student Honor Code, please see: <https://sccr.dso.ufl.edu/process/student-honor-code/>.

Software Use

All faculty, staff and students of the university are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against university policies and rules, disciplinary action will be taken as appropriate.

Services for Students with Disabilities

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center. [Click here to get started with the Disability Resource Center](#). It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

In-Class Recording

Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A “class lecture” is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To “publish” means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

Campus Resources

Health and Wellness

U Matter, We Care: If you or someone you know is in distress, please contact umatter@ufl.edu, 352-392-1575, or visit [U Matter, We Care website](#) to refer or report a concern and a team member will reach out to the student in distress.

Counseling and Wellness Center: [Visit the Counseling and Wellness Center website](#) or call 352-392-1575 for information on crisis services as well as non-crisis services.

Student Health Care Center: Call 352-392-1161 for 24/7 information to help you find the care you need, or [visit the Student Health Care Center website](#).

University Police Department: [Visit UF Police Department website](#) or call 352-392-1111 (or 9-1-1 for emergencies).

UF Health Shands Emergency Room / Trauma Center: For immediate medical care call 352-733-0111 or go to the emergency room at 1515 SW Archer Road, Gainesville, FL 32608; [Visit the UF Health Emergency Room and Trauma Center website](#).

GatorWell Health Promotion Services: For prevention services focused on optimal wellbeing, including Wellness Coaching for Academic Success, visit the [GatorWell website](#) or call 352-273-4450.

Academic Resources

E-learning technical support: Contact the [UF Computing Help Desk](#) at 352-392-4357 or via e-mail at helpdesk@ufl.edu.

Career Connections Center: Reitz Union Suite 1300, 352-392-1601. Career assistance and counseling services.

Library Support: Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center: Broward Hall, 352-392-2010 or to make an appointment 352- 392-6420. General study skills and tutoring.

Writing Studio: 2215 Turlington Hall, 352-846-1138. Help brainstorming, formatting, and writing papers.

Student Complaints On-Campus: [Visit the Student Honor Code and Student Conduct Code webpage for more information.](#)

On-Line Students Complaints: [View the Distance Learning Student Complaint Process.](#)

Tentative schedule (subject to change due to crop growth, guest speaker availability, etc.)

Date	Topic	Reading from Havlin et al.	Assignments
Aug. 24	Introduction, class logistics Soil sampling basics & experiment description	Chapter 1 Chapter 9 (336-344)	
<i>Aug. 29</i>	<i>Field trip: Soil sampling & tour at FFG</i>		
Aug. 31	Review of crop physiology/nutrition & soil properties	Chapter 2	
Sept. 5	Nitrogen cycle & inputs	Chapter 4	
Sept. 7	Phosphorus cycle (pre-recorded)	Chapter 5	
<i>Sept. 12</i>	<i>Field trip: Fertilization and planting at FFG</i>		Posted: 1 st fertility trial report
Sept. 14	Phosphorus inputs Problem set (PS) demo	Chapter 5	Posted: PS1 (soil properties, N, P)
Sept. 19	Soil test interpretation Plant nutrient sampling approaches and methods	Chapter 9 (344-366) Chapter 9 (311-335)	
Sept. 21	In-class activity: Soil test analysis for FFG trial Potassium cycling and inputs Exam 1 review session	Chapter 6	
<i>Sept. 26</i>	<i>Field trip: Crop health sampling at FFG (SPAD, sap nutrients)</i>		
Sept. 28	Exam # 1: Soil and crop nutrition review, N & P cycles (up to 9/19)		
<i>Oct. 3</i>	<i>Field trip: Crop health sampling at FFG (SPAD, sap nutrients)</i>		Due: PS1
Oct. 5	In-class activity: crop health analyses for FFG trial Exam 1 review		Posted: 2 nd fertility trial report
<i>Oct. 10</i>	<i>Field trip: Harvest and crop nutrient sampling at FFG</i>		Due: 1 st fertility trial report
Oct. 12	Sulfur, calcium, and magnesium	Chapter 7	
Oct. 17	Micronutrients	Chapter 8	Posted: PS2 (Macro & micronutrients)

Oct. 19	Soil acidity & alkalinity	Chapter 3	
Oct. 24	Soil salinity & sodicity Nutrient management principles & 4Rs	Chapter 10 (369-413)	
Oct. 26	Exam # 2: K, Ca, Mg, S, micronutrients, soil acidity/salinity (9/21 to 10/24)		
Oct. 31	<i>IFAS soil testing lab virtual visit (pre-recorded)</i> Guest speaker: Dr. A. Schumann – Citrus & AI (pre-recorded)		Due: PS2
Nov. 2	Guest speaker: Dr. T. Sanchez – Vegetable systems Irrigation management	Chapter 11 (431-446)	Posted: Final fertility trial report
Nov. 7	Guest speaker: Dr. J. Vogel – Forested systems In-class activity: analysis of yields for FFG trial		Due: 2 nd fertility trial report Posted: PS3 (organic amendments)
Nov. 9	Organic amendments & livestock integration Soil health, conservation, and management	Chapter 10 (413-424) Chapter 12 (455-480)	
Nov. 14	Exam 2 review Crop rotation and cover crops		Posted: PS4 (BMPs, soil conservation)
Nov. 16	Environmental impacts Introduction to Best Management Practices (BMPs)	Chapter 12 (480-505) Chapter 10 (426-429)	
Nov. 21	BMPs in Florida Nutrient management in organic systems I		Due: PS3
Nov. 28	Guest speaker: Dr. A.J. Reisinger – Urban systems Nutrient management in organic systems II		Due: PS4
Nov. 30	Guest speaker: Dr. M. Clark – BMPs for P Biodynamic & other alternative systems		
Dec. 5	Review session for final exam		Due 12/6: Final fertility trial report
Dec. 14	Final cumulative exam in McCarty Hall B G108 (3:00 PM – 5:00 PM)		