

## **NUTRITION OF HORTICULTURAL CROPS**

HOS3430C - 3 CREDITS

SPRING 2017

### **MEETING TIMES AND LOCATION**

Monday 11:45 am – 12:35 pm (5<sup>th</sup> period)  
Wednesday 11:45 am – 1:40 pm (5<sup>th</sup> - 6<sup>th</sup> period)

Lectures Fifield Hall room 2316  
Field demonstrations Horticultural Sciences Teaching Garden  
Field and Fork Teaching Farm

### **INSTRUCTOR**

Gerardo Nunez g.nunez@ufl.edu  
Fifield Hall 1113  
(352) 273 - 4765  
Wednesday 2:00 pm to 4:00 pm and by appointment

### **COURSE DESCRIPTION**

Plant nutrition is a critical aspect of horticultural production and environmental stewardship. As such, it is imperative that young horticulturists have the knowledge and skills necessary to make sound nutrient management decisions. This course is designed to deliver that knowledge and develop those skills.

*Nutrition of Horticultural Crops* encompasses the biochemical, physiological, and environmental factors that affect the nutritional status and productivity of horticultural crops. In order to deliver meaningful mastery of these contents, this course utilizes a combination of lectures, in-class exercises, and field activities.

### **LEARNING OBJECTIVES**

Upon successful completion of this course, students will be able to:

- Explain how chemical and physical properties of soils and substrates affect nutrient availability.
- Classify nutrients as essential, beneficial, and non-essential for plant growth.
- Discuss plant ion uptake mechanisms.
- Contrast fertilizer types, fertilizer sources, and fertilizer practices.
- Sample for, submit, and interpret soil, water, and tissue tests.
- Diagnose nutrient deficiencies and recommend corrective measures.
- Design fertilizer schedules for hydroponic systems and fertigation.

## COURSE MATERIALS

There is no required textbook for this course. The following three textbooks can be used as reference materials. Additional learning materials will be provided via Canvas.

*Vegetable Production Handbook of Florida* Freeman, Vallad & Dittmar

This textbook is provided to you at no cost by the UF/IFAS Extension Office. You can pick up your textbook from the instructor during the first two weeks of class.

*Handbook of Plant Nutrition* Barker & Pilbeam (ISBN 978-1-4398-8198-9)  
*Plant Nutrition of Greenhouse Crops* Sonneveld & Voogt (ISBN 978-90-481-2532-6)

These two textbooks are available as e-books through the UF Libraries. You can download and save them to your devices while on campus or using a VPN connection off campus.

- UF Libraries, [www.uflib.ufl.edu](http://www.uflib.ufl.edu)

A personal computer with spreadsheet software will be required for the in-class and at-home portions of the fertilizer schedule assignment. I will create template files and present the in-class demonstration using Microsoft Excel 2013, but you are welcomed to use any spreadsheet software of your preference.

## COURSE WEBSITE

Even though this is a face-to-face course, *Nutrition of Horticultural Crops* has a comprehensive mini-site in the Canvas platform. Take time to familiarize yourself with the “My Assignments”, “Syllabus”, “Course Materials”, and “Grades” tabs in the navigation menu. Digital copies of this syllabus, and other learning materials can be found there.

- E-Learning in Canvas, [www.elearning.ufl.edu](http://www.elearning.ufl.edu)

## ATTENDANCE

You are encouraged to attend every class. Attendance will be taken based on a *photo book*. You must contribute to the creation of the course *photo book* by emailing the instructor a clear photo of your face during the first week of the semester.

Absences will be excused, late assignments will be graded, and make up-exams will be provided for documented emergencies as per UF’s attendance policy. However, I am aware that sometimes life throws you a *curve ball*. Thus, you are allowed one no-questions-asked absence per semester. You cannot use your no-questions-asked absence on a date when exams, or assignments are due. Subsequent unexcused absences will make you ineligible for the Extra Credit assignment.

Additional information about UF’s attendance policy can be found here:

- Attendance policy, [www.catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx](http://www.catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx)

## COURSE GRADE

### 1. Class participation

10 points

At the beginning of every class, students will be chosen at random and asked to provide a 2-minute verbal summary of the previous lecture. Additionally, throughout the course there will be opportunities for students to interact with the instructor by asking or answering questions. Class interaction and class summaries will be graded out of 5 points according to the rubrics below. The sum of your class summary and class interaction scores will be used as your participation grade.

Frequency of class interaction	Score
Never	1
Rarely	2
Sometimes	3
Often	4
Always	5

Quality of class summary	Score
Poor	1
Fair	2
Good	3
Very good	4
Excellent	5

### 2. Nutrient management practicum

20 points

This practicum is intended to aid in developing the technical skills necessary to successfully implement a nutrient management program. Students will have permanent and occasional duties related to the setup and maintenance of a multi-crop, multi-system horticultural operation. I will demonstrate all hands-on activities during class time, but you will have to use out-of-class time to successfully manage your farm plots and hydroponic growth systems. Consider this your homework.

#### Farm plots

Groups of two students will be assigned to a farm plot. Each farm plot will have a cash crop (bell pepper), a legume crop (snapbean), and a root crop (radish). Each group will plant and maintain their farm plot. Additionally, each group will sample for, submit, and interpret soil, water, and tissue tests.

#### Hydroponic growth systems

Students will collectively manage two hydroponic growth systems planted with lettuce and strawberry, respectively. Each student will select a two-day period during which he/she is responsible for the hydroponic growth systems. During this period, students will measure and document plant health and nutrient solution quality. Also, students will adjust nutrient solution pH and/or add water to nutrient tanks as necessary.

Farm plots will be evaluated three times during the semester (as indicated in the class schedule) using the rubric below. Individual responsibilities with the hydroponic growth systems will be graded on completion. Some hands-on activities will have reflection questions that need to be answered via Canvas.

<b>Level of Acceptability of Farm Plot</b>	<b>Score</b>
Totally unacceptable	1
Unacceptable	2
Slightly unacceptable	3
Neutral	4
Slightly acceptable	5
Acceptable	6
Perfectly acceptable	7

### 3. Exams

**50 points**

You will be evaluated through three cumulative exams. Exams will be graded out of 100 points, and the average of your exam scores will be used as your exam grade. Exams will draw from materials covered during lectures and in-class activities. All exams will test your knowledge, quantitative skills, and critical thinking through long and short answer questions. Additionally, exam #3 will contain a hands-on component where you will have to diagnose nutrient deficiencies and recommend corrective measures.

### 4. Fertilizer schedule

**20 points**

This assignment will test your logical and quantitative skills to design two fertilizer schedules: one for a hydroponic operation and one for a fertigation operation. I will demonstrate the necessary calculations with two essential elements. Then, you will complete all macronutrients in class, and all micronutrients at home. There will be two deliverables, one for each fertilizer schedule. Each fertilizer schedule will be graded out of 10 points, and the sum of your scores will be used as your grade. Additional details about this assignment will be provided in Handouts 1 and 2.

These assignments will require a fair degree of familiarity with spreadsheet software. Students who are unfamiliar with or need to brush up on their Excel skills should complete this tutorial before the start of the in-class activities.

- *Excel Easy tutorial*, [www.excel-easy.com](http://www.excel-easy.com)

### 5. Extra credit

**+ 10 points**

Wikipedia is –perhaps– the most commonly used reference text in the world. As a collection of contributed articles, pop culture tends to be overrepresented and scientific articles tend to be weak. The goal of this assignment is to contribute to improving a Wikipedia article about plant nutrition. This assignment has three milestones, scheduled to be completed over a three-week period in February. First, you will be introduced to Wikipedia basics (February 6<sup>th</sup>). Then, you will critique a plant nutrition article (February 13<sup>th</sup>). Finally, you will contribute to improving this article with 50-100 words and 2 scientific sources (February 20<sup>th</sup>). Students who meet the weekly milestones will earn 10 points towards their lowest exam grade. Students who choose not to complete this assignment or only complete it partially will neither be penalized nor receive extra credit. Additional information will be provided in Handout 3.

## GRADING SCALE

A	=	92 – 100 points	C	=	< 77 - 73 points
A-	=	< 92 - 90 points	C-	=	< 73 - 70 points
B+	=	< 90 - 87 points	D+	=	< 70 - 67 points
B	=	< 87 - 83 points	D	=	< 67 - 63 points
B-	=	< 83 - 80 points	D-	=	< 63 - 60 points
C+	=	< 80 - 77 points	E	=	< 60 points

Additional information on current UF grading policies for assigning grade points can be found here:

- *Grading policy*, [www.catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx](http://www.catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx)

## COURSE POLICIES

### Classroom Etiquette

Students are expected to be respectful learners. As such, you should arrive to and leave from class on time. Additionally, you should refrain from using electronic devices (laptops, tablets, and cellular phones) during class time, unless invited by the instructor. Activities such as talking, sleeping, eating, and studying for other classes should also be avoided. Students who repeatedly engage in disruptive behavior during a class period will be marked absent and/or asked to leave the room.

### Written Communication

Effective written communication is essential for student and professional success. Whether you go on to become a horticulturist, an accountant, or a CEO, written communication will be a critical skill in your repertoire. Thus, the instructor places great emphasis on coaching and participating in professional, context-specific written communication.

All course-related email communication should be polite, professional, and as different from a text message as possible. For additional recommendations, consult:

- *Email etiquette*, [www.advising.ufl.edu/docs/ProfessionalEtiquette.pdf](http://www.advising.ufl.edu/docs/ProfessionalEtiquette.pdf)

In addition to content, all written assignments will be evaluated with respect to proper spelling, grammar, punctuation, word usage, clarity, coherence, and organization. You are encouraged to use the resources provided by the UF Writing Studio to develop or enhance your writing skills. Free one-on-one tutoring (live and on-line) is available to enrolled students.

- *UF Writing Studio*, 302 Tigert Hall, 846-1138, [www.writing.ufl.edu/writing-studio/](http://www.writing.ufl.edu/writing-studio/)

### Growing Your Own Food

As a product of your successful nutrient management, you will grow many fruits and vegetables in this course. You are encouraged to take your harvest home, clean it thoroughly, and eat it. Eating the

produce you grew is optional (but I will eat everything I grow in my plots), and personal safety should be your number one priority when deciding whether or not to consume these fruits and vegetables.

Any produce left behind at the end of the semester will be donated to the Field and Fork Food Pantry.

### Academic Honesty

In 1995, the UF student body enacted a new honor code and voluntarily committed itself to the highest standards of honesty and integrity. When students enroll at the university, they commit themselves to this standard.

**The Honor Code:** We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity.

On all work submitted for credit by students at the university, the following pledge is either required or implied:

**“On my honor, I have neither given nor received unauthorized aid in doing this assignment.”**

The university requires all members of its community to be honest in all endeavors. A fundamental principle is that the whole process of learning and pursuit of knowledge is diminished by cheating, plagiarism and other acts of academic dishonesty. In addition, every dishonest act in the academic environment affects other students adversely, from the skewing of the grading curve to giving unfair advantage for honors or for professional or graduate school admission. Therefore, the university will take severe action against dishonest students. Similarly, measures will be taken against faculty, staff and administrators who practice dishonest or demeaning behavior. Students should report any condition that facilitates dishonesty to the instructor, department chair, college dean or Student Honor Court.

It is assumed all work will be completed independently unless the assignment is defined as a group project, in writing by the instructor. This policy will be vigorously upheld at all times in this course. Additionally, all work submitted for credit by students will be analyzed with originality-checking software to detect any academic misconduct.

### 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 when appropriate.

### Campus Resources

If you are experiencing crises or personal problems that interfere with your general wellbeing, I encourage you to utilize the university’s counseling resources. The UF Counseling and Wellness Center provides a wealth of confidential, free counseling services to enrolled students.

- *Counseling and Wellness Center*, 3190 Radio Road, 392-1575, [www.counseling.ufl.edu](http://www.counseling.ufl.edu)

Additionally, if you would like orientation on choosing a major, finding an internship, or planning your career, I encourage you to use the university's on-campus resources.

- *Career Resource Center*, CR-100 Reitz Union, 392-1601, [www.crc.ufl.edu](http://www.crc.ufl.edu)

#### Students with Disabilities

The Disability Resource Center (DRC) coordinates the needed accommodations of students with disabilities. This includes registering disabilities, recommending academic accommodations within the classroom, accessing special adaptive computer equipment, providing interpretation services and mediating faculty-student disability related issues.

If you would like to request classroom accommodations, you must first register with the DRC. The DRC will provide you with documentation that you must deliver to the instructor when requesting accommodations.

- *Disability Resource Center*, 0020 Reid Hall, 392-8565, [www.dso.ufl.edu/drc/](http://www.dso.ufl.edu/drc/)

#### Diversity

The University of Florida and I place great emphasis on affirming the diversity of the student body. Student, faculty, and staff interactions with others from varied backgrounds and experiences foster a superior educational environment and nurture a healthier, more accurate understanding of how our increasingly global and multicultural society operates.

I encourage you to engage in meaningful intra- and inter-culture dialogue and support a climate that is grounded in respect and inclusion for individuals of all of races, ethnic backgrounds, genders, and sexual orientations.

#### **ONLINE COURSE EVALUATION PROCESS**

Student assessment of instruction is an important part of the effort to improve teaching and learning. At the end of the semester, you are expected to provide feedback on the quality of instruction in this course using a standard set of university and college criteria. These evaluations are conducted online at:

- *Course evaluations*, [www.evaluations.ufl.edu](http://www.evaluations.ufl.edu)

Evaluations are typically open during the last two or three weeks of the semester. You will be notified of the specific times when evaluations for this course are open.

## NUTRITION OF HORTICULTURAL CROPS

Schedule SPRING 2017

<b>Date</b>	<b>Class topic</b>	<b>Action Items</b>
Wed 4-Jan	Lecture Introduction to the course Atoms, molecules, molecular weights, and charges	
Mon 9-Jan	Lecture CEC, base saturation, buffering capacity	
Wed 11-Jan	Lecture Solubility, concentration Activity Moving between concentration units	Due Selection day Due Picture for photo book
Mon 16-Jan	MLK Day – no class –	
Wed 18-Jan	Lecture Acidity, alkalinity, and fertilizer effect on soil pH Activities Hydroponic system maintenance training	Wear Field-ready clothes
Mon 23-Jan	Activity Estimate the effect of S application on Florida soil pH for blueberry production	
Wed 25-Jan	Lecture Problems in acid soils, liming, and CCE Activity Soil and water sampling	Wear Field-ready clothes
Mon 30-Jan	Lecture Soil salinity and organic matter	
Wed 1-Feb	Lecture Exam #1 Soil and substrate water relations	
Mon 6-Feb	Lecture Movement of ions from soils to roots	Due Extra credit: milestone 1
Wed 9-Feb	Lecture Microorganisms in the rhizosphere	
Mon 13-Feb	Activity Interpreting soil and water test results	Due Extra credit: milestone 2
Wed 15-Feb	Guest Lecture Effect of irrigation on nutrient availability – Dr. Lincoln Zotarelli	
Mon 20-Feb	Lecture History of fertilizers and the organic movement	Due Extra credit: milestone 3
Wed 22-Feb	Lecture Fertilizer contents and labels Activity Farm plot assignments and transplant	Due Plot signs Wear Field-ready clothes
Mon 27-Feb	Lecture Kinds of fertilizers	
Wed 1-Mar	Lecture Methods of fertilizer application	



	Activity	Comparing two fertilizer products	
Mon 6-Mar		Spring Break – no class –	
Wed 8-Mar			
Mon 13-Mar	Lecture	Placement and timing of fertilizer application	Due Farm plot evaluation #1
Wed 15-Mar	Lecture	Fertigation and nutrient solutions	Wear Field-ready clothes
	Activity	Hands-on fertilizer application	
Mon 20-Mar		Exam #2	
Wed 22-Mar	Lecture	Crop nutritional requirements, tissue sampling, and deficiencies	Wear Field-ready clothes
	Activity	Tissue sampling	
Mon 27-Mar	Lecture	Essential, beneficial, non-essential, mobile, and immobile elements	
Wed 29-Mar	Activity	Building a fertilizer schedule (hydroponics)	Bring Personal computer
Mon 3-Apr	Lecture	Nitrogen	Due Farm plot evaluation #2
Wed 5-Apr	Activity	Building a fertilizer schedule (fertigation)	Due Fertilizer schedule: hydroponic system Bring Personal computer
Mon 10-Apr	Lecture	Potassium and phosphorus	
Wed 12-Apr	Lecture	Sulfur, calcium, magnesium	Due Fertilizer schedule: fertigation
	Activity	Interpret tissue sample results	
Mon 17-Apr	Lecture	Micronutrients	
Wed 19-Apr	Lecture	BMPs and TMDLs	Due Farm plot evaluation #3
	Activity	Diagnosing nutritional deficiencies	
Finals Week		Exam #3	