

Greenhouse and Nursery Crop Culture
ORH 4264 (3 credits)/ ORH 4264L (1 credit)
Fall 2018

Course format

This course is taught live in Gainesville and through online lectures posted in Canvas for our students at the Research and Education centers (RECs). Online lectures will be posted every Wednesday and Friday before noon. Quizzes, complete discussion post assignments, and brief laboratory reports are due on Sundays at 11:59 PM. Laboratories will have different meeting times and may cover slightly different content depending on location. However, students in all sites will learn about managing a poinsettia and a high-wire tomato crop.

Lecture instructor

Dr. Celina Gómez cgomezv@ufl.edu (p) 352-273-4568
Environmental Horticulture Dept. 2543 Fifield Hall

Laboratory instructors

On-campus

Dr. Celina Gómez

Off-campus

Dr. Mack Thetford thetford@ufl.edu (p) (850) 983-7130
West Florida Research and Education Center (WFREC)

Dr. Brian Pearson bpearson@ufl.edu (p) 407-410-6930
Mid-Florida Research & Education Center (MREC)

Teaching assistant (TA)

George Grant gagrnt@ufl.edu

Meeting times and location

On-campus

Lectures: Wednesday and Friday
8:30 am – 9:20 am (2nd period)
PSF5

Laboratory

Monday
8:30 am – 11:30 am (2nd through 4th period)
PSF 5; Greenhouse 1365

Off-campus

Lectures: 100% online

Laboratory (WFREC)

Tuesday
Time TBD
Location TBD

Laboratory (MREC)

Friday
Time TBD
UF/IFAS Hoop House #4036

Office hours by appointment. Please email your availability, and we will get back to you promptly with a time and location to meet.

Course description

This course will offer students foundational information on the principles of planning, organizing, and managing greenhouse operations for ornamental and vegetable plant production. Students will learn about current cultural practices and challenges faced by the industry, as well as how environmental factors are monitored and controlled in production facilities. Hands-on activities will focus on integrated crop management practices for commercial greenhouse production. Case studies and discussions of relevant literature will help prepare students for positions in the green industry.

Learning objectives

Upon successful completion of this course students will:

- Appreciate the responsibilities of greenhouse management.
- Demonstrate basic technical knowledge of the operations performed in a commercial greenhouse operation.
- Understand the methods of monitoring and manipulating environmental factors and cultural practices (e.g., light, temperature, fertilizer, containers, substrates, etc.) to maximize yields and quality and minimize costs and time.
- Understand the rapid evolution of production technologies in the greenhouse industry.

Course materials

The recommended textbooks for this course are:

- 'Greenhouse Operations and Management, 7th edition' by Nelson, P.V. (ISBN-13:978-0-13-243936-7). You are also encouraged to use the following textbooks as valuable reference sources:
- 'Ball Redbook Volume 1- Greenhouse and equipment, 18th edition' Chris Beytes ed. (ISBN-13:978-1-883052-67-6)
- 'Ball Redbook Volume 2- Crop production, 18th edition' Jim Nau ed. (ISBN-13: 978-1-883052-68-3)

Videos to supplement topics discussed in class will be made available as the semester progresses. Digital copies of this syllabus, as well as handouts, and other instructive materials will be delivered via canvas. *E-Learning in Canvas*, www.elearning.ufl.edu

All materials provided in class are considered testable.

GRADING FOR THE LECTURE SECTION

1. Quizzes on Virtual Field Trip (VFT) videos

300 points

VFTs will introduce students to some of the most relevant commercial facilities in North America. There will be 12 online quizzes during the semester, each worth 25 points and timed to 30 minutes. Quizzes will consist of 10 multiple-choice questions and can only be taken once. Quizzes will become available on Fridays at 5:00 PM, and they will be due Sunday at 11:59 pm. Students can refer to personal notes or any reference material to complete the quiz. However, each student must work individually. Make up quizzes will be provided in accordance with the policy described below. A brief group discussion will follow each quiz during the first part of each laboratory session.

2. Discussion posts

300 points

There are many popular magazine articles written for growers and consumers that provide valuable information that is easy to follow. At the beginning of each week, the instructor will post an article from popular media that highlights an advantage, challenge, or opportunity faced by the greenhouse industry. Students will write a three-sentence summary of the article followed by a 150-word reaction

piece (due Wednesday before midnight), and comment on at least two reaction pieces from classmates (due Sunday before midnight). Both the reaction piece and the comments are to be submitted in the Discussions tab in canvas (20 points each). Please note that no discussions will occur on weeks 1, 14, and 16-17.

Participation in the discussion will be graded on a weekly basis using the following rubrics:

Summary and reaction piece	Strongly disagree	Neither agree or disagree	Strongly agree
	Possible points		
	0-3	4-7	8-10
The summary and reaction piece were written following the assigned instructions (e.g., sentence number and minimum word requirement).			
Student provides a thoughtful reflection (personal feelings and application of the topic as it relates to their career) and critical analysis of the topic.			
The reaction piece has a clear purpose: inform, persuade, or raise an interesting question.			
The reaction piece is engaging and moves the conversation forward			
The reaction piece is written using proper grammar, punctuation, and vocabulary.			

Peer comments	Strongly disagree	Neither agree or disagree	Strongly agree
	Possible points		
	0-3	4-6	8-10
Comments are substantive and reflect that the student read and understood the classmates' reaction pieces.			
Comments adds to the reaction of the classmate by explaining how the classmate's post impacted them or offering an alternative viewpoint to the classmate.			
Comments are engaging and move the conversation forward.			
Comments address classmates and instructors in a respectful, professional manner.			
Comments are written using proper grammar, punctuation, and vocabulary.			

Important note: The reaction piece is not supposed to be another summary. It should instead focus on your impression or past experience regarding the main topic of the article.

3. Midterm

150 points

Students will have 2 hours during the laboratory session of week 8 to complete the exam which will consist of 30 open-ended and multiple-choice questions.

4. Scholar's Ignite

100 points

The Scholar's Ignite presentation is an exciting and fun assignment designed to provide an opportunity for you to generate awareness, stimulate thoughts, and inspire your peers with topics or ideas related to our class through a short 1-slide (to be emailed to the instructor at least 24 h before class), 3-minute presentation. You will be required to select a topic, prepare a presentation, and present your work to your peers. In addition, to encourage in-class discussion, each student in the audience is expected to ask at least two questions during the activity. This assignment is similar to presentations and competitions held at scientific conferences and other academic institutions.

You will be graded based on the following questions:

- Did the student submit the topic/slide on time? (10 points)
- Did the student dress appropriately to present in class? (10 points)
- Was the timing of the presentation within an acceptable range (± 10 secs)? (10 points)
- Communication style: how well did the presenter communicate the topic or information? (10 points)
- Comprehension: was the presenter clear and organized? (10 points)
- Inspiration and engagement: did the presentation inspire you? (10 points)
- Impact: did the presentation have a strong influence on your knowledge or perception of the topic? (20 points)
- Content: was the presentation content clear and well organized with information pertinent to the subject? (10 points)
- Did the student ask at least two questions to other classmates? (10 points)

Check with your instructor at least one week before the assignment is due regarding the suitability of your topic.

5. Final exam

150 points

The final exam will be a take-home comprehensive test. Students will be presented with a greenhouse production scenario and asked to select among available technologies, strategies, and tradeoffs. Students will have 24 hours to complete the take-home final exam. The final exam should be submitted as a .doc in Canvas. Students can use reference materials (class slides, textbooks, etc.), but they must work independently and cite their sources as appropriate.

GRADING FOR THE LABORATORY SECTION

1. Hands-on activities

500 points

Students will work in pairs for the hands-on activities throughout this course. All pairs will work collectively towards the same goal and will be evaluated by the laboratory instructor based on performance and workplace hygiene. In addition, after week four, each pair will manage the tomato crop for at least two random weeks and will be responsible for:

- Measuring and recording pH, EC, and volume of solution and leachate (send weekly report to the laboratory instructor)
- If needed, communicating suggestions to change the fertigation schedule with the laboratory instructor
- Pollinating all plants during non-lab days

Finally, all pairs should submit weekly comments about the poinsettia crop and provide progress images of the growth curves before Sunday at midnight. A .doc file should be emailed to our TA

(gagrants@ufl.edu), who will communicate with the laboratory instructor if there are any crop management changes to be made.

1. Debate

200 points

Scenario: Each student has been employed (sorry, for free) as a public relations consultant by a lobby group that will be arguing in front of a town meeting. You will be given one side of a topic. Regardless of personal views, each student will develop an argument in favor of their assigned topic and try to persuade the town folk (i.e. the rest of the class) in their viewpoint. Researching and arguing a viewpoint with which you may not agree will hopefully help you look critically at your own biases, develop the depth of your own viewpoint, and show that most environmental issues are not black and white. If you are not believable and do not try to be persuasive for your case, it will be reflected in the grade. Each student will present their argument in a 5-minute presentation using Powerpoint (no more than five slides). We will allocate 5 minutes to questions for each pair of students.

You will be graded on the following (20 points each):

- Were all terms clearly defined (e.g. “sustainable”, “organic”, etc.)?
- Is information presented in a logical, structured case, with a clear introduction, limited number (3-5) of well-argued points, followed by a strong conclusion? Do you build evidence to back up these points?
- Was background evidence convincing? Were sources believable and reputable? Is evidence based on anecdotes and emotions or is it scientific, factual and rational? (Emotions and anecdotes are fine, but by themselves and without some hard evidence they do not make a strong argument).
- Did you convince the audience that you believe in the case you are presenting? Was the oral presentation interesting, informative, and persuasive? Did you keep your audience engaged and listening?
- Were Powerpoint slides legible, without too much animation, clip art or gaudy colors that it made it distracting, free of spelling mistakes, and used to enhance, not replace, the presentation?

2. Final report

300 points

Throughout the semester, students will track plant growth and record maintenance tasks for the poinsettia and tomato crop. The final report should include all growth curves for poinsettias, and bar graphs of growth (new growth by week and final stem length) and yield (weekly and final fruit number and cluster mass) for tomatoes. In addition, students should take notes on dates when major events happened during production (e.g., for poinsettias: pinching, PGR application, spacing, first color, first bud, anthesis; for tomatoes: transplant date, first sign of a visible flower, first anthesis, first leaning and lowering event, harvests (all), time from pollination to harvest, de-topping) and include those details, along with relevant pictures and miscellaneous comments (e.g., presence of insects or diseases, physiological disorders) in the final report. To be submitted as a .doc in Canvas before December 7, 2018.

Grading scale for each section

895-1000	A	695-764	C
865-894	B+	665-694	D+
795-864	B	595-664	D
765-794	C+	<594	E

Attendance and make-up work: Requirements for class attendance and make-up exams, assignments, and other work are consistent with university policies that can be found at:

<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>.

On-campus students, please note that attendance is mandatory and 1% may be taken off final grade for each class missed. Official documentation for approved absences must be submitted within one week before or after your absence.

Lateness: In order to be fair to fellow students, 1% may be taken off final grade for each school day late.

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 (e.g. assignments, papers, exams). 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://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/>

Online course evaluation process: Student assessment of instruction is an important part of efforts to improve teaching and learning. At the end of the semester, students 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 <https://evaluations.ufl.edu>. Evaluations are typically open for students to complete during the last two or three weeks of the semester; students will be notified of the specific times when they are open. Summary results of these assessments are available to students at <https://evaluations.ufl.edu/results>.

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.

Campus helping resources: Students experiencing crises or personal problems that interfere with their general well-being are encouraged to utilize the university's counseling resources. The Counseling & Wellness Center provides confidential counseling services at no cost for currently enrolled students. Resources are available on campus for students having personal problems or lacking clear career or academic goals, which interfere with their academic performance.

University Counseling & Wellness Center, 3190 Radio Road, 352-392-1575, www.counseling.ufl.edu/cwc/

Counseling Services

Outreach and Consultation

Training Programs

Groups and Workshops

Self-Help Library

Community Provider Database

Career Resource Center, First Floor JWRU, 392-1601, www.crc.ufl.edu/

Services for students with disabilities: The Disability Resource Center 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. Students requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the Instructor prior to activities where accommodation will be requested.

Disability Resource Center, 0001 Reid Hall, 352-392-8565, www.dso.ufl.edu/drc/

Greenhouse and Nursery Crop Culture

ORH 4264 (Lecture)- 3 credits

Schedule – Fall 2018*

Wk	Date	Topic
1	22-Aug	Self-introductions and syllabus; WPS training session
2	29-Aug	Introduction to the industry
	31-Aug	Protected structures
3	5-Sep	Greenhouse construction and design
	7-Sep	Choosing greenhouse components
4	12-Sep	GH glazing
	14-Sep	Greenhouse environment 1: heating and cooling
5	19-Sep	Greenhouse environment 2: ventilation and CO2 enrichment
	21-Sep	Temperature effects on GH plant production
6	26-Sep	Greenhouse production and light intensity
	28-Sep	Controlling flowering and morphology with light quality and photoperiod
7	3-Oct	Substrates for the greenhouse industry
	5-Oct	Midterm review
8	10-Oct	Greenhouses for native plant production, Gabriel Campbell will lead the lecture (to be recorded for RECs)
	12-Oct	Homecoming, no class
9	17-Oct	Scholars ignite, group 1
	19-Oct	Scholars ignite, group 2
10	24-Oct	Water management
	26-Oct	Fertilization in the greenhouse (nutrient solutions and injector systems)
11	31-Oct	Regulating plant growth
	2-Nov	Pest and disease management in greenhouses
12	7-Nov	Common physiological disorders and production challenges in the greenhouse
	9-Nov	The greenhouse vegetable industry in FL, Emil Belibasis will lead the lecture (to be recorded for RECs)
13	14-Nov	Opportunities beyond ornamental and vegetable crop production in the GH, Dr. Jim Barrett will lead the lecture (to be recorded for RECs)
	16-Nov	Greenhouse mechanization
14	21-Nov	Thanksgiving break, no class
	23-Nov	Thanksgiving break, no class
15	28-Nov	UAV applications for the GH industry, Dr. Jim Robbins will lead the online lecture

	30-Nov	Postharvest handling
16	5-dic	Greenhouse sanitation and maintenance
	7-dic	Final review
17	10-dic	Final Exam available (24 h)

* Please note that this syllabus/schedule is subject to change. Changes, if any, will be announced in class.

Greenhouse and Nursery Crop Culture

ORH 4264L - 1 credit

Schedule – Fall 2018*

Tentative On-campus Laboratory Schedule

Wk	Date	Laboratory Topic	VFT Discussion
1	24-Aug	Introduction to high-wire greenhouse vegetable production	n/a
2	27-Aug	1) Pinch poinsettias; demonstrate On Target graphical tracking; start measuring poinsettias; 2) Continuation of high-wire production practices; start measuring vegetables	Bachman's
3	3-Sep	Holiday, no lab	AgriStarts
4	10-Sep	Lysimeter and pour-through measurement of leaching fraction, pH, and EC	Klassic Beauty
5	17-Sep	Walk-through greenhouse complex (dress appropriately); start maintenance if high-wire crops	Hines Hort.
6	24-Sep	Review of sensors and data to monitor the environment	Eurofresh
7	1-Oct	Debate	Van Wingerden
8	8-Oct	Midterm	n/a
9	15-Oct	Overview of substrate physical properties	SunGro
10	22-Oct	Food harvest and social work with food pantry	Masterplant
11	29-Oct	Space allocation	Sun Valley
12	5-Nov	AlkCalc, Back Pocket Grower, and Virtual Grower	Smith GHs
13	12-Nov	Holiday, no lab	n/a
14	19-Nov	Greenhouse pest monitoring	Raker and Sons
15	26-Nov	Grade poinsettia cultivars	Metrolina
16	3-dic	Greenhouse clean-up	n/a

Tentative WFREC Laboratory Schedule

Wk	Date	Laboratory Topic	VFT Discussion
1	n/a	No Lab. Classes start 22 August 2018	n/a
2	28-Aug	Introduction to high-wire greenhouse vegetable production and practices; start measuring vegetables; pinch poinsettias	Bachman's
3	4-Sep	Pinch poinsettias; demonstrate On Target graphical tracking; start measuring poinsettias	AgriStarts
4	11-Sep	Lysimeter and pour-through measurement of leaching fraction, pH, and EC	Klassic Beauty
5	18-Sep	Walk-through greenhouse complex (dress appropriately); start maintenance if high-wire crops	Hines Hort.
6	25-Sep	Review of sensors and data to monitor the environment	Eurofresh
7	2-Oct	Debate	Van Wingerden
8	9-Oct	Midterm	n/a
9	16-Oct	Overview of substrate physical properties	SunGro
10	23-Oct	Food harvest and social work with food pantry (tentative)	Masterplant
11	30-Oct	Space allocation	Sun Valley
12	6-Nov	AlkCalc, Back Pocket Grower, and Virtual Grower	Smith GHs
13	13-Nov	Scholars Ignite Activity – more information to follow from Gainesville.	n/a
14	20-Nov	Local lab activity (Farm to City food distribution program at WFREC)	Raker and Sons
15	27-Nov	Greenhouse pest monitoring; Raker and sons VFT discussion	Metrolina
16	4-Dec	Greenhouse clean-up	n/a

Tentative MREC Laboratory Schedule

Wk	Date	Laboratory Topic	VFT Discussion
1	n/a	No Lab. Classes start 22 August 2018	n/a
2	31-Aug	Introduction to high-wire greenhouse vegetable production and practices; start measuring vegetables	Bachman's
3	7-Sep	Pinch poinsettias; demonstrate On Target graphical tracking; start measuring poinsettias	AgriStarts
4	14-Sep	Lysimeter and pour-through measurement of leaching fraction, pH, and EC	Klassic Beauty
5	21-Sep	Walk-through greenhouse complex (dress appropriately); start maintenance if high-wire crops	Hines Hort.
6	28-Sep	Review of sensors and data to monitor the environment	Eurofresh
7	5-Oct	Debate	Van Wingerden
8	12-Oct	Midterm	n/a
9	19-Oct	Overview of substrate physical properties	SunGro
10	26-Oct	Food harvest and social work with food pantry ((Second Harvest Food Bank of Central Florida)	Masterplant
11	2-Nov	Space allocation	Sun Valley
12	9-Nov	AlkCalc, Back Pocket Grower, and Virtual Grower	Smith GHs
13	16-Nov	Scholars Ignite Activity – more information to follow from Gainesville.	n/a
14	23-Nov	Holiday, no lab	Raker and Sons
15	30-Nov	Greenhouse pest monitoring; Raker and sons VFT discussion	Metrolina
16	7-Dec	Greenhouse clean-up	n/a