Greenhouse and Nursery Crop Culture
ORH 4264 (3 credits)/ ORH 4264L (1 credit)
Fall 2019

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. Kimberly Moore
Fort Lauderdale Research and Education Center — klock@ufl.edu (p) 954-577-6328

Teaching assistants (TAs)

Yuvraj Khamare — ykhamare@ufl.edu
Marlon Retana — mretanacordero@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; Greenhouses 1365

Off-campus

Lectures:	100% online
Laboratory (RECs)	Day, time, and location TBD

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. Weekly quizzes: Virtual Field Trip (VFT) videos + modules' material 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 evaluating material about the VFTs and the weekly lectures. Each quiz will be worth 25 points will consist of 10 multiple-choice questions (5 about each VFT and 5 about each module's material). Quizzes will be timed to 60 minutes and can only be taken once. Each quiz will become available on Friday 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. For part A (due Wednesday before midnight), students will write a three-sentence summary of the article followed by a 150-word reaction piece. In addition, each student must provide one question

about the article to prompt discussions. For part B (due Sunday before midnight), students must comment on at least two reaction pieces from different classmates. At least one comments should attempt to answer a question raised by another student. Both the reaction piece and the comments are to be submitted in the Discussions tab in canvas (20 points). Late posts for part A will not receive credit.

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, reaction piece, and question 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	4-7	8-10
Comments are substantive and reflect that the student read and understood the classmates' reaction pieces.			
Comments answered a pending question and move the conversation forward.			
Comments are engaging and add to the reaction of the classmate by explaining how the classmate's post impacted them or offering an alternative viewpoint to the classmate.			
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. 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.

4. Exams **300 points**

Students will have 2 hours during the laboratory session of weeks 7 and 11 to complete the in-class exams, which will consist of 20 open-ended and multiple-choice questions. 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 48 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, extension bulletins, research papers, etc.), but they must work independently and cite their sources as appropriate. Each exam will be worth 100 points.

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 attendance, performance, and workplace hygiene. In addition, each pair will manage the tomato crop for at least one random week and will be responsible for:

- Measuring and recording pH, EC, and volume of solution and leachate (send daily 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, who will communicate with the laboratory instructor if there are any crop management changes to be made.

2. Final report **500 points**

Throughout the semester, students will track plant growth and record maintenance tasks for the poinsettia and tomato crop. Students should keep track of dates when major events happened during production (e.g., for poinsettias: pinching, PGR application, spacing, first color, first bud, anthesis; for the tomato crop: sowing, grafting, and transplant date, first sign of a visible flower, first anthesis, first leaning and lowering event, harvests (all), time from pollination to harvest, de-topping). In addition, students must keep records of relevant pictures and miscellaneous comments (e.g., presence of insects or diseases, physiological disorders, environmental changes) to be included in the final report. To be submitted as a *.doc* in Canvas before December 7, 2019.

You will be graded based on the following:

- Introduction that describes the objectives of the activities conducted throughout the semester (100 points)
- Detailed description about the poinsettia crop, with information about critical production processes/steps (and explanations about the purpose of each process), pictures highlighting the different stages of production, and final OnTarget graphs (100 points)
- Detailed description about the tomato crop, with information about the production environment, critical production processes/steps (and explanations about the purpose of each process), and pictures highlighting the different stages of production. In addition, this section must include graphs showing trends for growth (new growth by week and final stem length) and yield (weekly and final fruit number and cluster mass) (100 points).
- Description of challenges faced during the production of both crops and suggestions to overcome the challenges encountered (100 points).
- Reflection about the value of the laboratory activities to your professional development (100 points).

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/

Course evaluation: 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/.

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	Groups and Workshops
Outreach and Consultation	Self-Help Library
Training Programs	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 (3 credits)/ ORH 4264L (1 credit)
Schedule – Fall 2019*

Module	Date	Topic	VFT
1	8/21/2019	Self-introductions and syllabus	n/a
	8/23/2019	WPS training session	
2	8/26/2019	Laboratory: Pinch poinsettias; demonstrate On Target graphical tracking; start measuring poinsettias; sow vegetable crop	Bachman's
	8/28/2019	Introduction to the industry	
	8/30/2019	Protected structures	
3	9/2/2019	No laboratory due to Holiday	AgriStarts
	9/4/2019	Greenhouse construction and design	
	9/6/2019	Choosing greenhouse components	
4	9/9/2019	Laboratory: Pour-through measurement of leaching fraction, pH, and EC; graft vegetable crop	Klassic Beauty
	9/11/2019	GH glazing	
	9/13/2019	Greenhouse environment 1: heating and cooling	
5	9/16/2019	Laboratory: Walk-through greenhouse complex (dress appropriately and bring water)	Hines Hort.
	9/18/2019	Greenhouse environment 2: ventilation and CO2 enrichment	
	9/20/2019	Temperature effects on GH plant production	
6	9/23/2019	Laboratory: Transplant vegetable crop; review of sensors and data to monitor the environment	Eurofresh
	9/25/2019	Greenhouse production and light intensity	
	9/27/2019	Controlling flowering and morphology with light quality and photoperiod	
7	9/30/2019	Exam 1	Van Wingerden
	10/2/2019	Substrates for the greenhouse industry	
	10/4/2019	Soilless culture and hydroponics	
8	10/7/2019	Laboratory: Overview of substrate physical properties	SunGro
	10/9/2019	Regulating plant growth	
	10/11/2019	***Homecoming, no class***	
9	10/14/2019	10	Masterplant
	10/16/2019	Water quality and irrigation	
	10/18/2019	Fertilization in the greenhouse	

Module	Date	Topic	VFT
10	10/21/2019	Laboratory: Fertilizer calculation and overview of online tools: AlkCalc, Back Pocket Grower, e-GRO, and Virtual Grower	Sun Valley
	10/23/2019	Pest and disease management in greenhouses (recorded lecture)	
	10/25/2019	Common physiological disorders and production challenges in the greenhouse	
11	10/28/2019	Exam 2	Smith GHs
	10/30/2019	Greenhouse mechanization	
	11/1/2019	UAV applications for the GH industry, Dr. Jim Robbins will lead the online lecture	
12	11/4/2019	Laboratory: Greenhouse pest monitoring	Metrolina
	11/6/2019	The greenhouse vegetable industry in FL, Emil Belibacis will lead the lecture	
	11/8/2019	Greenhouse economics, Dr. Adam Watson will lead the lecture	
13	11/11/2019	***No laboratory due to Holiday***	Raker and Sons
	11/13/2019	Scholars ignite, group 1	
	11/15/2019	Scholars ignite, group 2	
14	11/18/2019	Opportunities beyond ornamental and vegetable crop production in the GH, Dr. Jim Barrett will lead the lecture	n/a
	11/20/2019	Postharvest handling	
	11/22/2019	Greenhouse sanitation and maintenance	
15	11/25/2019	Laboratory: Greenhouse clean-up	n/a
	11/27/2019	***Thanksgiving break, no class***	
	11/29/2019	***Thanksgiving break, no class***	
16	12/2/2019	Final review	n/a
	12/4/2019	***No class***	
	12/7/2019	Final Exam available (48 h)	

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