



Horticultural Physiology

HOS 6932 - 3 CREDITS

Monday and Wednesday 9:35 AM to 10:25 AM (3rd period)

Friday 9:35 AM to 11:30 AM (3rd and 4th periods)

Fall 2021

COURSE FORMAT

This is a 100% online, synchronous course. Course lectures and interactive activities will take place during our scheduled meeting time (see above). Attendance is mandatory, but lecture videos will be published as an additional tool to supplement student learning. Links and all other learning materials will be published in Canvas. This course also includes a journal club to be scheduled during the first week of class.

INSTRUCTOR

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Fifield Hall 1113

(352) 273 - 4765

Office hours: Mondays 2:00 PM to 3:00 PM via Zoom

COURSE DESCRIPTION

This course covers basic concepts and processes of plant physiology, including water relations, ion uptake, photosynthesis, respiration, and source-sink relations with an emphasis on horticultural crops.

LEARNING OBJECTIVES

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

- Summarize the physical and biological principles by which plants take up and transport water and ions
- Summarize the photochemical and biochemical phenomena that mediate carbon fixation and energy flux in photosynthesis and respiration
- Synthesize how environmental conditions and cultural practices impact water and nutrient uptake, photosynthesis, respiration, and - ultimately - horticultural productivity
- Analyze and critique primary literature focused on plant physiology
- Interpret plant physiology data and write scientific conclusions
- Moderate a journal club discussion about a recently published plant physiology article

COURSE MATERIALS

Textbooks

There is no required textbook for this course. The following textbook can be used to supplement and extend lecture topics.

- Fundamentals of Plant Physiology Taiz, Zeiger, Moller, & Murphy (ISBN 9781605357904)

Reading list

These are examples of the scientific articles that will be discussed during the course journal club.

- Re-evaluating pressure chamber methods of water status determination in field-grown grapevine (*Vitis* spp.) – Levin <https://doi.org/10.1016/j.agwat.2019.03.026>
- Drought Tolerance of Navajo and Lovell Peach Trees: Precision Water Stress Using Automated Weighing Lysimeters – Wheeler et al. <https://doi.org/10.21273/HORTSCI13806-18>
- Signal coordination before, during and after stomatal closure in response to drought stress – Bauerle et al. <https://doi.org/10.1111/nph.16082>
- Contribution of Glycine Betaine and Proline to Water Deficit Tolerance in Pepper Plants – Escalante-Megana 2019 <https://doi.org/10.21273/HORTSCI13955-19>
- Resilient and Sensitive Key Points of the Photosynthetic Machinery of *Coffea* spp. to the Single and Superimposed Exposure to Severe Drought and Heat Stresses – Dubberstein et al. <https://doi.org/10.3389/fpls.2020.01049>
- Relating Whole-plant Photosynthesis to Physiological Acclimations at Leaf and Cellular Scales under Drought Stress in Bedding Plants – Nemali and van Iersel <https://doi.org/10.21273/JASHS04665-19>
- Influence of High Temperature on Photosynthesis, Antioxidative Capacity of Chloroplast, and Carbon Assimilation among Heat-tolerant and Heat-susceptible Genotypes of Nonheading Chinese Cabbage – Yuan et al. <https://doi.org/10.21273/HORTSCI12259-17>
- Photosynthesis, growth, and water use of *Hydrangea paniculata* ‘Silver Dollar’ using a physiological-based or a substrate physical properties-based irrigation schedule and a biochar substrate amendment – Jahromi <https://doi.org/10.1007/s00271-020-00670-7>
- Physiological Changes in *Mesembryanthemum crystallinum* During the C3 to CAM Transition Induced by Salt Stress – Guan et al. <https://doi.org/10.3389/fpls.2020.00283>
- Differential source-sink manipulation affects leaf carbohydrate and photosynthesis of early- and late-harvest nectarine varieties – Andrade et al. <https://doi.org/10.1007/s40626-019-00150-0>
- Revisiting the role of carbohydrate reserves in fruit set and early-season growth of apple – Tustin et al. <http://dx.doi.org/10.1016/j.scienta.2019.109034>

Course Website

This course has a comprehensive mini-site in Canvas. Take time to familiarize yourself with the course site. Digital copies of this syllabus, and other learning materials can be found there.

- *E-Learning in Canvas*, www.elearning.ufl.edu

Technology

This is an online course. Thus, access to reliable technology is paramount to student success. You will need to have access to a personal computer, web camera, and microphone to attend lectures, participate in class, and take exams. **Your camera must be turned on for the duration of class.** Please, be mindful of your appearance and surroundings.

You will also need to have access to broadband internet. **Your internet connection should allow for a smooth web conference experience or smooth video playback.** If you have trouble streaming videos (e.g., from Hulu or Netflix) on your WiFi connection, you will not be able to take an online exam. Mobile phones (“Hot Spots” or data) are almost certainly not a good idea.

COURSE GRADE

1. Exams

45 points

The purpose of these assessments is to evaluate student content retention and ability to synthesize information. Students will be evaluated through three cumulative exams administered in Canvas with HonorLock. Each exam will be graded out of 15 points. Exams will include short- and long-answer questions focused on the most-recent 5 weeks of lecture material. Exams #1 and #2 will take place during regularly scheduled classes. Exam #3 will take place during finals week at the time indicated by the University Registrar (see dates below). Practice exams will be available a week before each exam and an after-hours review session will be held the evening before each exam.

Exam	Date
Exam #1	09/29/21
Exam #2	11/03/21
Exam #3	12/16/21 3:00 PM – 5:00 PM

2. Homework

20 points

The purpose of these assignments is to connect experimental data with plant physiology concepts and scientific writing. Students will receive data from a simple horticulture physiology experiment. Then, they will analyze the data using statistical software, illustrate the data as publication-ready graphs, and summarize the findings in a brief (< 500 words) scientific report. Students can refer to personal notes, textbooks, online tutorials, and other sources, but they must work individually. Scripts for statistical analysis using R will be provided by the instructor, but students can use any software they prefer. Homework assignments will be submitted through Canvas and processed with originality-checking software. There will be three homework assignments in the semester; each will be graded out of 10 points. The two highest scores from each student will be used to compute the homework final grade.

3. Journal Club

35 points

The purpose of this exercise is to expose students to the plant physiology research environment (journals, methods, approaches, etc.), practice clear and effective communication, and expand on the knowledge covered during lectures. We will focus on whole-plant physiology articles published in reputable, peer-reviewed journals (e.g. JASHS, Tree Physiology, JBSA, JXB etc.) within the past five years. The instructor will provide a list of articles that will be discussed during the semester. Students will select an article and date to moderate the discussion. Moderators will prepare a presentation where they share the strengths and weaknesses of the article at hand. Subsequently, they will moderate the academic debate about this article. All students will prepare a 500-word written valuation and 3 questions about the article at hand. Both moderators and discussants will participate in the oral discussion of the article. A total of 35 points can be earned from the following components:

Role	Assessment	Points possible
Moderator	Presentation	10 points
Discussant	Journal club participation	10 points
Both	Article evaluation	15 points

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

COURSE POLICIES

Attendance

Students are encouraged to attend every class. Attendance will be taken based on the screen name you use in Zoom. Your screen name must be your first name and last-name initial (for example, my screen name will be Gerardo N.). For additional help on how to customize your Zoom profile, see this resource:

- *Customizing your profile*, <https://support.zoom.us/hc/en-us/articles/201363203-Customizing-your-profile>

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, journal club discussions, or assignments are due. Subsequent unexcused absences will make you ineligible for all extra credit assignments.

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

- *Attendance policy*, www.catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx

Zoom Etiquette

Students are expected to be respectful learners. As such, you should arrive to and leave from class on time. Your camera must be turned on for the duration of our class, but your microphone can be muted. You should be ready to answer questions using your microphone. The chat feature must be used exclusively for course-related communication. Links and files should be shared and transferred using Canvas and email as appropriate (Zoom is not an acceptable method for assignment submission).

Challenging a Grade

All discrepancies in grading must be resolved within 7 days of the grade being posted in canvas. The instructor's memory is frail. Thus, grade disputes older than 7 days old will not be entertained unless proper excuse is provided (see attendance policy).

Email

Email will be the main means of communication between us. Hence, it is critical that all course-related emails are polite, professional, and as different from a text message as possible. You must use your Gator Link email. Canvas messages will not be answered. I will reply to all emails within 2 business days of receiving them. For additional recommendations, consult:

- *Email etiquette*, <https://www.inc.com/business-insider/email-etiquette-rules.html>

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 toolbox. Thus, I place great emphasis on coaching and participating in professional, context-specific written communication. Proper spelling, grammar, and punctuation are expected in all course assignments. 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/

Academic Honesty

UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students 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."**

The Honor Code specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class. For more information regarding the Student Honor Code, please see:

- *UF Honor Code*, <http://www.dso.ufl.edu/sccr/process/student-conduct-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 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 confidential counseling services at no cost for currently enrolled. Additionally, resources are available on campus for students having personal problems or lacking clear career or academic goals, which interfere with their academic performance.

- *Counseling and Wellness Center*, 3190 Radio Road, 392-1575, www.counseling.ufl.edu
- *Career Connections Center*, CR-100 Reitz Union, 392-1601, www.career.ufl.edu
- *U Matter We Care*, www.umatter.ufl.edu/
- *Student Success Initiative*, <http://studentsuccess.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.disability.ufl.edu

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 professional and respectful feedback on the quality of instruction in this course. Guidance on how to give feedback in a professional and respectful manner is available here:

- *Providing professional and respectful feedback*, <https://gatorevals.aa.ufl.edu/students/>

Students will be notified when the evaluation period opens, and they can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via:

- *Course evaluations*, <https://ufl.bluera.com/ufl/>

Student Complaints

You can file and resolve any complaints about your experience in this course in the following site:

- *Student complaints in online courses*, www.distance.ufl.edu/student-complaint-process

Diversity

The University of Florida and the instructor 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.

HORTICULTURAL PHYSIOLOGY

Schedule of Topics

Fall 2021

Week of	Lecture topics
Aug 23	Introduction to the course Plant cells, tissues, and organs
Aug 30	Water potential and stomatal function
Sep 7	Long distance water movement and transpiration
Sep 13	Daily transpiration patterns Factors affecting transpiration
Sep 20	Ion movement across the plasma membrane Isohydric and anisohydric species
Sep 27	Light-dependent reactions of photosynthesis
Oct 4	CO ₂ fixation reactions (C3)
Oct 11	CO ₂ concentrating mechanisms (C4 and CAM) Factors affecting photosynthesis
Oct 18	Photosynthesis in a changing planet
Oct 25	Sucrose and starch synthesis
Nov 1	Glycolysis and the TCA cycle Electron transport and ATP synthesis
Nov 8	Alternative pathways for respiration Factors affecting respiration
Nov 15	Phloem loading and unloading Phloem translocation
Nov 22	Source-sink competition
Nov 29	Source-sink management and premium produce
Dec 6	Carbohydrate fluxes in woody perennials
Final Exams week	Exam #3