

HYDROPONIC SYSTEMS

PLS 3421C – 3 credits (in-person)

Spring 2026

MEETING TIMES AND LOCATION

Wednesday 11:45 am – 12:35 pm (5th period) PSF5

Friday 8:30 am – 10:25 am (2nd-3rd period) PSF5 and Teaching greenhouse

INSTRUCTOR: Dr. Yuyao Kong yuyao.kong@ufl.edu

Horticultural Sciences Dept. 2551 Fifield Hall

Office hours: Mondays 12:00PM - 2:00PM

TA: Madison Goeppinger email TBD

PRE-REQUISITES HOS 3020C or PLS 3004C

PRE-REQUISITE KNOWLEDGE

Students are expected to be familiar with basic solution calculations (percentages, dilutions, and concentrations) and plant cultivation concepts.

COURSE DESCRIPTION

This course offers students foundational information and hands-on experience on hydroponic and soilless cultivation of horticultural crops. Production practices, growing systems, new technologies, and current challenges are discussed.

LEARNING OBJECTIVES

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

- Describe essential components of single-pass and recirculating hydroponic systems
- Compare different substrates and hydroponic system designs
- Interpret water quality analysis results and recommend corrections

- Create nutrient solutions using salts or mixed fertilizers
- Evaluate the importance of water quality, dissolved oxygen, salinity, and pH management for hydroponic production
- Select hydroponic systems for production of leafy greens, herbs, and small fruit vegetables
- Apply solution chemistry knowledge and plant biology concepts to manage hydroponic systems

COURSE MATERIALS

There is no required textbook for this course. These two textbooks are valuable reference sources.

- Hydroponics for the Home Grower – Howard M. Resh ISBN 978-1-14822-3926-3
- How to hydroponics – Keith Roberto ISBN 0-96-72026-0-4

Digital copies of this syllabus, as well as handouts, videos, and other instructive materials will be delivered via canvas. Maps to all locations relevant to the course will also be available here.

- *E-Learning in Canvas, [elearning.ufl.edu](#)Links to an external site.*

Sun protection and hydration should be your personal priorities. More information on sun protection can be found [here](#).

- *Summer Sun Safety – Moffit Cancer Center, <https://www.moffitt.org/taking-care-of-your-health/taking-care-of-your-health-story-archive/practicing-sun-safety/Links to an external site.>*

COURSE GRADE

1. Quizzes #1-2 (15 points each = 30 points) 9.1%

Each quiz will be worth 10 points, and there will be 2 quizzes during the semester. Each quiz will be timed to 15 minutes, and it can only be taken once. Multiple-choice, true/false, and or calculation questions may be included. Each quiz will be available in Canvas for 3 days before due date on Sunday at 11:59 PM. Students can refer to personal notes, websites, or any reference materials to complete the quiz. However, each student must work individually. Make-up quizzes will be provided in accordance with the policy described below.

2. Exams (midterm and final exams, 100 points each = 200 points) 60.6%

There will be two comprehensive exams (midterm and final), each worth 100 points. Multiple choice, true/false, calculation, short answer, and essay questions may be included on each exam. Exams will only cover materials directly presented or discussed during class unless otherwise noted. Make-up exams will be provided in accordance with the policy described below.

3. Lab activity (20 points) 6.1%

This course includes nine hands-on practical activities where students get to assemble, operate, disassemble, and sanitize hydroponic systems. We will meet in person as a group to receive instructions and carry out demonstrations for the practicum. Students will work in pairs. Every meeting of the practicum will be graded. Participation in the practical activities will be evaluated by your peers and the instructor after each activity using the following rubric. Peer evaluation scores from each activity will be added to the instructor score. The average of scores in all activities will be the total score for the practicum.

Practicum Rubric					
Points possible à	Poor (1 point)	Fair (2 points)	Good (3-4 points)	Excellent (5 points)	
Interaction With Group	No participation	Minimal participation and interest	Good participation and shows interest in team activities	Very good to outstanding levels of participation and shows strong ability to manage tasks in an equal manner.	
Following Procedure	Lacks the appropriate knowledge of the procedures.	Demonstrates general knowledge of the procedures.	Demonstrates good knowledge of the procedures.	Demonstrates sound knowledge of procedures.	
	Often requires help from the professor to	Asks questions to professor that are for help with answered in the	Relies on peers	Exemplifies strong critical thinking skills with peers to	
			problems in lab		

	complete basic procedures.	procedure, more than once.	procedures before asking the professor.	solve problems in procedures.
Points possible à	Poor (1 point)	Fair (2 points)	Good (3-4 points)	Excellent (5 points)
Safety and Housekeeping	Proper safety and crop management precautions are consistently missed. Professor required to complete cleanup.	Proper safety and crop management precautions are often missed. Needs to be reminded more than once to maintain proper cleanup procedures.	Proper safety precautions and crop management procedures are generally used. Workplace generally left clean.	Consistently uses proper clean-up and crop management procedures. Work area left neat and clean, pitches in to help others clean up and directs others to do the same.

4. Lab reports (15 points each = 75 points) 22.7%

This course includes nine hands-on practical activities and five of them need to be documented in lab reports format. The instructor will hand out lab instruction before each activity section. Details of lab report will be provided in lab instructions.

5. Attendance (5 points) 1.5%

Class attendance will account for 5 points. Students who don't miss more than 2 classes in the entire semester will earn 5 points towards the course grade. Accommodations will be provided for illness/ health conditions with doctors note.

GRADING SCALE

Letter grades will be assigned according to the following scale:

A = 93 – 100 %

A- = < 93 - 90 %

B+ = < 90 - 87 %

B	=	< 87 - 83 %
B-	=	< 83 - 80 %
C+	=	< 80 - 77 %
C	=	< 77 - 73 %
C-	=	< 73 - 70 %
D+	=	< 70 - 67 %
D	=	< 67 - 63 %
D-	=	< 63 - 60 %
E	=	< 60 %

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

- *Grading policy*, <https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>
Link s to an external site..

Hydroponic Systems
PLS 3421C (3 credits)
Schedule – Spring 2026*

Date	Topic
01/14/2026	Introductions and syllabus
01/16/2026	Hydroponics basics and applications (1) WPS training session
01/21/2026	Hydroponics basics and applications (2)
01/23/2026	Soilless substrate Laboratory: Soilless substrate EC and pH measurement
01/28/2026	Water quality (1)
01/30/2026	Water quality (2) Laboratory: nutrient solution preparation and seeding in trays
02/04/2026	Nutrient management (1)
02/06/2026	Nutrient management (2)
02/11/2026	Aerial environment in hydroponic production-light (1)
02/13/2026	Laboratory: Set up DWC and ebb and flow systems and transplant
02/18/2026	Aerial environment in hydroponic production-light (2)
02/20/2026	Aerial environment in hydroponic production-temperature Laboratory: start seeding for NFT system

02/25/2026	Lettuce and microgreens production
02/27/2026	Strawberry production (1) Laboratory: set up NFT system and transplant
03/04/2026	Strawberry production (2)
03/06/2026	Midterm exam
03/11/2026	Tomato production
03/13/2026	Cucumber production
03/18/2026	Spring break
03/20/2026	Spring break
03/25/2026	Organic hydroponics (1) (guest lecture)
03/27/2026	Organic hydroponics (2) (guest lecture) Laboratory: Plants and systems maintenance
04/01/2026	Hydroponic water treatment (guest lecture)
04/03/2026	Laboratory: Microgreen planting
04/08/2026	Aquaponics (1)
04/10/2026	Aquaponics (2) Laboratory: Plants and systems maintenance
04/15/2026	Indoor farming
04/17/2026	Laboratory: Harvest and clean up
04/22/2026	Cleaning and sanitation in hydroponic systems
04/24/2026	Reading day
04/29/2026	Final exam

Disclaimer: This syllabus and schedule of topics reflect my current plans and objectives. As the semester progresses, adjustments may be necessary to improve learning opportunities or accommodate guest speakers. Any changes will be announced in class and on Canvas. Updated versions of the syllabus will be posted when plans change.

Course Policies and Campus Resource

Grades and Grade Points

For information on current UF policies for assigning grade points, see <https://catalog.ufl.edu/UGRD/academic-regulations/grades-grading-policies/>.

Fees: Distance education- \$20.00.

Attendance and Make-Up Work

Requirements for class attendance, assignments, and other work are consistent with university policies that can be found at: <https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/>.

Accommodations 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. See the

“Get Started With the DRC” webpage on the Disability Resource Center site. 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 education 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 an 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, field trips, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), conversations between students in the class, or between a student and the faculty or guest lecturer during a class session. Publication without permission from 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.

Online Course Evaluation Process

Student assessment of instruction is an important part of efforts to improve teaching and learning. Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online.

Students can complete evaluations in three ways:

1. The email they receive from GatorEvals,
2. Their Canvas course menu under GatorEvals, or
3. The central portal at <https://my-ufl.bluera.com>

Guidance on how to provide constructive feedback is available at <https://gatorevals.aa.ufl.edu/students/>. Students will be notified when the evaluation period opens. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>.

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 Conduct Code specifies a number of behaviors that are in violation of this code and the possible sanctions. See the UF Conduct Code website for more information. If you have any questions or concerns, please consult with the instructor or TAs in this class.

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, quizzes, exams). It is your 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: (New Link: <https://policy.ufl.edu/regulation/4-040/>)

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.

The Whole Gator App and website connect UF students with resources dedicated to supporting overall health and well-being. In addition to many of the resources below, it also has strategies to practice self-care. <https://one.uf.edu/whole-gator/topics>

- **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.
- Hitchcock Field and Fork Pantry. Food and toiletries for those experiencing food insecurity.
- Student Success Initiative, <http://studentsuccess.ufl.edu>.

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. Call 866-281-6309 or email ask@ufl.libanswers.com for more information.
- Teaching Center: 1317 Turlington Hall, 352-392-2010 or to make an appointment 352- 392-6420. General study skills and tutoring. • Writing Studio: Daytime (9:30am-3:30pm): 2215 Turlington Hall, 352-846-1138 | Evening (5:00pm-7:00pm): 1545 W University Avenue (Library West, Rm. 339). Help brainstorming, formatting, and writing papers.
- Academic Complaints: Office of the Ombuds; Visit the Complaint Portal webpage for more information.
- Enrollment Management Complaints (Registrar, Financial Aid, Admissions): View the Student Complaint Procedure webpage for more information. • Dean of Students Office. 202 Peabody Hall, 392-1261. Among other services, the DSO assists students who are

experiencing situations that compromise their ability to attend classes. This includes family emergencies and medical issues.

Student Complaints

- Residential Course: <https://www.ombuds.ufl.edu/complaint-portal/>
- Online Course: <https://pfs.tnt.aa.ufl.edu/state-authorization-status/#student-complaint>