

AOM4932

Controlled Environment Agriculture Principles and Practice

Credits: 3

Class Periods: M & W: 5th & 6th periods, from 11:45 pm to 1:40 pm

Location: 283 Frazier-Rogers Hall

Academic Term: Spring 2024

Catalog Description

Sensors and instruments for monitoring growing environment in controlled environment agriculture will be introduced. Students will learn how to evaluate production systems, monitor environmental variables, control growing conditions, and design experiments.

Course Description

This course aims to teach students the principles and techniques in Controlled Environment Agriculture. Sensors and instruments to track environmental parameters will be introduced to the class for measuring light intensity and quality, temperature, humidity, carbon dioxide, air flow, water, etc. Students will learn how to evaluate production systems, monitor environmental variables, and control growing conditions. At the end of this course, environmental control technologies, experimental design methods, and maintenance guidelines will be covered to build fundamental knowledge for scientific research and farm operations.

Instructor

Ying Zhang

Email Address: yingzhang409@ufl.edu

Office Phone: (352)294-6864

Office Hours: MWF 7th and 8th Periods (1:55pm – 3:50pm), at Frazier Rogers Hall room 103, or by Appointment

When contacting the instructor, please allow up to 48 hours for a response, not including weekends or holidays.

Course Pre-Requisites / Co-Requisites

Junior standing

Course Objectives

Students, upon completing this course, will be able to:

- a. Recognize the advantages, complexities, and problems associated with environmental controls
- b. Measure environmental variables affecting plant growth and development under controlled environments
- c. Analyze environmental data for scientific research
- d. Apply different control algorithms on climate controls
- e. Build a data acquisition system for controlled environment plant production systems
- f. Design experiments with statistical analysis

Materials and Supply Fees

Not Applicable

Required Textbooks and Software

Handouts and online material will be provided to students that will serve as a textbook.

Recommended Materials

- Greenhouse Operation and Management, Paul V. Nelson, 2011, 7th Edition, ISBN number: 978-0132439367

Course Schedule

For the weeks with planned lecture and lab sections, the lecture will be given in the first meeting, and lab activities will be planned for the following meeting. From Week 12, no lectures and lab sections will be provided. The instructor will mentor students in developing and conducting term projects in the classroom.

Week 1:	Lecture: Introduction to Controlled Environment Agriculture & Environmental Factors
Week 2:	Lecture: Data collection and measurement/ Lab: Introduction/ Homework 1
Week 3:	Lecture: Temperature management / Lab: Temperature measurement/ Homework 2
Week 4:	Lecture: Solar radiation/ Lab: light spectrum measurement/ Homework 3
Week 5:	Lecture: Lighting systems/ Lab: Lighting system design/ Homework 4
Week 6:	Lecture: Water and nutrient delivery/ Lab: Irrigation system control / Homework 5
Week 7:	Lecture: Plant nutrient and the root zone environment/ Lab: PH and EC measurements/ Homework 6
Week 8:	Review/Midterm Exam
Week 9:	Lecture: Air environment/ Lab: Greenhouse tours/ Homework 7
Week 10:	Lecture: Humidity Management/ Lab: Humidity measurement/ Quiz 1
Week 11:	Lecture: Experimental Design / Quiz 2
Week 12:	Lab: Term project meetings
Week 13:	Lab: Term project meetings
Week 14:	Lab: Term project meetings
Week 15:	Lab: Term project meetings/ Term project presentations

Attendance Policy, Class Expectations, and Make-Up Policy

Attendance. Attendance (on time) at lectures is expected from all students at all times and will be recorded at every class meeting. 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/UGRD/academic-regulations/attendance-policies/>.

Late Submission of Course Work. All coursework (including, but not limited to: assignments, quizzes, exams, and term projects) must be submitted no later than the due date unless prior arrangements are made with the mentor and a new due date is established. Assignments submitted late without having made arrangements with the mentor, but before 5:00 PM on the day following the due date, will be marked down 10 points. Assignments returned late before 5:00 PM on the second day following the due date will be marked down 50 points. No assignments will be accepted after 5:00 PM on the third day following the due date. Students with documented evidence of an emergency that prevented prior communication with the mentor may present documentation to the mentor for consideration.

Make-up Exams. No make-up exams will be given except for excused absences or unless prior arrangements have been made.

Evaluation of Grades

Assignment	Percentage of Final Grade
Attendance	10%
Homework Assignments (7)	25%

<i>Assignment</i>		<i>Percentage of Final Grade</i>
Quizzes (2)		10%
Midterm Exam		25%
Term Project		30%
Total		100%

Attendance (100 pts.). Attendance (on time) at lectures is expected from all students at all times and will be recorded at every class meeting with a sign-in sheet. The attendance score for each student will be calculated according to the missed percentage of the class meetings without excused absences. Attendance will be weighted at 10% for the final course grade.

Homework Assignments (100 pts. each). Each homework assignment will be worth 100 points and there will be 7 assignments to complete during the semester. **Homework assignments will become available on Friday at 12:00 PM, and they will be due next Friday at 11:59 pm.** Make up assignments will be provided in accordance with the attendance policy described under **Attendance**. Homework assignments account for 25% of your final grade.

Quizzes (100 pts. each). Each quiz will be worth 100 points and there will be 2 quizzes with 8 multiple choice questions and 2 short answer questions during the semester. **Quizzes will become available on Friday at 12:00 PM, and they will be due next Friday at 11:59 pm.** Make up assignments will be provided in accordance with the policy described below. Quizzes account for 10% of your final grade.

Midterm exam (100 pts.). In the midterm exam, students will be asked to analyze different production systems using engineering principles. The exam will consist of two parts. The first part has a mix of multiple-choice, short-answer, and computational questions. In the second part, students will be asked to use sensors to meet specific control requirements with an Arduino board. The midterm exam accounts for 25% of your final grade.

Term Project (100 pts.). Students will be randomly selected for forming groups to conduct a group project with sensing, control, and data acquisition components. Each group will contain 2 to 4 students based on the total number of students enrolled in the class. Students will demonstrate the capability of monitoring one or more environmental parameters and use executors to modify the environment to achieve specific environmental conditions for agricultural production. Students will make a technical presentation and submit a project report at the end of the semester. The term project accounts for 30% of your final grade. The grading rubrics are listed in the following tables.

Total	Category	20-25	10-19	5-9	0-4
20	Teamwork Contribution	Excellent	Good	Fair	Need to improve
20	Creativity	Exceptionally clever and unique in showing deep understanding	Thoughtfully and uniquely presented	A few original touches enhance the project	Shows little creativity, originality and/or effort
20	Understanding of Content	Shows a sophisticated	Shows an understanding of the major	Displays a somewhat limited	Does not show an understanding

		understanding of the themes in the course content	themes of the course content	understanding of the course content	of the course content
20	Grammar	No grammatical or mechanical mistakes in the project	A few grammatical/mechanical mistakes which are not distracting	Several grammatical/mechanical mistakes which are distracting	Many grammatical/mechanical mistakes throughout the project
20	Overall quality and completion	Project is engagingly organized and presents material that meet the assignment requirements	Project is somewhat organized, complete the basic requirements	Project is disorganized and incomplete	Project is incomplete and not easy to follow

All of the categories will be evaluated based on team presentation and report quality except for Team Contribution. Teamwork Contribution will be assessed separately for each student with the following Self and Peer Assessment table.

Write your name and the date and write the names of your group members in the numbered boxes. In the "Yourself" box, assign yourself a value for each listed attribute. Finally, do the same for each of your group members and total all of the values. Provide any additional comments in the box at the end of the assessment form.

Values: 1=Strongly disagree 2=Disagree 3=Neither disagree or agree 4=Agree 5=Strongly agree

Attribute	Yourself	1.	2.	3.
Was dependable in attending group meetings				
Willingly accepted assigned tasks				
Contributed positively to group discussions				

Completed work on time or made alternative arrangements				
Helped others with their work when needed				
Did work accurately and completely				
Worked well with others				
Overall was a valuable member of the team				
Column Totals				

Comments:

Grading Policy

Percent	Grade	Grade Points
90.0 - 100.0	A	4.00
87.0 - 89.9	A-	3.67
84.0 - 86.9	B+	3.33
81.0 - 83.9	B	3.00
78.0 - 80.9	B-	2.67
75.0 - 79.9	C+	2.33
72.0 - 74.9	C	2.00
69.0 - 71.9	C-	1.67
66.0 - 68.9	D+	1.33
63.0 - 65.9	D	1.00
60.0 - 62.9	D-	0.67
0 - 59.9	E	0.00

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

Course Evaluation

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. 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.

Health and Wellness

You are expected to wear approved face coverings at all times during class and within buildings even if you are vaccinated. Please continue to follow healthy habits, including best practices like frequent hand washing. Following these practices is our responsibility as Gators.

If you are sick, stay home and self-quarantine. Please visit the UF Health Screen, Test & Protect website about next steps, retake the questionnaire and schedule your test for no sooner than 24 hours after your symptoms began. Please call your primary care provider if you are ill and need immediate care or the UF Student Health Care Center at 352-392-1161 (or email covid@shcc.ufl.edu) to be evaluated for testing and to receive further instructions about returning to campus. UF Health Screen, Test & Protect offers guidance when you are sick, have been exposed to someone who has tested positive or have tested positive yourself. Visit the [UF Health Screen, Test & Protect website](#) for more information.

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, quizzes, 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: <http://www.dso.ufl.edu/sccr/process/student-conduct-honor-code>.

Software Use and Technology Assistance:

All faculty, staff and student 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.

If you are having issues with technology and software including the Canvas site, please contact the [UF Help Desk](#) to resolve any matters. Additional information and resources about technology assistance and technical help can be found in the Canvas site on the page titled Technical Help.

Student Privacy

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: <http://registrar.ufl.edu/catalog0910/policies/regulationferpa.html>

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 when requesting accommodation.

0001 Reid Hall, 352-392-8565, <https://disability.ufl.edu/>

Campus Helping Resources

Students experiencing crises or personal problems that interfere with their general wellbeing 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

Counseling Services
Groups and Workshops
Outreach and Consultation
Self-Help Library
Wellness Coaching

- U Matter We Care, www.umatter.ufl.edu/.
- Career Connections Center, First Floor JWRU, 392-1601, <https://career.ufl.edu/>.
- Student Success Initiative, <http://studentsuccess.ufl.edu>.

Student Complaints

- Residential Course: <https://sccr.dso.ufl.edu/policies/student-honor-code-studentconduct-code/>.
- Online Course: <https://distance.ufl.edu/state-authorization-status/#student-complaint>.