AOM4510C

Instrumentation and Climate Management in Controlled Environment Agriculture

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 2026

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 of climate monitoring and management in controlled environment agriculture. Sensors and instruments to track environmental conditions 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. In addition, 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
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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 offered 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 during class hours.

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

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.

Acceptable reasons for absence from or failure to engage in class include illness; Title IX-related situations; serious accidents or emergencies affecting the student, their roommates, or their family; special curricular requirements (e.g., judging trips, field trips, professional conferences); military obligation; severe weather conditions that prevent class participation; religious holidays; participation in official university activities (e.g., music performances, athletic competition, debate); and court-imposed legal obligations (e.g., jury duty or subpoena). Other reasons (e.g., a job interview or club activity) may be deemed acceptable if approved by the instructor.

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%

Assignment	*Percentage of Final Grade*
Quizzes (2)	10%
Midterm Exam	25%
Term Project	30%
Total	100%

Attendance. 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.

Homework Assignments. 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**.

Quizzes. 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.

Midterm exam. 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.

Term Project. 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 grading rubrics are listed in the following tables.

Total	Category	16-20	10-15	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 understanding of the themes in	Shows an understanding of the major themes of the course content	Displays a somewhat limited understanding	Does not show an understanding of the course content

		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/mechanic al 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:

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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/.

Academic Policies & Resources: To support consistent and accessible communication of university-wide student resources, instructors must include this link to academic policies and campus resources: https://go.ufl.edu/syllabuspolicies. Instructor-specific guidelines for courses must accommodate these policies.