

**ALS 4210/AOM6932**  
**CONTROLLED ENVIRONMENT PLANT PRODUCTION**  
FALL 2025; 3 CREDITS

**Course Format:**

This course is taught through online lectures delivered through Canvas. Lectures, learning materials, and assessments go “live” at 9 am every Monday during the semester. Most assignments in this course are due at 11:59PM on Sundays.

**Catalog Description:**

This course covers foundational information on the principles of controlled environment plant production. Students are introduced to concepts describing the interactions between plants and their microenvironments created by different production systems and climate control strategies. Engineering aspects of environmental control will be discussed. Current technologies and practices for indoor plant production are reviewed. Students are presented with current trends in the controlled environment industry, and are asked to identify costs, develop budgets, and make decisions that impact profitability, output, and marketing methods in plant-production supply chains.

**Instructors:**

**Dr. Ying Zhang**

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**Dr. Adam Watson**

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**Henry Zhu, PhD student (TA):**

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

**Pre-requisites and Co-requisites:** Junior or senior standing

**Course Objectives:**

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

- a. Describe environmental parameters that will affect plant growth and productivity in controlled environments
- b. Compare environmental sensors for plant production
- c. Interpret environmental and crop data obtained in the production environment

- d. Describe canopy environments with energy balance equations
- e. Identify moist air properties and analyze psychrometric processes
- f. Explain advanced climate control methods and technologies
- g. Apply essential business functions and plan for financial success
- h. Integrate sound economic principles into a controlled environment plant production operation
- i. Evaluate optimal output to achieve profitability

**Class/Laboratory Schedule:** This course is available online in asynchronous weekly format. There are 15 modules made available on Monday of each week starting the first week of class. You are responsible for watching all lectures, completing weekly online discussion and quizzes, as well completing exams. Activities, due dates, and key events are available on the course Canvas Calendar page.

Your instructors will be available each week to answer questions or discuss course material. Please navigate to **Zoom each Thursday at 4:00PM** by clicking the Zoom Conferences tab in Canvas and selecting the appropriate meeting date.

**Note: Zoom meetings in this course require a password that will be sent to you through Canvas announcements. Please be sure to set your Canvas notification preferences so that you receive these messages.**

**Material and Supply Fees:** None

**Textbooks and Software Required:** Handouts and online material will be provided to you that will serve as a text.

**Recommended Reading:** None

**Course Outline:**

<u>WEEK</u>	<u>TOPICS/ASSIGNMENTS &amp; EXAMS</u>
Week 1	Introduction to controlled environments /discussion posts & weekly quiz
Week 2	Light /discussion posts & weekly quiz
Week 3	Gases / discussion posts & weekly quiz
Week 4	Thermal radiation / discussion posts & weekly quiz
Week 5	Considerations for indoor plant production / discussion posts & weekly quiz
Week 6	Leaf and canopy environment / discussion posts & weekly quiz & Exam 1
Week 7	Psychrometrics / discussion posts & weekly quiz
Week 8	System components / discussion posts & weekly quiz
Week 9	HVAC systems / discussion posts & weekly quiz
Week 10	Advanced technologies / discussion posts & weekly quiz
Week 11	Planning for production / discussion posts & weekly quiz & Exam 2
Week 12	Budgeting / discussion posts & weekly quiz
Week 13	Output decisions / discussion posts & weekly quiz
Week 14	Marketing methods of horticultural and ornamental plants / discussion posts & weekly quiz
Week 15	Evaluating financial performance / discussion posts & weekly quiz
Week 16	Exam 3

**Grading:**

	Undergraduate Students			Graduate Students		
	Pts. Per Assignment	No. of Assignments	Total Points in Category	Pts. Per Assignment	No. of Assignments	Total Points in Category
Syllabus Quiz	8	1	8	8	1	8
Discussion*	8	13	104	8	13	104
Quizzes*	8	13	104	8	13	104
Exam 1	100	1	100	75	1	75
Exam 2	100	1	100	75	1	75
Exam 3	100	1	100	75	1	75
Graduate Student Design Project	0	0	0	75	1	75
<b>Total After Drops</b>		<b>30</b>	<b>516</b>		<b>31</b>	<b>516</b>

\*Fifteen assignments are included in this category, but two lowest grades will be dropped.

*Syllabus Quiz (8 pts.).* A syllabus quiz will be assigned the first week of the semester to avoid misconceptions of important content and policies on the syllabus, such as the course structure, due dates, late work, and communication policies. Students will have 7 days to complete the quiz.

*Discussion Posts (8 pts. Each).* Every module, you will be required to review an article or book chapter selected by your instructors that corresponds to an assigned module. In Part A, 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 (**due by Wednesday each week**). In Part B, students must comment on at least two reaction pieces from different classmates. At least one comment should attempt to answer a question raised by another student (**due by Sunday each week**). Both Part A and Part B are to be submitted in the Discussions tab in Canvas. Participation in the discussion will be graded on a weekly basis using the following rubric:

Total	Points	2 to >1.52	1.52 to >0.72	0.72 to >0	0
2	<b>Quality of post</b>	Appropriate comments; thoughtful, reflective, and respectful of other's postings	Appropriate comments and respectful of other's postings	Responds with minimum of effort; states thoughts/opinions without supporting content	No posting
2	<b>Relevance of post</b>	Post related to discussion topic and prompts further discussion	Post related to discussion topic	Post not related to discussion content	No posting
2	<b>Response to others</b>	Responds thoughtfully to the specified number of posts (2 each week);	Responds thoughtfully to specified number of posts (2 each	Responds to one post with minimal effort	Does not respond to other posts

		prompts further discussion	week) with minimal effort		
<b>2</b>	<b>Grammar/Mechanics/Word Count</b>	Summary meets word requirement (250 words +/- 50 words); free of noticeable grammar, spelling, or punctuation errors	No more than 50 words above/below the word requirement; some noticeable grammar, spelling, or punctuation errors	No more than 50 words above/below word requirement; multiple noticeable grammar, spelling, or punctuation errors	No post

**Important note:** The reaction piece is not supposed to be another summary. It should instead focus on your impression or experience regarding the main topic of the article. Late posts for part A will not receive credit.

The assignment of discussion posts in each module is designed 1) to deepen students' understanding of the topic covered by assigning a corresponding literature to read, 2) to develop students' scholarly skills of literature review by asking students to summarize complex readings, 3) to establish students' critical thinking skill of issue analysis and identification by asking students to identify one course-related arguable issue and post one questions, and 4) to promote communication skills through explaining and discussing issues and their possible solutions with peers. The two lowest grades will be dropped for the final course grade.

*Weekly quizzes (8pts. Each).* There will be 15 quizzes during the semester, one for each module. **Quizzes will become available on Friday at 5:00 PM, and they will be due Sunday at 11:59 pm.** Each quiz will be timed to 60 minutes, and it can only be taken once. Each quiz will consist of a mix of multiple-choice, true false, as well as short, open-ended, essay-style questions. 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. For the final course grade, the two lowest grades will be dropped. If there are concerns about quiz questions, please send an email to the corresponding instructor, who will respond within 24 hours.

*Exams (100 pts. Each for undergraduates; 75 pts. Each for graduates).* Each module will conclude with a comprehensive take-home exam. In Exam 1, students will be presented with different scenarios and asked to select among available technologies, strategies, and tradeoffs to optimize indoor plant production. In Exam 2, students will be asked to analyze different indoor production systems using engineering principles. In Exam 3, students will be tasked with applying economic principles to achieve success in the operation. **Exams will be posted at the end of each five-module unit and students will have 48 hours to complete each exam.** Exams can be submitted as a .doc or .pdf file in Canvas. Students can use reference materials (class slides, textbooks, etc.), but they must work individually and cite their sources as appropriate.

*Graduate Student CEPP Planning Project (75 pts. total).* Graduate students are required to complete a solo project where they develop a plan for a greenhouse, plant factory, or other facility that produces crops in a controlled environment. This includes specifications and design elements. Select a crop or crops to produce and estimate materials, equipment, production, energy costs for the design and

operation of this venture. Students will carefully consider the production environment including effects on plant growth, environmental control as well as environmental modification such as temperature, lighting, watering, and carbon dioxide enrichment to design a facility that produces marketable plants. For the final course grade, the graduate student review article will be weighted 20%.

**Assignments:** Assignments will be marked down for a sloppy presentation and, if excessive, they may be returned un-graded. All assignments must be typed and are due one week from when assigned. Assignments must be submitted via Canvas by 11:59 PM of due date. Assignments submitted late, but before 5:00 PM on the day following the due date, will be marked down 0.8 points. Assignments returned late, before 5:00 PM on the second day following the due date will be marked down 4 points. No assignments will be accepted after 5:00 PM on the third day following the due date.

For the final course grade, the following grading scale will be used:

**Grading Scale:**

- A 516 – 480 pts.
- A- 479 – 464 pts.
- B+ 463 – 433 pts.
- B 432 – 428 pts.
- B- 427 – 413 pts.
- C+ 412 – 397 pts.
- C 396 – 377 pts.
- C- 376 – 361 pts.
- D+ 360 – 346 pts.
- D 345 – 325 pts.
- D- 324 – 310 pts.
- E 309 – 0 pts.

Students who have questions about their grades should contact their professor by e-mail. Do NOT contact the TA about grades assigned.

**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.