

## **AOM4932**

### **Controlled Environment Agriculture Principles and Practice**

**Credits: 3**

**Class Periods:** T & R: 6<sup>th</sup> & 7<sup>th</sup> periods, from 12:50 pm to 2:45 pm

**Location:** 283 Frazier-Rogers Hall

**Academic Term:** Fall 2021

#### **Instructor**

Ying Zhang

Email Address: yingzhang409@ufl.edu

Office Phone: (352)294-6864

Office Hours: By Appointment, Frazier Rogers Hall room 103

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

#### **Course Description**

3 credits & offered each Fall: 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.

#### **Course Pre-Requisites / Co-Requisites**

Senior standing and 1<sup>st</sup> year physics

#### **Course Objectives**

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

- Recognize the advantages, complexities, and problems associated with environmental controls
- Measure, monitor, and control the various environmental variables affecting plant growth and development under controlled environments
- Analyze and report environmental data for scientific research
- Apply different control algorithms on climate controls
- Build a data acquisition system for controlled environment plant production systems

#### **Materials and Supply Fees**

Not Applicable

#### **Required Textbooks and Software**

Handouts and online material will be provided to you that will serve as a text.

#### **Recommended Materials**

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

#### **Course Schedule**

Week 1: **Lecture:** Introduction to Controlled Environment Agriculture & environmental factors

Week 2: **Lecture:** Data collection and measurement/**Quiz**

Week 3: **Lecture:** Temperature management /**Lab:** Temperature measurement/**Quiz**

Week 4: **Lecture:** Solar radiation/**Lab:** light spectrum measurement/**Quiz**

Week 5: **Lecture:** Lighting systems/**Lab:** Lighting system design/**Quiz**

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|          |   |
|----------|---|
| Week 6:  | <b>Lecture:</b> Water and nutrient delivery/ <b>Lab:</b> Irrigation system control/ <b>Quiz</b>               |
| Week 7:  | <b>Lecture:</b> Plant nutrient and the root zone environment/ <b>Lab:</b> PH and EC measurements/ <b>Quiz</b> |
| Week 8:  | <b>Review/Exam 1</b>  |
| Week 9:  | <b>Lecture:</b> Structures and components/ <b>Lab:</b> Greenhouse tours/ <b>Quiz</b>                          |
| Week 10: | <b>Lecture:</b> Air movement/ <b>Lab:</b> Air speed measurement/ <b>Quiz</b>                                  |
| Week 11: | <b>Lecture:</b> Humidity management/ <b>Lab:</b> Humidity measurement and sensor calibration/ <b>Quiz</b>     |
| Week 12: | <b>Lecture:</b> Air environment/ <b>Lab:</b> CO <sub>2</sub> measurement and control/ <b>Quiz</b>             |
| Week 13: | <b>Lecture:</b> Environmental Control Systems/ <b>Quiz</b>  |
| Week 14: | <b>Lecture:</b> Experimental Design/ <b>Quiz</b>  |
| Week 15: | <b>Lecture:</b> Production systems maintenance/ <b>Review/Quiz</b>  |
| Week 16: | <b>Exam 2</b>   |

### ***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. During the course of the semester, students may miss no more than three days without penalty to their attendance grade. In general, acceptable reasons for absence from or failure to participate in class include illness, serious family emergencies, special curricular requirements (e.g., judging trips, field trips, professional conferences), military obligation, severe weather conditions, religious holidays, and participation in official university activities such as music performances, athletic competition or debate. Absences from class for court-imposed legal obligations (e.g., jury duty or subpoena) must be excused. Other reasons also may be approved.

**Late Submission of Course Work.** All course work (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 which 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 valid medical reasons or unless prior arrangements have been made.

**Excused Absences.** In the event you do miss course work for valid medical reasons, your instructors require letter-head documentation from either a physician (NOT health clinic), an academic advisor, or the UF Dean of Student's Office (UF email will suffice) within 24 hours of an assignment deadline. Please note that letterhead documentation does NOT mean a note from your Mom (or Dad or Aunt, Uncle, cousin, Uncle who is a lawyer, best friend, boss, etc.). Letterhead documentation does NOT refer to a note scribbled on a prescription pad from a walk-in clinic or the Student Health Center the day an assignment is due because you had a cold, or pleading that you overslept, had computer problems, or a job interview on a due date...these types of excuses do not satisfy the criteria for extenuating circumstances and cannot be accepted. Letterhead documentation DOES mean the submission of a formal, business letter on letterhead (or a UF email from advisor or UF Dean of Students) including relevant dates for the excuse within 24 hours of a missed assignment. Excused absences must be consistent with university policies in the Graduate Catalog (<http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#attendance>) and require appropriate documentation. Additional information can be found here: <https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>

**Online Course Recording.** Our class sessions may be audio visually recorded for students in the class to refer back and for enrolled students who are unable to attend live. Students who participate with their camera engaged or

utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live. The chat will not be recorded or shared. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.

**Honorlock Proctoring.** Honorlock may be used to proctor your exams this semester. Honorlock is an online proctoring service that allows you to take your exam from the comfort of your home. You DO NOT need to create an account, download software or schedule an appointment in advance. Honorlock is available 24/7 and all that is needed is a computer, a working webcam, and a stable Internet connection. To get started, you will need Google Chrome and to download the Honorlock Chrome Extension. You can download the extension at [www.honorlock.com/extension/install](http://www.honorlock.com/extension/install). When you are ready to test, log into Canvas, go to your course, and click on your exam. Clicking "Launch Proctoring" will begin the Honorlock authentication process, where you will take a picture of yourself, show your ID, and complete a scan of your room. Honorlock will be recording your exam session by webcam as well as recording your screen. Honorlock also has an integrity algorithm that can detect search-engine use, so please do not attempt to search for answers, even if it's on a secondary device. Honorlock support is available 24/7/365. If you encounter any issues, you may contact them via live chat.

### ***Evaluation of Grades***

| <b><i>Assignment</i></b> | <b><i>Total Points</i></b> | <b><i>Percentage of Final Grade</i></b> |
|--------------------------|----------------------------|---|
| Attendance               | 100                        | 10%                                     |
| Lab reports (9)          | 100 each                   | 20%                                     |
| Quizzes (13)             | 100 each                   | 20%                                     |
| Exam 1                   | 100                        | 25%                                     |
| Exam 2                   | 100                        | 25%                                     |
|                          |                            | 100%                                    |

**Lab Reports (100 pts. each).** Each lab report will be worth 100 points and there will be 9 reports to complete during the semester. **Lab reports will become available on Thursday before the class, and they will be due next Thursday at 11:59 pm.** Make up labs will be provided in accordance with the policy described below.

**Quizzes (100 pts. each).** Each quiz will be worth 100 points and there will be 13 quizzes during the semester. **Quizzes will become available on Friday at 12:00 PM, and they will be due next Friday 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.

**Exams (100 pts. each).** In exams, students will be asked to analyze different production systems using engineering principles. Each exam will consist of a mix of multiple-choice, short-answer, and computational questions. For the final course grade, each exam will be weighted 25%.

### ***Grading Policy***

The following is given as an example only.

| <b><i>Percent</i></b> | <b><i>Grade</i></b> | <b><i>Grade Points</i></b> |
|-----------------------|---------------------|----------------------------|
| 90.0 - 100.0          | A                   | 4.00                       |

| <b>Percent</b> | <b>Grade</b> | <b>Grade Points</b> |
|----------------|--------------|---------------------|
| 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                |

More information on UF grading policy may be found at:

<http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#grades>

<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

### ***Students Requiring Accommodations***

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center by visiting <https://disability.ufl.edu/students/get-started/>. 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.

### ***Course Evaluation***

Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at <https://gatorevals.aa.ufl.edu/>. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at <https://gatorevals.aa.ufl.edu/>.

### ***University Honesty Policy***

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 (<https://www.dso.ufl.edu/sccr/process/student-conduct-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.

### ***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. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

### ***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>

### ***Campus Resources:***

Health and Wellness

**U Matter, We Care:**

If you or a friend is in distress, please contact [umatter@ufl.edu](mailto:umatter@ufl.edu) or 352 392-1575 so that a team member can reach out to the student.

**Counseling and Wellness Center:** <http://www.counseling.ufl.edu/cwc>, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

**Sexual Assault Recovery Services (SARS)**

Student Health Care Center, 392-1161.

**University Police Department** at 392-1111 (or 9-1-1 for emergencies), or <http://www.police.ufl.edu/>.

## Academic Resources

**E-learning technical support**, 352-392-4357 (select option 2) or e-mail to [Learning-support@ufl.edu](mailto:Learning-support@ufl.edu).  
<https://lss.at.ufl.edu/help.shtml>.

**Career Resource Center**, Reitz Union, 392-1601. Career assistance and counseling. <https://www.crc.ufl.edu/>.

**Library Support**, <http://cms.uflib.ufl.edu/ask>. Various ways to receive assistance with respect to using the libraries or finding resources.

**Teaching Center**, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring.  
<https://teachingcenter.ufl.edu/>.

**Writing Studio, 302 Tigert Hall**, 846-1138. Help brainstorming, formatting, and writing papers.  
<https://writing.ufl.edu/writing-studio/>.

**Student Complaints Campus:** [https://www.dso.ufl.edu/documents/UF\\_Complaints\\_policy.pdf](https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf).

**On-Line Students Complaints:** <http://www.distance.ufl.edu/student-complaint-process>.