



BE 350 Advanced Hydroponic Crop Production

Location

Controlled Environment Agriculture Center (CEAC), Room 117
1951 E. Roger Rd, Tucson, AZ 85719

Time

Tuesdays/Thursdays 1:00 – 2:15 pm

Description of Course

This is an advanced level course that builds upon the basic principles covered in BE 217 Introduction to Hydroponics. Crop production using hydroponic systems in controlled environments will be covered in-depth, including leafy greens, microgreens, mushrooms, aquaponics, and Organic hydroponics. Specialty crop production using hydroponics will also be covered, including strawberry, spinach, hops, and hemp. Critical topics related to Controlled Environment Agriculture (CEA) will be discussed in detail, such as environmental factors, Integrated Pest Management (IPM), food safety, and sustainable food production practices.

Course Pre-Requisites

BE 217 Introduction to Hydroponics

Instructor and Contact Information

Dr. Triston Hooks

CEAC, Room 103

520-626-9953

tristonh@arizona.edu

Office hours: Tuesdays/Thursdays 10:00 am – 1:00 pm

Course Format and Teaching Methods

This course is a lecture that will be taught both In-Person and Live Online and include in-class/online discussion, touring CEAC facilities, and reading scientific literature.

Course Objectives

The objectives for this course are for students to gain:

1. ...an advanced understanding of crop production in hydroponic systems
2. ...a holistic view of the current challenges and future opportunities in CEA

3. ...knowledge on food safety and sustainable food production practices

Expected Learning Outcomes

This course aligns with five of the Student Learning Outcomes for the Biosystems Engineering Major (based on the 2019-2020 Criteria for Accrediting Engineering Programs):

1. ...an ability to acquire and apply new knowledge as needed, using appropriate learning strategies
2. ...an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
3. ...an ability to communicate effectively with a range of audiences
4. ...an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
5. ...an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts

Absence and Class Participation Policy

Participating in the course and attending lectures and other course events are vital to the learning process. As such, attendance is required at all lectures and discussion section meetings. Absences may affect a student's final course grade. If you anticipate being absent, are unexpectedly absent, or are unable to participate in class online activities, please contact me as soon as possible.

The UA's policy concerning Class Attendance, Participation, and Administrative Drops is available at: <http://catalog.arizona.edu/policy/class-attendance-participation-and-administrative-drop>

The UA policy regarding absences for any sincerely held religious belief, observance or practice will be accommodated where reasonable, <http://policy.arizona.edu/human-resources/religious-accommodation-policy>

Absences pre-approved by the UA Dean of Students (or Dean Designee) will be honored. See: <https://deanofstudents.arizona.edu/absences>

To request a disability-related accommodation to this attendance policy, please contact the Disability Resource Center at (520) 621-3268 or drc-info@email.arizona.edu.

If you are experiencing unexpected barriers to your success in your courses, the Dean of Students Office is a central support resource for all students and may be helpful. The Dean of Students Office is located in the Robert L. Nugent Building, room 100, or call 520-621-7057.

Makeup Policy for Students Who Register Late

Students who register after the first class meeting must make up all assignments and online discussions within a week of first day of attendance, or time agreed upon by instructor.

Course Communications

All course communications will be done through D2L

Required Text

There is no required textbook. All course materials will be provided to you on D2L. An excellent textbook that I recommend is Hydroponic Food Production by Howard Resh.

Required or Special Materials

Students will need access to a computer with Internet so that they can access D2L and use Zoom.

Required Extracurricular Activities

Tours of various facilities at CEAC will be provided (if available) and will be announced ahead of time. Closed-toe shoes are required and working clothes are recommended during tours.

Assignments and Examinations: Schedule/Due Dates

Readings

There will be two reading assignments and each one will consist of a scientific paper from a peer-reviewed journal. Questions based on the content of the paper will be posted on D2L and answers must be uploaded to D2L by 11:59pm on the due date.

Quizzes

There will be two quizzes that will cover lecture material. Content from the quizzes will appear on the exams, so consider them as preparation for the exams. Quizzes will be posted on D2L and answers must be uploaded to D2L by 11:59pm on the due date.

Exams

There are two exams: a Mid-Term and a Final. The Mid-Term will be held on March 3 and the Final will be held on May 10. The final will *not* be comprehensive. The exams will cover the lecture material. You will have two hours to complete each exam.

Final Exam Regulations and Final Exam Schedules can be found here:

<https://registrar.arizona.edu/faculty-staff-resources/room-class-scheduling/schedule-classes/final-exams>

Discussions

Discussions related to the course are highly encouraged, both in lecture and on D2L. Specific discussion topics will be posted on D2L and students can earn extra credit by participating in the discussion on D2L. Extra credit points will be assigned based on contribution to the discussion and content of the posts. Up to 20 points of extra credit can be earned in this way (half of a letter grade).

Grading Scale and Policies

Points

What?	How Many?	Points (Each)?	Points (Total)?
Reading	2	50	100
Quiz	2	50	100
Exam	2	100	200
		TOTAL:	400
<i>Discussion (Extra Credit)</i>	4	5	20
		Total with Extra Credit:	420

Grading Scale

A = 360 – 400 pts

B = 320 – 360 pts

C = 280 – 320 pts

D = 240 – 280 pts

F < 240 pts

University policy regarding grades and grading systems is available at:

<http://catalog.arizona.edu/policy/grades-and-grading-system>

Late work policy

A grade of “0” will be assigned if the work is turned in after the due date/time, unless otherwise agreed upon by the instructor.

Requests for incomplete(I) or withdrawal (W)

Requests for incomplete (I) or withdrawal (W) must be made in accordance with University policies, which are available at:

<http://catalog.arizona.edu/policy/grades-and-grading-system#incomplete>

<http://catalog.arizona.edu/policy/grades-and-grading-system#Withdrawal>

Scheduled Topics/Activities

Week	Date	Module	Lecture	Assignment Due
1	13-Jan	-	Introduction and Greenhouse Rules	-
2	18-Jan	1	Greenhouse Hydroponic Lettuce Production: Deep Water Culture (DWC) and Nutrient Film Technique (NFT)	-
	20-Jan			-
3	25-Jan	2	Other Greenhouse Hydroponic Systems: Towers and Ebb and Flow	-
	27-Jan			Discussion 1
4	1-Feb	3	Indoor Controlled Environment Agriculture (CEA): Aeroponics and Shallow Water Culture	-
	3-Feb			Quiz 1
5	8-Feb	4	Advanced Environmental Factors (DO, GDD, VPD, DLI)	-
	10-Feb			-
6	15-Feb	5	Plant Responses to Light Pt. 1 (Solar Radiation and PAR)	-
	17-Feb			Discussion 2
7	22-Feb	6	Plant Responses to Light Pt. 2 (ePAR, UV, and Far-Red)	-
	24-Feb			Reading 1
8	1-Mar	-	Review	-
	3-Mar		Mid-Term Exam	Mid-Term Exam!
9	8-Mar	-	Spring Break	-
	10-Mar			-
10	15-Mar	7	Food Safety	-
	17-Mar			-
11	22-Mar	8	CEA Challenges and Sustainable Food Production	-
	24-Mar			Discussion 3
12	29-Mar	9	Microgreen Production	-
	31-Mar			Quiz 2
13	5-Apr	10	Organic Hydroponics	-
	7-Apr			-
14	12-Apr	11	Aquaponics and Mushroom CEA Production	-
	14-Apr			Discussion 4
15	19-Apr	12	Specialty Crops Pt. 1 (Herbs and Strawberry)	-
	21-Apr			Reading 2
16	26-Apr	13	Specialty Crops Pt. 2 (Hops and Hemp)	-
	28-Apr			Discussion 5

17	3-May	-	Review	-
	5-May		Reading Day (No Class)	-
18	10-May	-	Final Exam	Final Exam!

Classroom Behavior Policy

To foster a positive learning environment, students and instructors have a shared responsibility. We want a safe, welcoming, and inclusive environment where all of us feel comfortable with each other and where we can challenge ourselves to succeed. To that end, our focus is on the tasks at hand and not on extraneous activities (e.g., texting, chatting, reading a newspaper, making phone calls, web surfing, etc.). Students are asked to refrain from disruptive conversations with people sitting around them during lecture. Students observed engaging in disruptive activity will be asked to cease this behavior. Those who continue to disrupt the class will be asked to leave lecture or discussion and may be reported to the Dean of Students.

Threatening Behavior Policy

The UA Threatening Behavior by Students Policy prohibits threats of physical harm to any member of the University community, including to oneself. See:

<http://policy.arizona.edu/education-and-student-affairs/threatening-behavior-students>.

Accessibility and Accommodations

At the University of Arizona, we strive to make learning experiences as accessible as possible. If you anticipate or experience barriers based on disability or pregnancy, please contact the Disability Resource Center (520-621-3268, <https://drc.arizona.edu/>) to establish reasonable accommodations.

Code of Academic Integrity

Students are encouraged to share intellectual views and discuss freely the principles and applications of course materials. However, graded work/exercises must be the product of independent effort unless otherwise instructed. Students are expected to adhere to the UA Code of Academic Integrity as described in the UA General Catalog. See:

<http://deanofstudents.arizona.edu/academic-integrity/students/academic-integrity>.

The University Libraries have some excellent tips for avoiding plagiarism, available at

<http://new.library.arizona.edu/research/citing/plagiarism>.

Nondiscrimination and Anti-harassment Policy

The University of Arizona is committed to creating and maintaining an environment free of discrimination. In support of this commitment, the University prohibits discrimination, including harassment and retaliation, based on a protected classification, including race, color, religion, sex, national origin, age, disability, veteran status, sexual orientation, gender identity, or genetic information. For more information, including how to report a concern, please see

<http://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy>

Our classroom is a place where everyone is encouraged to express well-formed opinions and their reasons for those opinions. We also want to create a tolerant and open environment where such opinions can be expressed without resorting to bullying or discrimination of others.

Additional Resources for Students

UA Academic policies and procedures are available at <http://catalog.arizona.edu/policies>

Campus Health

Campus Health provides quality medical and mental health care services through virtual and in-person care. Phone: 520-621-9202 <http://www.health.arizona.edu/>

Counseling and Psych Services (CAPS)

CAPS provides mental health care, including short-term counseling services. Phone: 520-621-3334 <https://health.arizona.edu/counseling-psych-services>

The Dean of Students Office's Student Assistance Program

Student Assistance helps students manage crises, life traumas, and other barriers that impede success. The staff addresses the needs of students who experience issues related to social adjustment, academic challenges, psychological health, physical health, victimization, and relationship issues, through a variety of interventions, referrals, and follow up services. Email: DOS-deanofstudents@email.arizona.edu Phone: 520-621-7057 <http://deanofstudents.arizona.edu/student-assistance/students/student-assistance>

Survivor Advocacy Program

The Survivor Advocacy Program provides confidential support and advocacy services to student survivors of sexual and gender-based violence. The Program can also advise students about relevant non-UA resources available within the local community for support. Email: survivoradvocacy@email.arizona.edu Phone: 520-621-5767 <https://survivoradvocacy.arizona.edu/>

Campus Pantry

Any student who has difficulty affording groceries or accessing sufficient food to eat every day, or who lacks a safe and stable place to live and believes this may affect their performance in the course, is urged to contact the Dean of Students for support. In addition, the University of Arizona Campus Pantry is open for students to receive supplemental groceries at no cost. Please see their website at: <https://campuspantry.arizona.edu>

Confidentiality of Student Records

<http://www.registrar.arizona.edu/personal-information/family-educational-rights-and-privacy-act-1974-ferpa?topic=ferpa>

Subject to Change Statement

Information contained in the course syllabus, other than the grade and absence policy, may be subject to change with advance notice, as deemed appropriate by the instructor.