



BE 217 LAB: Introduction to Hydroponics and Controlled Environment Agriculture (1 Credit)

Location: Campus Agriculture Center
Controlled Environment Agriculture Center (CEAC)
1951 E. Roger Rd, Tucson, AZ 85719
Main building, Classroom 117

Day/Time: Tuesdays & Thursdays 4:15 - 5:30 pm
Lab is directly after BE 217 LEC 3:00 – 4:15 pm

- You must currently be registered for, or have already taken, BE/PLS 217 LEC, in order to take the LAB!

Description of Course

Hands-on tomato plant cultivation course, teaching tomato production from seedling through harvest using commercial high-wire production techniques. Students apply what they have learned in PLS 217 Lecture to real plants in a real commercial-style greenhouse. Course includes plant cultivation techniques such as clipping, stem pruning, leaning and lowering, cluster pruning and clipping, leaf maintenance, and harvesting techniques. Course also includes plant spacing, making nutrient tanks, and monitoring plant health, pollination, and irrigation, and awareness of various production systems and the importance of environmental control for the success of the crop.

Course Prerequisites or Co-requisites

BE/PLS 217 LECTURE is a Pre-Requisite or Co-Requisite.

Instructor and Contact Information

Name	Dr. Stacy Tollefson
Office Location	CEAC Building Room 103
Telephone number	520-626-9953
E-mail address	stacytolleffson@yahoo.com
Office Hours/"Open Door Policy"	By appointment
Web information:	
Course:	http://ceac.arizona.edu/pls-217-introduction-hydroponics-and-cea
	Current semester info available through D2L.

Course Format and Teaching Methods

This is a hands-on laboratory (the greenhouse is our laboratory) course that takes place entirely in the UA-CEAC Teaching Greenhouse (GH# 2087). Students will learn all aspects of hydroponic tomato cultivation from planting the crop up through harvest by physically working on the plants and completing exercises to give them experience with other aspects of production including pollination,

plant health, and irrigation/fertigation management. Students will be assigned a group of plants, and must complete a list of tasks each class period, which is checked for completion by the instructor, and then turned in for credit (5 pts each day). Students will also complete 10 short exercises and a final plant care evaluation, which serves as the Final Exam. Students MUST make every possible effort to attend every single class period (the plants do not stop growing!). Students will respect the greenhouse as any other UA laboratory for safety of activities, but also as a greenhouse with production by other classmates in producing crops that are to be safe and without damage.

Course Objectives and Expected Learning Outcomes

The course objective is for students to gain a theoretical and practical understanding of the science and techniques of hydroponics and controlled environment agriculture.

The expected learning outcomes are for students to be able to:

- 1) Demonstrate an understanding of basic principles of plant biology, entomology, plant nutrition and disorders, irrigation and fertilization, and environmental conditions necessary for growing greenhouse hydroponic vegetable crops.
- 2) Understand, apply, and practice plant cultivation, harvesting, pest management, and food safety techniques for growing hydroponic tomatoes.

This course aligns to all five Student Learning Outcomes for the Sustainable Plant Sciences Major:

This course will provide the students with opportunities to:

- 1) Integrate and apply the general principles of Sustainable Plant Systems to specific plant production systems (Hydroponics and CEA)
- 2) Apply the basic principles of plant biology and soil science to plant production systems.
- 3) Communicate effectively principles and technical terms associated with plant production systems both orally and in writing.

This course aligns to four of the Student Learning Outcomes for the Agriculture Technology Management Major:

- 1) Students will be able to demonstrate safe practices when operating tools and equipment.
- 2) Students will be able to identify and select tools and equipment to perform specific operations.
- 3) Students will be able to work cooperatively with others.
- 4) Students will be able to identify unsafe conditions in a laboratory or workplace.

This course aligns to four of the Student Learning Outcomes for the Agricultural and Biosystems Engineering Major:

- 1) Can apply mathematics, science, and engineering principles to solve problems.
- 2) Can use the techniques, skills, and modern engineering tools necessary for engineering practices.
- 3) Has the broad education necessary to understand the impact of engineering solutions in global, economic, environmental, and societal context.
- 4) Has a knowledge of relevant contemporary issues.
- 5) Can communicate effectively.

Absence and Class Participation Policy

This class is unlike most classes you will take at the U of A. Plants continue to grow daily and work needs to be completed in a timely manner, essentially, daily. Attending laboratory sessions are

vital to the learning process and as such, **attendance is required at each and every laboratory meeting.** All plant work is done during class time, unless there is an extenuating circumstance where you need extra time and then that time must be approved by the instructor.

If regular greenhouse times are missed:

Due to personal illness/accident: Students who miss class due to illness or emergency are **required** to bring documentation from their health-care provider or other relevant, professional third parties. Failure to submit third-party documentation will result in unexcused absences, inability to make up work, and grade points missed. Contact the instructor (phone, email, in person) **within 24 hours** of the missed class and arrange to make up the work within 1 day after the missed day (or within a time period agreed upon with the instructor). A MAXIMUM of 2 classes may be made up under this category. If a 3rd class is missed, see next section, starting with “1st Occurrence (5 % deducted; 2nd, 10 %, etc.).

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>

Due to prescheduled event: Greenhouse make-up will only be allowed for official UA events **with documentation.** Absences pre-approved by the UA Dean of Students (or Dean Designee) will be honored. See: <https://deanofstudents.arizona.edu/absences>. **YOU MUST contact instructor prior to AND as soon as you know the dates you will be gone.** Arrange to complete the hours/work missed before and/or after the event. A MAXIMUM of 2 classes may be made up under this category. If a 3rd class is missed, even with a Dean’s Excuse, see the next section, starting with “1st Occurrence (5 % deducted; 2nd, 10 %, etc.).

Due to religious belief, observance, or practice: 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>. Students will still be responsible for lecture material and must complete their greenhouse work in a timely manner (to be arranged with the instructor). **POLICY:** Students MUST give the instructor a list of these events within the first 7 days of the semester AND make arrangements, at that time, to make up classes to be missed.

For any other reason – No other reasons will be accepted for missing class. If you miss class for any other reason, a specified **% of the final grade** will be deducted: Note: losing 10% (= 55 points) will drop your total point value almost one full grade.

1st occurrence = If you make it up, 5% will be deducted; if not, 10% will be deducted

2nd occurrence = If you make it up, 10% will be deducted; if not, 20% will be deducted

3rd or more occurrences = If before week 8, you will be administratively dropped from the class.

See UA Policies: available at: <http://catalog.arizona.edu/policy/class-attendance-participation-and-administrative-drop>

If after week 8, 30% will be deducted from the total grade for each missed class, thereafter, whether made up or not. At this point you will have failed the course.

Class make up: The student must make up the missed class within 24 hours (or a time agreed upon with the instructor) AND fill out a **“Greenhouse time make-up sheet”** (from instructor).

Dropping the course once it has begun:

If you decide to drop the class once it has begun (once you have been assigned a rep of plants, i.e.,

after the first class meeting), you MUST NOTIFY the instructor prior to dropping the class so that your plants can be reassigned to student workers or others for care.

Course withdrawal policy: Students must notify the instructor prior to non-attendance in classes and must execute drop or withdrawal procedures: <http://catalog.arizona.edu/policy/grades-and-grading-system#Withdrawal> Please see University withdrawal procedures: <http://catalog.arizona.edu/policy/grades-and-grading-system#Withdrawal>

Makeup Policy for Students Who Register Late

Students who register after the first class meeting must make up all assignments and laboratory time within 3 days of first day of attendance, or time agreed upon by instructor.

Required Texts or Readings

Students can refer to PLS 217 Class Notes: Intro to Hydroponics and CEA is available on D2L and online at <http://ceac.arizona.edu/pls-217-introduction-hydroponics-and-cea>. Handouts will be distributed in class and/or on D2L.

Required or Special Materials

Work clothes and closed-toed shoes must be worn in greenhouse. Water, sunscreen, and camera are recommended. No food or drinks other than water are allowed in the greenhouse. A white lab coat and disposable plastic gloves will be provided to each student. NOTE: Each student will be assigned a box with items/tools to be used in the greenhouse, which will be checked out/in during each lab session. If any items are lost/damaged, the student will be assessed the cost of the lost/damaged items.

Assignments and Examinations: Schedule/Due Dates

Lab check out sheets are due at the end of each class period. The 10 short exercises will be due according to the lab schedule.

Plants must be ready for the Final Plant Evaluation before the Final Exam day/time listed in the UA catalog. See <http://www.registrar.arizona.edu/schedules/finals.htm>

Assignment Format

Exercises will be handed out, to be filled in and then turned in by the end of the class period assigned.

Final Examination

The Final Plant Evaluation is the Final Exam or this course and must be completed by the final exam date listed in the UA catalog. See at <http://www.registrar.arizona.edu/schedules/finals.htm>

Grading Scale and Policies

All points, as listed below, will count toward the final grade.

30 Check out sheets (5 pts each)	=	150	493-550 (90%)	= A
10 short exercises (20 points each)	=	200	438-492 (80%)	= B
Final Exam: Plant evaluation (end of course)	=	200	383-437 (70%)	= C
Total	=	550	328-382 (60%)	= D
			Below 327	= E
*Extra Credit pot luck dish		up to 10pts		

Late work policy: Exercises must be completed in class on the day listed in the Lab Schedule. They may not be taken home to finish, unless agreed upon by the instructor.

Extra Credit Opportunity: On the last regular class meeting day (Tuesday, December 10), we will have a “pot luck” (*). Faculty, staff, and students of the CEAC will be invited to share in our bounty. This is a time to show off your favorite recipes, so start planning early. **YOU MUST PREPARE THIS YOURSELF!** You will receive 10 points of extra credit if you:

- 1) Bring a dish to share that includes at least one of the crops we have grown: tomato, cucumber, and/or pepper.
- 2) Bring a copy of your recipe to display with your dish (this will be collected)
- 3) Have the dish (ready to eat) and recipe at the CEAC by 4:15pm on Tues, Dec. 10.

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> and <http://catalog.arizona.edu/policy/grades-and-grading-system#Withdrawal> respectively. Incomplete grades must be verified with a written agreement between the instructor and student. This agreement will specify the work to be done and a timetable of completion.

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.). Cell phones should remain OFF during greenhouse times, unless being used as calculators. Laptops, ipads, and tablets are allowed during lecture for the purpose of taking notes only (no internet, games, etc). Phones, laptop, and other personal electronics are NOT allowed during exams.

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

Our goal in this classroom is that learning experiences be as accessible as possible. If you anticipate or experience physical or academic barriers based on disability, please let me know immediately so that we can discuss options. You are also welcome to contact the Disability Resource Center (520-621-3268) to establish reasonable accommodations. For additional information on the Disability Resource Center and reasonable accommodations, please visit <http://drc.arizona.edu>.

If you have reasonable accommodations, please plan to meet with me by appointment or during office hours to discuss accommodations and how my course requirements and activities may impact your ability to fully participate.

Please be aware that the accessible table and chairs in this room should remain available for students who find that standard classroom seating is not usable.

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://www.library.arizona.edu/help/tutorials/plagiarism/index.html>.

Selling class notes and/or other course materials to other students or to a third party for resale is not permitted without the instructor's express written consent. Violations to this and other course rules are subject to the Code of Academic Integrity and may result in course sanctions. Additionally, students who use D2L or UA e-mail to sell or buy these copyrighted materials are subject to Code of Conduct Violations for misuse of student e-mail addresses. This conduct may also constitute copyright infringement.

UA Nondiscrimination and Anti-harassment Policy

The University is committed to creating and maintaining an environment free of discrimination; 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>

Student Assistance and Advocacy information is available at <http://deanofstudents.arizona.edu/student-assistance/students/student-assistance>

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.

**PLS 217: HYDROPONICS: SCHEDULE OF LECTURES AND LABS
FALL 2019**

INSTRUCTOR: Dr. Tollefson

(Schedule subject to change)

DATE	LAB *READ each chapter prior to class	DUE (Check out sheets are due at the end of every class period starting Aug 29)
27 Aug.	Introduction/Syllabus/Go over experiment Choose sections	
29 Aug.	Hang tomahooks	
03 Sept.	N/A	
05 Sept.	Planted Greenhouse	
10 Sept.	Adjust tomahooks and tighten strings. Add clips	
12 Sept.	Add clips as needed. Tighten strings (first checkout sheet)	
17 Sept.	Discuss types of emitters, amount of irrigation per cycle expected. First growth tape. Clip and prune if needed.	<u>EX 1: Monitoring Emitters</u>
19 Sept.	Discuss crop layout/spacing. Continue plant care. Bees come tomorrow.	<u>EX 2: Plant Spacing</u>
24 Sept.	Growth tapes. Continue plant care.	
26 Sept.	Continue plant care. Add j-hooks.	<u>EX 3: Measure pollination %</u>
01 Oct.	Growth tapes. Continue plant care. Start cluster pruning.	
03 Oct.	Continue plant care.	
08 Oct.	Growth tapes. Continue plant care	
10 Oct.	Continue plant care. Take 2 bottom leaves, keep 13 fully expanded leaves on.	<u>EX 4: Veg vs Rep Characteristics #1</u>
15 Oct.	Growth tapes. Continue plant care. Lower plant if you need to to get tape on.	<u>EX 5: Pest ID & count #1</u>
17 Oct.	Continue plant care. Lean and lower if needed.	
22 Oct.	Growth tapes. Continue plant care (saw first fruit barely show color)	
24 Oct.	Continue plant care. First full lean and lower for many students.	<u>EX 6: Monitoring Irrigation/lysimeters</u>
29 Oct.	Growth tapes. Continue plant care. Harvest?	
31 Oct.	Continue plant care	
05 Nov.	Growth tapes. Continue plant care. Harvest?	
07 Nov.	Continue plant care	
12 Nov.	Growth tapes. Continue plant care. Harvest.	<u>EX 7: Veg vs Rep Characteristics and Pollination % #2</u>
14 Nov.	Continue plant care. Set up shelf life test.	
19 Nov.	Growth tapes. Continue plant care. Harvest.	
21 Nov.	Continue plant care	<u>EX 9: Brix, Shelf Life, Taste Tests</u>

26 Nov.	Growth tapes. Continue plant care. Harvest.	
28 Nov.	THANKSGIVING BREAK – No Class Continue plant care if possible	
03 Dec.	Growth tapes. Harvest. Replace sticky cards. Continue plant care	
05 Dec.	Continue plant care	EX 10 : Pest ID & count and Pollination % #2
10 Dec.	Growth tapes. Harvest. Continue plant care	EC: Potluck dish
16 Dec Monday	FINAL EXAM (100 pts)	Plant Care Evaluation: Plants must be ready for grading on Friday Dec. 13, 5:00pm