



**BE/PLS 217 LECTURE: Introduction to Hydroponics**  
**3 Credits**  
**Fall 2021**  
**In-person**

**In-person Location:**                   **Campus Agriculture Center**  
**Controlled Environment Agriculture Center (CEAC)**  
**1951 E. Roger Rd, Tucson, AZ 85719**  
**CEA Building, Classroom 117**

**Day/Time:**                   **Tuesdays & Thursdays from 1500 – 1615 (3 PM to 4:15 PM)**

**Description of Course**

Controlled environment agriculture is the science and technology of producing crops such that the grower controls the plant's aerial and root zones in order to optimize growth, yields, and quality while minimizing the use of resources. This course teaches the scientific and technological principles of hydroponics and CEA including different types of systems, appropriate crops and cultivation methods, plant anatomy and physiology, transplant production, pest management, plant nutrition, monitoring plant health, fertigation management, environmental parameters, greenhouse structures and climate control, and lighting. The course covers current trends in CEA such as urban rooftop greenhouses, indoor growing, vertical farming/plant factories, lunar/space applications, and aquaponics. This course uses common vegetable crops cultivated as models such as Tomato, Lettuce, and others.

**Course Prerequisites or Co-requisites**

N/A

**Instructor and Contact Information**

Name	Mr. Myles Lewis
Office Location	CEA Building Room 103
Telephone number	520-626-9953
E-mail address	mylesd@email.arizona.edu
Office Hours/"Open Door Policy"	Tuesdays and/or Thursdays 1200 - 1300
Web information:	Current semester info available through D2L.

**Course Format and Teaching Methods**

This is an IN-PERSON course. That means classes will only be provided in-person, requiring attendance each class to obtain all the material. There will be in-person quizzes as well as online quizzes. Tests will be in-person only, requiring attendance. Assignments will be handed in on the due

date during class. The course readings, videos, online quizzes, and potential online assignments will all be accessible in D2L.

## **Course Objectives**

The objective of this course is to introduce students to the field hydroponics and controlled environment agriculture (CEA) as a technological science and as a growing industry. Students will learn about current trends in the industry, types of systems, and the scientific principles and techniques involved in hydroponic crop production.

## **Expected Learning Outcomes**

The course objective is for students to gain a theoretical understanding of the science and techniques of hydroponic crop production.

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

- 1) Describe the advantages/disadvantages of hydroponic crop production in the production of various crops.
- 2) Demonstrate an understanding of basic principles of plant biology, entomology, plant nutrition and disorders, irrigation and fertilization, and the environmental conditions necessary for growing greenhouse hydroponic vegetable crops.
- 3) Describe hydroponic growing systems and cultivation practices for a variety of crop types.
- 4) Demonstrate an understanding of the effects of site selection, structural components, equipment, and control systems for the success of indoor and greenhouse hydroponic operations.

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) [High]
- 2) Demonstrate an understanding of the history, current conditions, and future challenges associated with plant sciences and production systems on a local and global scale.
- 3) Apply the basic principles of plant biology and soil science to plant production systems.
- 4) Think critically as demonstrated by evaluating information from multiple perspectives, drawing reasonable conclusions, and defending them rationally.
- 5) Communicate effectively principles and technical terms associated with plant production systems both orally and in writing.

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

- 1) Fulfills knowledge for topic area of Controlled Environment Agriculture
- 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.

This course aligns to five the Student Learning Outcomes for the 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**

YOU ARE EXPECTED TO SHOW UP TO CLASS. There will be points associated with attendance and each student will sign in for each class period. If a student does not sign-in, then they will not receive the attendance points.

You are allowed one absence, no questions asked, no points deducted. This does not include test days or announced quiz days.

All other absences will require written explanation from your Major Advisor or other UA Department Head.

Students are expected to access D2L on a timely basis to access all course materials, along with the in-person lectures/recorded in-person lectures.

### **Classroom Considerations:**

- Face coverings are requested in our classroom:
  - Per UArizona's Administrative Directive, face coverings that cover the nose, mouth, and chin are required to be worn in all learning spaces at the University of Arizona (e.g., in classrooms, laboratories and studios). Any student who violates this directive will be asked to immediately leave the learning space, and will be allowed to return only when they are wearing a face covering. Subsequent episodes of noncompliance will result in a Student Code of Conduct complaint being filed with the Dean of Students Office, which may result in sanctions being applied. The student will not be able to return to the learning space until the matter is resolved.
  - The Disability Resource Center is available to explore face coverings and accessibility considerations if you believe that your disability or medical condition precludes you from utilizing any face covering or mask option. DRC will explore the range of potential options as well as remote course offerings. Should DRC determine an accommodation to this directive is reasonable, DRC will communicate this accommodation with your instructor.
- **Physical distancing is requested in our classroom:** During our in-person class meetings, we will respect CDC guidelines, including restricted seating to increase physical distancing. Any student who does not maintain physical distance from others may be asked to immediately leave the learning space. Noncompliance may result in a Student Code of Conduct complaint being filed with the Dean of Students Office, which may result in sanctions being applied.
- **Classroom attendance:**
  - If you feel sick, or have been in contact with someone who is infectious, stay home. Except for seeking medical care, avoid contact with others and do not travel.
  - Notify your instructors. You are still responsible for material during the semester and arrangements MUST be promptly made with the instructor.
  - Campus Health is testing for COVID-19. Please call (520) 621-9202 before you visit in person.
  - Visit the UArizona COVID-19 page for regular updates.

If you become ill and unable to complete coursework and assignments, contact me right away so we can process an incomplete.

Dropping the course once it has begun:

If you decide to drop the class once it has begun, please notify the instructor.

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 online discussions within 3 days of first day of attendance, or time agreed upon by instructor.

## **Course Communications**

All course communications will be done through email and D2L. You may email me anytime at [mylesd@email.arizona.edu](mailto:mylesd@email.arizona.edu). If you have not received a prompt response from me, please let me know in person when you arrive for class. **DO NOT use the D2L email. I don't get those emails!**

## **Required Texts or Readings**

There is no required textbook. There ARE required readings. Assigned reading will need to be complete each week in order to keep up and perform well on assignments, quizzes, tests, and discussions.

All course materials will be provided to you on D2L.

## **Required or Special Materials**

Students will need a computer with Internet access to, send and receive messages, access D2L and other websites, as assigned.

## **Assignments and Examinations: Schedule/Due Dates**

All readings, videos, Powerpoints, quizzes, assignments and discussions will be posted to D2L under each module along with due dates if applicable. Assignment and Quiz due dates will be listed when assigned and must be uploaded to D2L by 11:59pm on the due date.

Exams and quizzes will be comprehensive. Some materials just carry over like that and you need to remember them. They will cover readings, videos, quiz material, and lecture material. The Midterm Exam will cover material in the modules before that exam. The Final Exam will be comprehensive. It will cover material from the modules after the Midterm. **The Final Exam will be taken in-person.** More information will be given when exam dates get closer as conditions may change.

**MID-TERM Date: 07 OCT 2021**

FINAL Date: TBD

## **\*Discussions**

There will be a general discussion forum for any questions or thoughts you have about the course. This may be questions about assignments, or questions or thoughts about topics or extensions of topics. This can be used to interact with me but also get thoughts from your peers. Sometimes I will post discussion questions in a separate forum. These discussions are not required, but they will enhance your

learning experience.

## Final Examination

The Final exam will cover readings, videos, quiz material, and lecture material. The Final Exam will be comprehensive. It will cover material from the beginning of the course. More information will be given when exam dates get closer.

## Grading Scale and Policies

<u>How your grade will be determined</u>	<u>%</u>
Quizzes	39.9%
Assignments	10.0%
Midterm Exam	20.0%
Final Exam	20.0%
*Attendance	10.1%
<b>TOTAL</b>	<b>100.0%</b>

<u>Grading Scale</u>
A = 90.0% - 100 %
B = 80% - 89.9%
C = 70.0% - 79.9%
D = 60.0% - 69.9%
E < 60.0%

Late work policy: Assignments must be turned in during class on the date due. 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.

Testing policy: All tests will cover readings, videos, quiz material, and lecture material. DRC students may communicate their requirements to the instructor directly, or to the instructor through the DRC office. Cheating will result in failing the course, no questions asked.

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

Netiquette = manner rules for the digital age (communicating digitally).

Important! These rules apply whether you are communicating with your professor or another student!

**Communication:** Maintain the same standard of behavior and ethics that you would follow in a professional, face-to-face context in a business meeting.

**Tone:** Treat others with respect. Be mindful of your tone and how that is conveyed.

**Clarity and Content:** Be succinct. Write, reread, and then post. Carefully consider what you have written. Does it make sense? Is it free from errors? Is it substantive? Is it unnecessarily confrontational or offensive?

**Contribute:** Share your knowledge and insight. Be an active contributor to the learning community.

**Be forgiving:** If someone makes a mistake or does something inappropriate, address it privately and politely if it affected you. Reach out to that person first. If that does not address the situation, let your instructor know. Situations can ALWAYS be mediated first!

## **Class recordings, Powerpoint Lectures Use**

For lecture recordings and Powerpoint lectures, which are used at the discretion of the instructor, students must access content in D2L only. Students may not modify content or re-use content for any purpose other than personal educational reasons. All recordings are subject to government and university regulations. Therefore, students accessing unauthorized recordings or using them in a manner inconsistent with UArizona values and educational policies are subject to suspension or civil action.

## **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>.

## **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>.

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**

Academic advising: If you have questions about your academic progress this semester, or your chosen

degree program, please note that advisors at the Advising Resource Center can guide you toward university resources to help you succeed. 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>

Life challenges: If you are experiencing unexpected barriers to your success in your courses, please note the Dean of Students Office is a central support resource for all students and may be helpful. The Dean of Students Office can be reached at 520-621-2057 or [DOS-deanofstudents@email.arizona.edu](mailto:DOS-deanofstudents@email.arizona.edu).

Physical and mental-health challenges: If you are facing physical or mental health challenges this semester, please note that Campus Health provides quality medical and mental health care. For medical appointments, call (520-621-9202. For After Hours care, call (520) 570-7898. For the Counseling & Psych Services (CAPS) 24/7 hotline, call (520) 621-3334.

### **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.

**BE/PLS 217: Intro to Hydroponics**  
**COURSE SCHEDULE**  
**FALL 2021**

**INSTRUCTOR:** Mr. Myles Lewis

(Schedule subject to change)

Introductory Module	24-Aug
Module 1: Principles of Hydroponics	26-Aug
Module 2: Types of Systems and Controlled Environments	31-Aug
Module 3: Plant Anatomy and Physiology	2-Sep
Module 4: Environmental Conditions Required for Plant Growth	7-Sep
Module 5: Propagation	9-Sep
Sub - TBD	14-Sep
Sub - TBD	16-Sep
Module 6: How to Grow Vining Crops, Tomato	21-Sep
Module 7: How to Grow Cucumbers, Peppers, Eggplant	23-Sep
Module 8: Pollination, Fertilization, and Bee Management	28-Sep
Module 9: Watch Student Presentations	30-Sep
Module 10: Hydroponic Nutrient Solutions	5-Oct
MIDTERM EXAM (Subject to change)	7-Oct
Module 11: TBD	12-Oct
Module 12: Fertigation Systems and Management	14-Oct
Module 13: Nutrient Deficiencies and Physiological Disorders	19-Oct
Module 14: Monitoring Plant Health	21-Oct
Module 15: Pest Management	26-Oct
Module 15 Pest Management (cont'd)	28-Oct
Module 16: Guest speaker	2-Nov
Module 17: Site Selection	4-Nov
Module 18: Greenhouse Design Considerations	9-Nov
Module 19: Cooling and Heating	16-Nov
Module 20: Marketing Considerations and Certifications: Organic, Food Safety, Pesticide-Free	18-Nov
TBD	23-Nov
TBD	30-Nov
Last Day of our class	2-Dec
Final TBD	7-Dec