# PLS 504 Adv. Hydroponic Crop Production

COURSE SYLLABUS: SUMMER I 2023

## INSTRUCTOR INFORMATION

**Instructor:** Dr. Desire Djidonou, (Dr. D), Assistant Professor – Urban/Sustainable Horticulture
**Office Location:** AgIT 248
**Office Hours:** In-office or Online by appointment
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**Preferred Form of Communication**: email

## COURSE INFORMATION

### Materials – Textbooks, Readings, Supplementary Readings

There is no required textbook for this course. Digital copies of selected chapters from the books below will be provided via D2L to complement lecture slides.

- Resh, Howard M. 2012. ***Hydroponic Food Production: A Definitive Guidebook for the Advanced Home Gardener and the Commercial Hydroponic Grower*** (7th edition). Taylor & Francis Group (publishers).
- Sonneveld, C. and Voogt, W. 2009. ***Plant Nutrition of Greenhouse Crops***. Springer.
- Lopez, R. and Runkle, E.S. (edts). 2017. ***Light Management in Controlled Environments***. Meister MediaWorldwide, Willoughby, OH. ISBN-13:978-1544254494, ISBN-10:1544254490

## Course Description

Advanced knowledge on principles and practices of hydroponic crop production in controlled environment agriculture (CEA), including types of hydroponic systems, nutrient solution preparation and management, aerial environmental production factors and their manipulation, emerging indoor vertical farming. Specific cases of hydroponic production practices of major vegetables (leafy greens, culinary herbs, and fruit crops such as tomatoes, peppers, cucumbers, and strawberries) will be discussed.

**Prerequisites:** PLS 1315 or PLS 1307

The *syllabus/schedule are subject to change.*

## Student Learning Outcomes

At the end of this class, students will be able to:

1. Describe specific hydroponic systems for successfully growing leafy greens, culinary herbs, and fruiting vegetables;
2. Estimate plant mineral nutrient requirements for accurately formulating and managing nutrition solution in specific hydroponic crop production system;
3. Describe the plant responses to aerial environmental factors and their optimization for food production in controlled environment systems;
4. Develop writing skills through critical review and summary of scientific literature pertaining to controlled environment hydroponic crop production.

# COURSE REQUIREMENTS

### Minimal Technical Skills Needed

Students will need a computer with Internet access in order to access and use D2L. Basic knowledge of Microsoft office (especially Excel) is required for in-class and at-home exercises.

## Instructional Methods

Lectures: This is a lecture-based course with no laboratory activity. The lecture materials (PowerPoint slides, additional reading materials, and videos) will be made available on the course D2L page.

## Student Responsibilities

**Expectation of Students**

1. Students are expected to review course materials within two days after being posted on D2L to follow the course progress;
2. Completion of assignments and exams by the due dates;
3. Late submission of assignments or make-up of exams and other work in this course will only be allowed for legitimate, pre-excused absences.

## ASSESSMENTS and GRADING

**Course evaluation**

Student's final grade will be based on 450 points total from exams, homework assignments, special project, literature review, and field trip.

| Items | Points | Percentage |
|---|---|---|
| Midterm Exam | 100 | 20 |
| Final Exam | 100 | 20 |
| Homework assignments | 100 | 20 |
| Special project – Formulation of nutrient solution recipe | 50 | 15 |
| Literature review | 50 | 15 |
| Field trip | 50 | 10 |

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Exams: There will be two one-hour exams taken through D2L. The exams will include material from lectures, additional reading assignments, and handout.

Special project: Students will develop a specific nutrient solution formulation in Excel spreadsheet.

Homework assignments: There will be 4 to 5 homework assignments posted on D2L with due date.

Literature review: There will be two published articles related to topics in controlled environment hydroponic crop production to review and summarize.

Field Trip: Students will make arrangement with one commercial greenhouse vegetable production facility in the area they reside for a visit. During the visit, students will talk with the owner/manager to learn about their hydroponic production practices. Student will write a report to include:

- Description of the facility;
- Major vegetable crops grown;
- Production practices in use (type of hydroponic system, transplant production, grow-out, nutrient solution recipes, formulation, and management, and pest management);
- Environmental control set-up (supplemental lighting, humidity control, $CO_2$ enrichment, etc.);
- Harvest and marketing strategies;
- Production challenges they deal with and possible technical solutions to offer them;

## Grade Assignment

Letter grades for the course will be assigned according to the chart below:

A = 90%-100%

B = 80%-89%

C = 70%-79%

D = 60%-69%

F = 59% or Below

# TECHNOLOGY REQUIREMENTS

## LMS

All course sections offered by Texas A&M University-Commerce have a corresponding course shell in the myLeo Online Learning Management System (LMS). Below are technical requirements

LMS Requirements:
https://community.brightspace.com/s/article/Brightspace-Platform-Requirements

LMS Browser Support:
https://documentation.brightspace.com/EN/brightspace/requirements/all/browser_support.htm

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YouSeeU Virtual Classroom Requirements:
https://support.youseeu.com/hc/en-us/articles/115007031107-Basic-System-Requirements

## ACCESS AND NAVIGATION

You will need your campus-wide ID (CWID) and password to log into the course. If you do not know your CWID or have forgotten your password, contact the Center for IT Excellence (CITE) at 903.468.6000 or helpdesk@tamuc.edu**.**

**Note:** Personal computer and internet connection problems do not excuse the requirement to complete all course work in a timely and satisfactory manner. Each student needs to have a backup method to deal with these inevitable problems. These methods might include the availability of a backup PC at home or work, the temporary use of a computer at a friend's home, the local library, office service companies, Starbucks, a TAMUC campus open computer lab, etc.

## COMMUNICATION AND SUPPORT

If you have any questions or are having difficulties with the course material, please contact your Instructor.

### Technical Support

If you are having technical difficulty with any part of Brightspace, please contact Brightspace Technical Support at 1-877-325-7778. Other support options can be found here:
https://community.brightspace.com/support/s/contactsupport

## COURSE AND UNIVERSITY PROCEDURES/POLICIES

### Syllabus Change Policy

The syllabus is a guide. Circumstances and events, such as student progress, may make it necessary for the instructor to modify the syllabus during the semester. Any changes made to the syllabus will be announced in advance.

## University Specific Procedures

### Student Conduct

All students enrolled at the University shall follow the tenets of common decency and acceptable behavior conducive to a positive learning environment. The Code of Student Conduct is described in detail in the Student Guidebook.
http://www.tamuc.edu/Admissions/oneStopShop/undergraduateAdmissions/studentGuidebook.aspx

Students should also consult the Rules of Netiquette for more information regarding how

to interact with students in an online forum: https://www.britannica.com/topic/netiquette

## TAMUC Attendance

For more information about the attendance policy please visit the Attendance webpage and Procedure 13.99.99.R0.01.
http://www.tamuc.edu/admissions/registrar/generalInformation/attendance.aspx

http://www.tamuc.edu/aboutUs/policiesProceduresStandardsStatements/rulesProcedures/13students/academic/13.99.99.R0.01.pdf

## Academic Integrity

Students at Texas A&M University-Commerce are expected to maintain high standards of integrity and honesty in all of their scholastic work. For more details and the definition of academic dishonesty see the following procedures:

Undergraduate Academic Dishonesty 13.99.99.R0.03

http://www.tamuc.edu/aboutUs/policiesProceduresStandardsStatements/rulesProcedures/13students/undergraduates/13.99.99.R0.03UndergraduateAcademicDishonesty.pdf

Graduate Student Academic Dishonesty 13.99.99.R0.10

http://www.tamuc.edu/aboutUs/policiesProceduresStandardsStatements/rulesProcedures/13students/graduate/13.99.99.R0.10GraduateStudentAcademicDishonesty.pdf

**AI use in course**

Texas A&M University-Commerce acknowledges that there are legitimate uses of Artificial Intelligence, ChatBots, or other software that has the capacity to generate text, or suggest replacements for text beyond individual words, as determined by the instructor of the course.

Any use of such software must be documented. Any undocumented use of such software constitutes an instance of academic dishonesty (plagiarism).

Individual instructors may disallow entirely the use of such software for individual assignments or for the entire course. Students should be aware of such requirements and follow their instructors' guidelines. If no instructions are provided the student should assume that the use of such software is disallowed.

In any case, students are fully responsible for the content of any assignment they submit, regardless of whether they used an AI, in any way. This specifically includes cases in which the AI plagiarized another text or misrepresented sources.

13.99.99.R0.03 Undergraduate Academic Dishonesty
13.99.99.R0.10 Graduate Student Academic Dishonesty

## Students with Disabilities-- ADA Statement

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you have a disability requiring an accommodation, please contact:

**Office of Student Disability Resources and Services**
Texas A&M University-Commerce
Gee Library- Room 162
Phone (903) 886-5150 or (903) 886-5835
Fax (903) 468-8148
Email: studentdisabilityservices@tamuc.edu
Website: Office of Student Disability Resources and Services
http://www.tamuc.edu/campusLife/campusServices/studentDisabilityResourcesAndServices/

## Nondiscrimination Notice

Texas A&M University-Commerce will comply in the classroom, and in online courses, with all federal and state laws prohibiting discrimination and related retaliation on the basis of race, color, religion, sex, national origin, disability, age, genetic information or veteran status. Further, an environment free from discrimination on the basis of sexual orientation, gender identity, or gender expression will be maintained.

## Campus Concealed Carry Statement

Texas Senate Bill - 11 (Government Code 411.2031, et al.) authorizes the carrying of a concealed handgun in Texas A&M University-Commerce buildings only by persons who have been issued and are in possession of a Texas License to Carry a Handgun. Qualified law enforcement officers or those who are otherwise authorized to carry a concealed handgun in the State of Texas are also permitted to do so. Pursuant to Penal Code (PC) 46.035 and A&M-Commerce Rule 34.06.02.R1, license holders may not carry a concealed handgun in restricted locations.

For a list of locations, please refer to the Carrying Concealed Handguns On Campus document and/or consult your event organizer.

Web url:
http://www.tamuc.edu/aboutUs/policiesProceduresStandardsStatements/rulesProcedures/34SafetyOfEmployeesAndStudents/34.06.02.R1.pdf

Pursuant to PC 46.035, the open carrying of handguns is prohibited on all A&M-Commerce campuses. Report violations to the University Police Department at 903-886-5868 or 9-1-1.

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# COURSE OUTLINE / CALENDAR

**Lecture Schedule**

| Week | Dates | Topics, Exam | Reading |
|---|---|---|---|
| 1 | June 05 – 09 | Lecture 0: Welcome – syllabus overview<br>Lecture 1: Overview of Controlled Environment Agriculture (CEA) and Hydroponics | Chap 1<br>Assigned review |
| | | Lecture 2: Types of Hydroponic Systems | Chap 5-7<br>Video |
| | | Lecture 3: Growing Substrates for Hydroponics | Chap. 11 |
| 2 | June 12 – 16 | Lecture 4: Plant Nutrition Basics | Chap. 2 |
| | | Lecture 5: Hydroponic Nutrient Solution: Formulation & Management | Chap. 3 |
| | | Lecture 6: Fertilizer Calculation Basics for Hydroponics | **Handout** |
| 3 | June 19 – 23 | Lecture 7: Aerial Environmental Factors and Plant Growth: **Light** | **-** |
| | | Lecture 8: Aerial Environmental Factors and Plant Growth: **Temperature, $CO_2$, Relative Humidity, Wind** | **-** |
| | | **Midterm Exam** | **-** |
| 4 | June 26 – 30 | Lecture 9: Hydroponic Production of Leafy Greens: **Lettuce, Basil, and Microgreens** | Chap. 5 & 6 |
| | | Lecture 10: Hydroponic Production of Vine Crops: **Tomatoes** | Chap. 7-11, 14 |
| | | Lecture 11: Hydroponic Production of Vine Crops: **Peppers** and **Cucumbers** | Chap. 7-11, 14 |
| 5 | July 3 – 7 | Lecture 12: Hydroponic Production of **Strawberries** | **-** |
| | | Lecture 13: Emerging CEA – **Hemp**/**Cannabis** production under controlled environment | **-** |
| | | **Final exam** and special project due | **-** |

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