

Spring 2018

PLS/BE 575A Physiology of Production Under Controlled Environment (3 units)

Course Description:

Students will learn the major environmental factors affecting plant growth and development and will understand interactions between plants and their microenvironments, including light penetration and CO₂/H₂O diffusion. Students will learn energy and mass balance of leaves and canopy and correlate these phenomena with plant productivity and related plant physiological mechanisms. Lectures cover principles of plant physiology with applications in controlled environment agriculture settings as well as in agronomic and horticultural field production. Applications of plant physiological principles relevant to production practices in fields, greenhouses, plant production factories, tissue culture vessels and post-harvest storage will be explored through study of current research publications in these areas.

Course Prerequisites:

Undergraduate plant biology (required) or permission of instructor. Concurrent enrollment in basic plant physiology PLS360 is acceptable.

Location and Times:

Jan. 10 to May 2

Tuesday and Thursday 3:30pm-4:45pm

Instructor: Prof. Tanya M. Quist

Office: Forbes Room #317

Phone: 621-1582

Email: tquist@email.arizona.edu

Office Hours: anytime by appointment.

Learning Objectives:

Upon completion of this course, students will:

- I. Be familiar with the terminology and techniques used in controlled environment agriculture, horticultural and agronomic field production.
- II. Understand and be able to describe general mechanisms involved in plant responses to environmental conditions in field and controlled environment agriculture settings.
- III. Understand the basics of energy and mass transfer as applied to plant-environment interactions occurring under different production systems.
- IV. Be able to compare and contrast the effects of production systems on plant physiological responses including both quantitative and qualitative factors relating to development, growth, yield.
- V. Understand how to evaluate scientific literature covering principles and applications of plant physiology to production systems.

Textbook (optional):

There is no required textbook for this class. The following books are listed here as resources. They are recommended but are not required:

Victor O. Sadras and Daniel Calderini (2015) *Crop Physiology*, Second Edition: Applications for Genetic Improvement and Agronomy. Elsevier, Inc.

Hanan, J.J. 1998. *Greenhouses. Advanced Technology for Protected Cultivation*. CRC Press.

Jones, H.G. 2014. *Plants and microclimate. A Quantitative Approach to*

Environmental Plant Physiology (3rd edition). Cambridge University Press.

Examinations:

There will be a midterm examination and a final examination.

Grading Policy:

Grade for the course will be based on points accumulated over the course of the semester (>90%=A; >80%=B; >70%=C; >60%=D; <59%=E). Total possible points obtained are 600 pts. These points will be awarded based on attendance, two exams (midterm and final) and homework assignments.

Attendance	100
Class participation	50
Midterm exam	100
Final exam	200
Literature review paper	100
<u>Homework assignments</u>	<u>50</u>
Total	600 pts.

Incomplete Grade Policy <http://registrar.arizona.edu/gradepolicy/incomplete.htm>

Teaching Format:

The course will be provided in lecture format. Lecture materials will be available for student access via our D2L course website.

Classroom Behavior:

Policy regarding use of cell phones/pagers – prohibited during instruction sessions. The Arizona Board of Regents' Student Code of Conduct <http://web.arizona.edu/~policy/threatening.pdf>, ABOR Policy 5-308, prohibits threats of physical harm to any member of the University community, including to one's self. See: <http://policy.web.arizona.edu/~policy/threaten.shtml>.

Special Needs and Accommodations Statement:

Students who need special accommodation or services should contact the Disability Resources Center, 1224 East Lowell Street, Tucson, AZ 85721, (520) 621-3268, FAX (520) 621-9423, email: uadrc@email.arizona.edu, <http://drc.arizona.edu/>. You must register and request that the Center or DRC send me official notification of your accommodations needs as soon as possible. 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. *The need for accommodations must be documented by the appropriate office.*

Student 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/codeofacademicintegrity>

Confidentiality of Student Records:

<http://www.registrar.arizona.edu/ferpa/default.htm>

Subject to Change Statement:

Information contained in the course syllabus may be subject to change with

advance notice, as deemed appropriate by the instructors.

Spring 2018 Course Schedule

Week	Date	Topics
1	Jan 11 Th	Course Overview
2	Jan 16 Tu	SI Units
	Jan 18 Th	Overview of Plant Environmental Responses
3	Jan 23 Tu	Plant Environmental Responses - Light Intensity and Quality
	Jan 25 Th	Plant Environmental Responses - Light Intensity and Quality
4	Jan 30 Tu	Plant Environmental Responses - Photoperiod
	Feb 1 Th	Plant Environmental Responses - Photoperiod
5	Feb 6 Tu	Plant Environmental Responses - CO ₂
	Feb 8 Th	Plant Environmental Responses - Wind
6	Feb 13 Tu	Plant Environmental Responses - Temperature
	Feb 15 Th	Plant Environmental Responses - Humidity
7	Feb 20 Tu	Canopy Biology - Energy Balance on leaves and canopy
	Feb 22 Th	Energy Balance and
8	Feb 27 Tu	Canopy Biology - Light and CO ₂ Diffusion
	Mar 1 Th	Canopy Biology - Scaling Up from Single Leaf to Canopy
9	Mar 4-11	Spring Break - no class
10	Mar 13 Tu	Exam Review Session
	Mar 15 Th	Midterm Exam
11	Mar 20 Tu	Plant Nutrition - Rootzone Nutrients
	Mar 22 Th	Adaphic Conditions - Rootzone Substrate
12	Mar 27 Tu	Plant Water Relations
	Mar 29 Th	Translocation of Photosynthates
13	Apr 3 Tu	Growth Analysis
	Apr 5 Th	Crop Growth and Yield - respiration
14	Apr 10 Tu	Growth Environment - greenhouses, hydroponics
	Apr 12 Th	Growth Environment – Energy balance in greenhouses
15	Apr 17 Tu	Growth Environment – growth chambers
	Apr 19 Th	Growth Environment - tissue culture systems
16	Apr 24 Tu	Growth Environment - vertical farming and field systems
	Apr 26 Th	Field Trip to Vertical Farming facilities at the CEAG
17	May 1 Tu	Storage Environment - post-harvest physiology