

Environmental Physiology - HORT(CRSS) 4440/6440

Instructor - Marc van Iersel (mvanier@uga.edu, room 1307)

Teaching Assistant: Ryan Contreras (rncontre@uga.edu, room 1102)

Lecture: 9:30 - 10:45 T, Th, Lab - 12:30-3:15 T

Office hours: Tuesday, 11:00 am - 1: pm, and by appointment

HORT(CRSS) 4440/6440 is designed to:

- 1. improve one's understanding of the environmental physiology of plants*
- 2. encourage application of physiological concepts to everyday agricultural problems*
- 3. demonstrate how plants modify microclimate, and conversely, how microclimate can be modified to optimize growth and reduce environmental stresses*
- 4. reinforce physiological concepts, and develop problem solving, scientific literacy, and small group communication skills through laboratory projects.*
- 5. improve one's ability to critically read and interpret scientific literature*

Lecture Topics - Check WebCT site for changes!

Course topics:

Water - functions, properties, diffusion, osmosis, mass flow; water potential, pages 1-10

Water movement in plants: roots & stems, water movement in plants: stomata & transpiration, pages 11-19

Phloem transport, Drought stress, pages 20-28

Irrigation systems and scheduling, pages 29-46

Salt stress - osmotic adjustment and tolerance, leaching saline soils, pages 47-54

Light: physics, photomorphogenesis, photoperiod and sun/shade adaptations, pages 55-68

Photosynthesis & respiration, pages 69-76

CO₂ enrichment, pages 77-84

Radiation stresses - visible, UV, shade, pages 85-90

Global climate change - overview, impact on agriculture, high temperature stress, pages 91-109

Low temperature stress - chilling injury, freezing injury, cold hardiness, acclimation,

pages 110-122

Frost protection, pages 123-129

Dormancy, chilling, vernalization, pages 130-135

Wind, mechanical conditioning, windbreaks, pages 136-143

Hormones: apical dominance, rooting, fruit set.

Final Exam: Thu, Dec 13, 8:00 - 11:00 am

Note: The course syllabus is a *general* plan for the course; deviations announced to the class by the instructor may be necessary.

Texts:

The HORT(CRSS) 4440 lecture guide *Environmental Physiology* will be available on the course WebCT site. It contains the vast majority of the lecture material used in the course. The instructor may provide sources for additional reading on a day-by-day basis, and post readings to the WebCT site.

Listed below are some good supplemental texts:

Taiz and Zieger, Plant Physiology, 3rd or 4th ed.

<http://4e.plantphys.net/> (Companion web site for Taiz and Zieger's Plant Physiology book)

Fitter, A.H. and R.K.M. Hay. 1987. Environmental physiology of plants, 2nd ed.

Larcher, W. 1980. Physiological plant ecology, 2nd ed.

Salisbury, F.B. and C.W. Ross. 1978. Plant physiology, 2nd ed.

Nobel, P. 1999. Physicochemical and environmental plant physiology.

Grading: 1. Exams (3) 50%

Exam I (Tuesday, September 25)	15%
Exam II (Tuesday, October 30)	15%
Exam III (Final, December 13, 8 am)	20%

All exams are comprehensive, although there will be an emphasis on material covered since the last exam. The exams are made up mostly of discussion questions, which are designed to test **your ability to synthesize information**.

Exams I and II will be administered during the lab period on the dates noted above. The class session in the morning before the exams will be used as a question and answer session.

Exam III will be given during the final exam period for the course.

2. Lab project 25%

2.a. Group grade - 10%

Progress report I	2%
Progress report II	2%
Rough draft of report	2%
Final report	4%

2.b. Individual grade - 15%

Attendance (lab weeks 1-5, 15)	5%
Performance of tasks, portion of report	10%

3. In-class writing, problem solving, and participation 15%

The instructor will conduct in-class written exercises periodically that are focused on problem solving and data interpretation. This serves as a means of encouraging & monitoring attendance in addition to meeting the course learning objectives.

4. Homework assignments 10%

There will be periodic homework assignments to test your understanding of the course material, with an understanding on the quantitative aspects of environmental physiology.

Grading Scale:	> 90 = A
	80-90 = B
	70-80 = C
	60-70 = D
	< 60 = F

In-class behavior & conduct:

- Unwanted talking or distracting behavior is *unwelcome*
- Questions, comments, and discussion of the daily topic are *most welcome*
- Please treat your classmates and the instructor with the respect and courtesy you expect
- Bring a calculator; some of the in-class assignments are mathematical
- Be on time; some of the written assignments will begin promptly at 9:30 am

Attendance and make up policy, academic honesty:

Attendance is required. It will be documented randomly by calling roll or through written assignments collected during class. If you are absent *for any reason* during one of these times, you must provide appropriate documentation or obtain clearance through the Office of Student Affairs, 201 Academic Bldg., in order to proceed with make up work.

Make-up work is scheduled by appointment with the instructor in cases of documented illness or conflict. You are responsible for obtaining any information presented in class, *regardless of the reason for your absence.*

If a student misses more than four classes or labs, 5 points will be subtracted for each additional class that was missed.

All academic work must meet the standards contained in “A Culture of Honesty”. Students are responsible for informing themselves about those standards before performing any academic work. For more detailed information about academic honesty: <http://www.uga.edu/ovpi/honesty/acadhon.htm>

“I will be academically honest in all of my academic work and will not tolerate academic dishonesty of others.” UGA Student Honor Code

LABORATORY

The lab periods are largely devoted to formulation and execution of a group term project. You will work in groups of four and perform an experiment during the course of the semester. The experiment will test a hypothesis concerning plant responses to environmental factors (water, light, temperature, wind, soil factors...) or stresses (freezing, chilling, heat, high light, drought, shade, salinity...), and therefore reinforce (or refute!) the basic concepts of environmental physiology covered in the lectures. Six of the fifteen lab periods are “scheduled labs” with mandatory attendance (see below). Two lab periods will be used for exams I and II. The other lab times are “open” to allow for group meetings, collection and analysis of data, etc, as the group deems necessary. The instructor will be available *by appointment only* during the “open” labs.

Each person will play clearly defined roles in lab groups; for example, data collector, statistics/graphics person, plant care and treatment applicator, editor, presenter. Also, each person must write a specific section of the group’s report. The reports will be in the format of a scientific article, with introduction, materials and methods, results, and discussion sections, so in a group of 4, each person will write one of these major sections. There will be both individual and group grades (see “grading” section above). Example term projects are available on the WebCT site for the course.

Three of the labs (weeks 3, 4, and 5) are devoted to developing the ability to use simple statistics to analyze data. Due to limited space in the computer room, the class will be divided into 2 groups for these labs, one meeting at 12:30 and the other meeting

at 2:00. After completing the third statistics lab, a series of practice problems will be made available for students to further hone their skills. The instructor and TA will be available by appointment for one-on-one consultation as well.

Key lab dates:

<u>Item</u>	<u>Due date</u>
Attendance (lab weeks 1-5, 15)	Aug 21 & 28; Sept 4, 11, & 18; Nov 27
Group Information Sheet Due	Aug 28, 3:15 pm
Progress report I	Sept 18, 3:15 pm
Exam I	Sept 25, 12:30 - 3:15 pm
Progress report II	Oct 23, 3:15 pm
EXAM II	Oct 30, 12:30 - 3:15 pm
Rough draft of report	Nov 20, 3:15 am
Project presentations	Nov. 27, 12:30 - 3:15 pm
Final report	FRIDAY, Dec 7, 5 pm