

EEMB 157C - Plant Physiology Course Syllabus

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Spring term, 2020
Lecture: T/TH 12:30-1:45

Lab/Discussion sections: Remote (Zoom)
Thursdays from 3:00-5:50 or Fridays from 9-11:50

Course Materials:
Optional:
Plant Physiology and Development
Lincoln Taiz, Eduardo Zeiger, Ian Moller, & Angus Murphy
6th Edition, 2015

COVID-19 UPDATE: Students should try to become familiar with all communication modes through **Gauchospace/GauchosCast** and **Zoom**. This means making sure that you are receiving email announcements through Gauchospace (PeachMail). Make sure that Gauchospace emails do not go to your spam or to an email account that you do not regularly check. Regular email and internet or phone access are very important. If you do not have **stable internet access** with capacity to view live lectures, please let us know as soon as possible. Live participation will significantly help each student receive real-time feedback and help other students learn as well, but I understand that participation may not be possible due to technical or personal difficulties. Also, if possible, being prepared to take notes on paper (rather than on your laptops) is highly recommended during the lectures.

There will be no *real-time* evaluations. All exams will be 'take-home'. All presentations can be pre-recorded. All quizzes/homeworks can be taken during a flexible time period. If you are having trouble meeting deadlines, please reach out to us. **Live participation only makes up 6% of your final grade.**

The lecture content is largely based on materials in the textbook (see above) but supplemented with primary literature as well as news articles and op-ed pieces from reputable news sources. These supplementary readings will be posted on the GauchoSpace prior to class discussion. An electronic version of the textbook is also available for purchase. Students who wish to get the most out of the lecture are recommended to read the chapters in the textbook prior to class. Lecture GoogleSlides will be available on GauchoSpace and lectures will be recorded through GauchoCast. Students should plan to take their own notes from the lectures. I will be providing a comprehension worksheet for students to follow during class and give enough time for students to take notes, but you should not expect the lecture slides to stand alone or be the only sufficient material for exam preparation.

Course Overview: This is a four-credit course, employing lecture, primary literature discussion and exercises, to provide students with a comprehensive introduction to major topics in cellular, physiological, and ecological plant biology. The ~~lab~~ discussion section exercises are designed to complement the lecture topics and will include readings about hypothesis-testing experiments, common tools and metrics used in plant physiology, and primary literature comprehension in groups.

Course Objectives:

Students will develop familiarity with plant development, biochemistry, and metabolism.

Students will be able to critically evaluate the primary literature pertaining to several major areas of active investigation in contemporary plant biology.

Students will be familiar with cutting edge technology employed in contemporary plant biology.

Students will further refine their skills in presenting scientific findings.

Students will integrate their knowledge of plant physiology to relevant cultural, social, and legal aspects of their lives.

Evaluation:

Lecture section 72%:

2x Take-home Midterm Exams 19% each

Final Mini-Exam OR a Final Project Presentation 10%*

Online lecture review quizzes/homework 16% (2% x 9 - lowest grade)

Participation in break-out discussions (0.5% x 18 - two excused absences = 8%)

*Students who do not receive at least a B- (80%) on both of their midterms will be given a **cumulative** final exam. All other students will be given a final exam that only covers material after the second midterm.

****A final project consists of either a long-term observational or experimental study of plants with a well-reasoned hypothesis and question. The study must include multiple physiological measurements, statistical analyses, and sound interpretation in a final presentation.**

Discussion section 28%:

Pre-discussion quiz (1% x 9 - lowest grade = 8%)

Post-discussion comprehension worksheet (2% x 9 - lowest grade = 16%)

Participation in break-out discussions (0.5% x 10 - two excused absences = 4%)

During discussion, each break-group will be responsible for answering a subset of the comprehension questions. Every student is required to have read the paper and ideally have the paper at hand in front of them rather than a copy on their computers. It is really hard to navigate between paper and Zoom if you only have one screen.

Grading – Course grades will be curved at the end of the course depending on the breakdown of scores. The percentages will go as such: A 93-100, A- 90-92; B+ 87-89, B 83-86, B- 80-82; C+ 75-79, C 70-74, C- 65-69, D 50-64; F < 50

Day	Topics	Readings	Quizzes and due dates
3/31 Tues.	Course overview and expectations What is a plant? Why is plant physiology important?	Ch. 1;	Pre-discussion quiz on Gagliano et al. 2014 Due 4/2/20 at 3:00 PM Post-discussion quiz on Gagliano et al. 2014 Due 4/7/20 at 11:59 PM
4/2 Thurs.	Cell types I: Plant structure; tissue types; xylem & phloem; sclerenchyma, parenchyma, collenchyma, cell wall components; cellulose, hemicellulose, pectin and lignin	Ch. 1, pp. 1-10, 39-47; Ch. 14, pp. 379-384, 388-392, 400-402 “Tuned in: plant roots use sound to locate water” (Gagliano et al. 2014)	Post-lecture quiz for Week 1

4/7 Tues.	Water I: Water transport, water potential	Ch. 3 & Ch. 4, Web topic 3.6, 3.7, Web essay 4.4	Pre-Discussion quiz Ambrose et al. 2009 - Due 4/9/20 at 3:00PM Post-Discussion quiz Ambrose et al. 2009 - Due 4/14/20 at 3:00PM
4/9 Thurs.	Water II: Transpiration through the leaf	Ch. 4, Ch. 6 is good background information “Effects of tree height on branch hydraulics, leaf structure and gas exchange in California redwoods” (Ambrose et al. 2009)	
4/14 Tues.	Photosynthesis I: chloroplast, thylakoid, Light reaction, Calvin-Benson cycle, C3	Ch. 1, pp. 25-27, Ch. 7, pp. 172-189, 193-195, Ch. 8, pp. 203-208, 220-228, Ch. 9, pp. 255-266	Pre-Discussion quiz Field et al. 2013 - Due 4/16/20 at 3:00PM Post-Discussion quiz Field et al. 2013 - Due 4/21/20 at 3:00PM
4/16 Thurs.	Photosynthesis II: Photorespiration, C4 photosynthesis	Ch. 8, pp. 211-220, 228-230 “Best of Both Worlds: Simultaneous High-Light and Shade-Tolerance Adaptations within Individual Leaves of the Living Stone Lithops aucampiae” (Hill et al. 2013)	
4/21 Tues.	Photosynthesis III: C4 photosynthesis & CAM,	Ch. 8, pp. 230-241, Ch. 12 is good review of respiration, pp. 317-329	Review for midterm I
4/23	Photosynthesis IV		

Thurs.	Starch and Sucrose accumulation,		
4/28 Tues.	Midterm I		Take-home Midterm I available Friday April 24 noon - Tuesday April 28 1:45
4/30 Thurs.	Nutrients: Assimilation from the environment. Symbiotic associations; mycorrhizae, actinorrhizae, rhizobia	Ch. 5, Ch. 13, pp. 353-367 “Evolutionary trajectories, accessibility and other metaphors: the case of C4 and CAM photosynthesis” (Edwards 2019)	Pre-Discussion quiz Edwards 2019 • Due 4/30/20 at 3:00PM Post-Discussion quiz Edwards 2019 • Due 5/5/20 at 3:00PM
5/5 Tues.	Nutrients II: Carnivory; parasitism; proteoid roots	Ch. 15, pp. 407-418	Pre-Discussion quiz Hynson et al. 2016 • Due 5/7/20 at 3:00PM Post-Discussion quiz Hynson et al. 2016 • Due 5/12/20 at 3:00PM
5/7 Thurs.	Plant hormones I: Auxin, gibberellins, cytokinins, ethylene, abscisic acid, jasmonic acid	Ch. 15, pp. 419-421, 441-444, Ch. 17, pp. 487-489 “Plant family identity distinguishes patterns of carbon and nitrogen stable isotope abundance and nitrogen concentration in mycoheterotrophic plants associated with ectomycorrhizal fungi.” (Hynson et al 2016)	
5/12 Tues.	Plant hormones II: Brassinosteroids, strigolactone, jasmonic acid, salicylic acid and their interactions in shoot and root development.	Ch. 18, pp. 513-523, Ch. 21, pp. 643-649 “Root exudates mediate kin recognition in plants” (Biedrzycki et al. 2010)	Pre-Discussion quiz Biedrzycki et al. 2010 • Due 5/14/20 at 3:00PM Post-Discussion quiz Biedrzycki et al. 2010 • Due 5/19/20 at 3:00PM

5/14 Thurs.	Life cycle I: What’s in a seed? Seed dormancy and phytochromes and photoreceptors	Ch. 19, pp. 572-582	
5/19 Tues.	15. Life cycle II: Flower development: Vernalization and photoperiodism	Ch. 20, pp. 605- 621	Midterm review II Midterm II will be offered Friday 5/15 - Tuesday 5/21 due at 1:45pm.
5/21 Thurs.	Environmental stress signals I: Drought, flood, nutrients, temperature	Ch. 9, 249-250, Ch. 10, 269- 276, Ch. 16, 447-454, Ch. 18, 535-538, 540-542, Ch. 20, pp. 597-605 Ch. 23	
5/26 Tues.	Midterm II		
5/28 Thurs.	Environmental signals II: Herbivores, pathogens, and pests	Ch. 22 Ch. 2, 19 “Leaf mimicry in a climbing plant protects against herbivory” (Gianoli and Carrasco-Urra 2014)	Pre-Discussion quiz Gianoli and Carrasco-Urra 2014 • Due 5/28/20 at 3:00PM Post-Discussion quiz Gianoli and Carrasco-Urra 2014 • Due 6/2/20 at 3:00PM
6/2 Tues.	Life cycle III: Senescence; cell death		Pre-Discussion quiz Appel and Cocroft 2014 • Due 6/4/20 at 3:00PM Post-Discussion quiz Appel and Cocroft 2014 • Due 6/9/20 at 3:00PM
6/4 Thurs.	Applications of plant physiology in industry I: GMOs	“Plants respond to leaf vibrations caused by insect herbivore chewing” (Appel and Cocroft 2014)	
6/11 Thurs.	Final exam ‘quiz’ on Gauchospace or final project is DUE		

Student Support Services

(1) Disabled Students Program: accommodations for exams

Students with disabilities may request academic accommodations for exams online through the UCSB **Disabled Students Program** at <http://dsp.sa.ucsb.edu/>. Please make your requests for exam accommodations through the online system as early in the quarter as possible to ensure proper arrangement.

(2) Managing stress / Supporting Distressed Students

Personal concerns such as stress, anxiety, relationships, depression, cultural differences, can interfere with the ability of students to succeed and thrive. For helpful resources, please contact UCSB **Counseling & Psychological Services (CAPS)** at 805-893-4411 or visit <http://counseling.sa.ucsb.edu/>.

If you encounter a student in distress, please contact 805-893-3030 immediately and/or consult the **Responding to Distressed Student Protocol** at <http://www.sa.ucsb.edu/distressedstudentsguide> or phone 893-3030.

(3) Building academic skills

For general **academic support**, students are encouraged to visit **Campus Learning Assistance Services (CLAS)** early and often. CLAS offers instructional groups, drop-in tutoring, writing and ESL services, skills workshops and one-on-one consultations. CLAS is located on the third floor of the Student Resource Building, or visit <http://clas.sa.ucsb.edu>

(4) Responsible scholarship

Honesty and integrity in all academic work is essential for a valuable educational experience. **The Office of Judicial Affairs** has policies, tips, and resources for proper citation use, recognizing actions considered to be cheating or other forms of academic theft, and students' responsibilities, available on their website at: <http://judicialaffairs.sa.ucsb.edu>. Students are responsible for educating themselves on the policies and to abide by them.

(5) Responding to Hate Incidents

Hateful actions based on race, ethnicity, religion, gender, sexual orientation, gender identity, citizenship status, age, or disability are not acceptable. In the event that a hate crime or incident does occur, please report it. Reports may be made anonymously. <http://judicialaffairs.sa.ucsb.edu/hate.aspx>