

BZ 440-001 - PLANT PHYSIOLOGY- SPRING 2024

Canvas Page: https://colostate.instructure.com/courses/180963

INSTRUCTOR

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COMMUNICATION

- 1. Email is the best way of communication. If you need to send an email, please include BZ440-SP24 in the subject line.
- 2. Personal communication is also preferred. This can happen immediately after the lectures and during office hours.
- 3. Special appointment: I will be happy to clarify material, discuss study strategies, and answer questions outside the office hours. Send me an email with a few options for when you can meet or drop in; knock at any time.

LECTURES

MWF 10:00-10:50 (BIO136).

OFFICE HOURS

Tuesday, 9:00 – 11:00 AM (Biology 408)

REVIEW SESSIONS

In addition to the weekly office hours, I will schedule review sessions before each exam. Time, location, and format will be scheduled and posted ahead of time.

Textbook

"Fundamentals of Plant Physiology" by Lincoln Taiz *et al*, Oxford Press. This book provides excellent and well-illustrated coverage of the topics that I will cover, but sometimes in more depth than is necessary for our purposes and other times in less detail than what we want to learn. As a result, you will be using the textbook primarily as a reference to review and reinforce material covered in lectures. Lectures are the primary guide of your study. The textbook can be purchased from the CSU Bookstore or online. Extra reading materials (either mandatory or optional) will be posted on Canvas on time. Review articles will be posted on Canvas for discussion.

Course Description

BZ440 is an upper-level botany class focusing on plant physiology (functions, activities, and mechanisms of biological processes at the cellular, organellar, and whole plant levels). The objectives are for students to develop integrative comprehension of how plants function (e.g., acquire and transport water and nutrients from the soil and within plants, how plants photosynthesize, respire, transpire, distribute the assimilate from sources to sinks, and how they respond to abiotic and biotic stresses in their environment). Also, students will learn how plant physiology is studied at the molecular level and how global warming affects plant growth and crop productivity. I will also discuss the roles of plant hormones in plant growth, development, and crop production and manipulation. Close to the end of the semester, I will discuss some applications of agricultural biotechnology in the development of genetically modified plants for economic purposes. The main target groups are upper-division undergraduate students with backgrounds/career interests in Biology, Horticulture, Soil and Crop Science, Forestry, Rangeland Ecology, and related areas. Graduate students conducting research in similar fields are also welcome.

Specific Learning Objectives

After taking this course, students should be able to demonstrate an understanding of ------

- the organization of plants from the level of cells through tissues, tissue systems, and organs.
- the plant water potential, its components, and its effect on cellular function.
- the physiological mechanisms involved in the uptake and transport of water and prepared food inside plants.
- the mechanisms of the establishment of membrane potential and its role in solute transport.
- the mechanisms for procurement of mineral ions by plants, mineral nutrition, and the role these minerals play in organic molecule synthesis.
- the nutrient deficiency and toxicity symptoms.
- the interrelationships among plants and micro-organisms symbiosis in nitrogen fixation, and assimilation of mimeral ions by plants particularly nitrogen and sulfur.

- the relationship of complementary metabolic pathways such as photosynthesis and respiration in energy acquisition and use during plant development.
- the environmental influences (drought, light intensity, and global warming) upon carbon metabolism in plants (e.g., concerning alternative fixation pathways, photoinhibition, and photorespiration) and plant responses.
- the plant natural products concerning their role in plant defense mechanisms.
- the major effects and physiological mechanisms of growth regulators (hormones) in plant growth, development, and crop production.
- the transformation and propagation of plants in tissue culture.
- application of biotechnology in agriculture for purposes such as increasing crop productivity, enhancing resistance to biotic and abiotic stresses, improving the nutritional value, and production of valuable products and pharmaceuticals in plants.

STUDY TIPS

Golden tips that help you achieve both learning objectives and course goals:

- 1. Attend lectures, make your notes during lectures, re-work your notes the same day, and then make your summaries. While doing this, highlight the important parts.
- 2. I highly encourage you to write notes by hand (on paper on a tablet), rather than using a laptop. Studies have shown that "in the classroom setting students who write out their notes by hand have a stronger conceptual understanding and are more successful in applying and integrating the material than those who take notes with their laptops". Read the "American taking notes with a laptop" under modules.
- 3. Important parts are those I repeat, covered as questions in the lecture, highlighted or written in different fonts or different colors in the presentations, or those explained on the board.
- 4. Disable the internet during the lecture to stop emails and message notifications.
- 5. Ask questions whenever needed. Never feel shy asking questions. By asking questions, you are helping yourself and your classmates as well. Do not underestimate the value of any question you might ask. "Part of my tasks is to answer students' questions".
- 6. Be an active participant in the lecture. This improves your critical and higher-level thinking skills.
- 7. Study in groups and share notes whenever possible, especially during exam preparations.
- 8. Participate in review sessions and office hours. My previous surveys in many courses have shown that students who attend review sessions and office hours accomplish the highest grades among their peers.

Assessments

i.

ii

Midterms and Final Exam (450 points total, ~65%)

There will be THREE non-comprehensive midterms (100 points each) and a comprehensive final exam (150 points). The midterms will be taken on Mondays (see dates below). The final exam will be comprehensive, and the date and time will be announced on time. Final exam worth 150 pts, with 100 pts specifically covering material after midterm 3 (Weeks 13-15) and the remaining 50 pts spread evenly over the material from the entire course.

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	Exams	Date	Material	Points	Time and location
	Midterm 1	February 12 (M)	Weeks 1 → 4	100	Class time
	Midterm 2	March 18 (M)	Weeks 5 → 8	100	Class time
	Midterm 3	April 15 (M)	Weeks 9 → 12	100	Class time
	Final	May 10 (F)	Weeks 1 → 15	150	Will be announced
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- Exams must be taken on the scheduled dates.
- Makeup exams will only be given to students with a university-approved proof of excuse.
- If you belong to any University-sponsored group, you must inform me of known conflicts with exams at least one week before the exam day. It is your responsibility to follow up with a reminder email one day before the exam day.

Weekly quizzes and group discussion (150 points total, ~22%)

A weekly quiz or a group discussion will be assigned each week (except weeks when there will be exams). Quizzes or discussions will be posted on Canvas no later than the Sunday night preceding the week and will be due on Canvas by Sunday 11:59 pm following that week (i.e., seven days later). There will be a total of **eight** weekly quizzes (12.5 points each) and **two** discussions (25 points each).

Tentative dates of the weekly Quizzes and discussions

1.	Quiz 1: Sunday, 1/28
2.	Quiz 2: Sunday, 2/04
3.	Quiz 3: Sunday, 2/18
4.	Quiz 4: Sunday, 2/25
5.	Quiz 5: Sunday, 3/03

6.	Quiz 6: Sunday, 3/10
7.	Quiz 7: Sunday, 3/30
8.	Quiz 8: Sunday, 4/07
9.	Discussion 1: Sunday, 4/21
10	Discussion 0: Cundeus 1/00

10. Discussion 2: Sunday, 4/28

iii. iClicker participation (100 points total, ~13%)

I will use iClicker Cloud technology to ask interactive questions during the lectures. <u>Students must</u> <u>access the iClicker application while they are in the classroom during all sessions</u>. There will be 2.5 points assigned for each iClicker session/lecture and a student will receive 60% (1.5 points) for just submitting answers even if those answers are incorrect and full points (2.5 points) for submitting the correct answer. This is to incentivize engagement with the material being presented in lectures. As this is worth a significant percentage of the grade (13%), getting a good grade will require regular attendance and active participation in iClicker activities, as measured by iClicker responses.

What if you have an emergency/tech issue that makes you miss iClicker questions? I will drop the lowest four scores for iClicker participation, so you can still receive full credit (100 pts) if you miss up to four lectures/sessions. The reason for dropping the four lowest grades is to accommodate unforeseen events that prevent attendance and participation in individual lectures/sessions. Therefore, missed classes will have to count towards these four drops.

Visit the Student iClicker Information page (<u>https://canvas.colostate.edu/iclicker/student-information/</u>) for instructions on setting up an iClicker Cloud account. You can also join the BZ440 iClicker via this link (<u>https://join.iclicker.com/GJAO</u>) This technology allows you to answer polling questions with a personal device such as a smartphone, tablet, or laptop.

Grading Scale

Grades will be calculated according to the following breakdown:

Midterm 1	100
Midterm 2	100
Midterm 3	100
Final Exam	150
Weekly assignments/discussions	150
iClicker participation	100

Total

= 700 points

Individual assignments and individual exam grades will not be curved.

In the end, the individual student's fractional grades will be rounded to the nearest whole number (*e.g.*, 69.6 = 70 and 69.4 = 69). Then grades will be calculated according to the following scale:

< 95	A+	
90-94	А	
85-89	A-	
80-84	B+	
75-79	В	
70-74	B-	
65-69	C+	
60-64	С	
55-59	D	
>55	F	

If the class average is less than 75% (B), final grades will be curved to bring the class average to 75%.

Regrading of Exams and Assignments

If a student has concerns about grading, he/she must present the exam/assignment for regrading within one week of when it was returned. I am happy to discuss how an exam or assignment was graded at any point, but formal regrade requests will only be accepted within the one-week time window. For any regrade requests, the entire assignment (not just individual questions) will be regraded. Therefore, it is possible to lose points on a regrade if I find that credit was mistakenly given for incorrect answers.

Students with Special Needs

Students requesting exams or classroom accommodations should contact the student disability center located in room 121 TILT building (<u>https://disabilitycenter.colostate.edu</u>). The phone number is (970) 491-6385. They will approve the request and communicate with me.

Academic Integrity

Exams are to be completed by each student on their own without assistance from other individuals, including other students in the course. For weekly assignments, it is permitted to

work with other students to arrive at an answer for each question. Also, you are permitted to ask me about the assignment questions during office hours, and I will help you understand the answers. However, it is not acceptable to copy answers verbatim from another student, the textbook, online sources, or a solutions manual. Written answers must be provided in your own words. Recognizably copied answers will receive zero credit and be considered cheating. The use of online "homework helper" sites is not permitted in this course. Use of these types of resources will be considered receiving unauthorized assistance and, therefore, a violation of the student conduct code. This course will adhere to the CSU Academic Integrity Policy as found on the Student Responsibilities page of the CSU General.

http://catalog.colostate.edu/general-catalog/policies/students-responsibilities/#academicintegrity. Violations will result in a grading penalty in this course and a report to the Office of Conflict Resolution and Student Conduct Services.

Tentative Lecture Schedule and Topics.

Week	Start Date	Modules	Chapter	Exams/assignments
1	17-Jan	Syllabus and course introduction Plant cell architecture	1	None
2	22-Jan	Water movement across membranes: Osmosis and water potential Whole-plant water relations	2 3	Quiz 1, Sunday 1/28
3	29-Jan	Mineral nutrition Assimilation of inorganic nutrients	4 5	Quiz 2, Sunday 2/4
4	5-Feb	Solute transport	6	Midterm 1, Monday, 2/12
5	12-Feb	Photosynthesis I: the light reactions	7	Quiz 3, Sunday 2/18
6	19-Feb	Photosynthesis II: carbon	8	Quiz 4, Sunday 2/25
7	26-Feb	fixation Ecophysiology	9	Quiz 5, Sunday 3/3
8	4-March	Translocation of assimilates in the phloem	10	Quiz 6, Sunday 3/10
	11-March Spring Break			No classes
9	18-March	Respiration and lipid metabolism	11	Midterm 2, Monday, 3/18
10	25-March	Signal transduction Hormones as signaling molecules. Signals from sunlight	12 13	Quiz 7, Sunday 3/30
11	01-April	Plant growth and development.		Quiz 8, Sunday 4/7
12	8-April	Development from Seed to	14-17	Midterm 3, Monday 4/15
13	15-April	seed.		Discussion 1, Sunday 4/21
14	22-April	Biotic and abiotic interactions	18, 19	Discussion 2, Sunday 4/28
15	29-April	Agricultural Biotechnology (Methods and applications) CRISPR Cas-9	External sources	none
16	06-May	Final week	Revision	Will be announced

Good luck Salah Abdel-Ghany