



BIOL 4411-001 Applied Plant Physiology

Biology Program (Department of Natural Sciences)

Instructor: J. Rodolfo Valdez Barillas (Call me Dr. Valdez)

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Office hours: WF 11-1pm in Sci &Tech 311L or by appointment via Microsoft Teams

Class meeting format: MWF 10:00 to 10:50 pm in Sci-Tech 105

Lab meeting time: M 11:00-1:45 pm in CAB 310

Course Description

Throughout history, humans have utilized plants in various ways; however, a more comprehensive understanding of the mechanisms and processes responsible for plant function emerged only in the latter half of the 20th century. This course aims to enhance the student's knowledge of plant function from a practical perspective. We will explore plant function, growth, and development through lectures and laboratory exercises. In the first part of the course, we will examine the structures and functions of plants. The second segment will focus on plant metabolic functions related to water balance, nutrient production, nutrient allocation, and defense mechanisms. The final segment will address the mechanisms and processes involved in the growth and development of different plant tissues, and plant's responses to biotic and abiotic stimuli.

Course Objectives

- Understand the mechanisms that explain how **plants** function and appreciate the diversity of adaptations that help plants cope with different environmental pressures.
- Understand plant function at different levels including a chemical, molecular, cellular, morphological, and from an ecological perspective.
- Understand the applications and links between plant use, plant products, and physiology
- Read and evaluate original literature (including peer-reviewed journals) to gain direct access to historical and modern developments related to Plant physiology.
- Learn different laboratory techniques to address plant physiology questions, emphasizing plant growth, development, and propagation.

Recommended resources

Textbook for Lectures: (Recommended)

- Plant Physiology 7th edition by Taiz, Moller, Murphy, and Zeiger (2022) Sinauer Associates: Oxford University Press. ISBN 9780197577240.
- Plant Physiology 6th edition by Taiz and Zeiger. (2014) Sinauer Associates, Inc. (ISBN-13 9781605352558 ISBN 1605352551).
- Other Recommended books: Emanuel Epstein and Arnold J. Bloom. 2005. Second edition. Mineral Nutrition of Plants: Principles and Perspectives. University of California, Davis.
- **Lab handouts: provided by the instructor, and posted on Blackboard on Friday**

Course Policies

Attendance: You are required to attend every lecture and laboratory session.

- For face-to-face lectures attendance during the entire lecture is expected, being no more than 10 minutes late.

Participation: You are expected to have reviewed the course material from previous lectures, so you come to class with questions and ready to participate in collective discussions.

Communication: All communication and inquiries outside lecture time should be e-mailed to jvaldezb@tamusa.edu. This e-mail is intended for communication only. No late assignments will be accepted via e-mail unless the instructor has granted accommodation. All assignments will be submitted using the link provided on Blackboard.

Online etiquette: When sending e-mails please initiate them by addressing me as Dr. Valdez, so I know I am the intended recipient, and try to be specific about your question or comment. Please include your name at the end of your e-mail so I can reply using your name.

Course Changes: The course syllabus, lecture, and lab schedules may be subject to change or updated during the semester; however, students will be notified via e-mail or during class should it change.

Exam Dates: The dates for all the Exams are included in the lecture schedule. However, the date might be changed at least one week in advance when 80% of the class or more students petition to move the date if overloaded with Exams from other courses. Any changes in dates will be submitted to class vote at least one week before the original scheduled date

Make-up Exams: Make-up Exams are granted at the instructor's discretion. Make-up Exams cannot be expected unless you have previously communicated your absence in written form or no later than 24 hours from your absence. Students can only make up one exam, and since one-half of the Exam is completed as a group, you can only receive credit for the individual portion.

Late assignments: I will deduct 10% of the assignment's possible points for each day passed after the due date.

Laboratory sessions: Laboratory activities indoors or outdoors are subject to Texas A&M System regulations and policy. Specific laboratory guidelines will be provided during the first lab session; however, **facemasks** will be needed during lab sessions that require sterile conditions. Lab coats will also be used during laboratory sessions in CAB 310 but not outdoors.

Outdoor lab activities: For laboratory activities and group projects in our greenhouse facility, students will be encouraged to dress appropriately for outdoor work, mainly to protect their skin from the sun, minimize heat stroke, and stay hydrated.

Course Evaluation

Exams: The Exam format will include multiple choice, true/false questions

- Exams are closed book and most questions will come from or will be like the quiz questions
- The Exam may include figures, tables, diagrams, or articles that will be provided on the day of the Exam
- Each exam will include the material covered during the lecture before the day of the exam
- Exams will normally be on Mondays and require 50 minutes to complete.
- You will be given a paper-printed Exam, you will need a pen or pencil to enter your answers directly on the Exam, and a scantron will be provided.

Quizzes: Quizzes will be available weekly

- Regular quizzes will be available via Blackboard and completed outside of lecture time. You will have 5 days to complete and submit the quiz attempts before the Due date and time.
- However, on the week of the Exam a quiz will be submitted on Wednesday, and you will have 48 hours to complete and submit it before the end of the day
- Your quiz can be taken three times, and the highest score will be added to your grade book.
- Questions will be presented one at a time and no backtracking will be possible; the number of questions may range from 5-10 questions.
- Length of quiz may range from 5 to 10 minutes.

Assignments: This may include a scientific article summary and critiques or in-class activities

- Please read the instructions provided on how to write an article summary and critique.
- Depending on the assignment, the submission may be during or after a lecture.
- You cannot turn in in-class assignments if you were absent the day it was provided.

Extra credit: Extra credit (5 points) will be given to those of you who post a news article.

- The article link needs to be provided and the article posted needs to be related to any topic in conservation or restoration covered during the week. You only need one posting to earn 1 point. Five Extra credit News folders will become available for posting your news during a specific period. You may not post articles for past or future weeks.

- Volunteering and Community Service (5 extra credit points): You will have the chance to earn 5 extra credit points for volunteering at any conservation organization or helping with undergraduate research projects. If interested, come talk to me, please. 1 hour of service = one extra credit point. Additional credit opportunities will be provided
- **Lab notebook:** You will be required to bring a lab notebook during every lab. In it, you will enter preliminary lab information, data collected during lab, data analysis and results, and data interpretation. **(Please read the instructions on how to use your lab book posted under course content on Blackboard)**
- Examples
 - <https://www.walmart.com/ip/National-Brand-Heavyweight-Reinforced-11-x-8-1-2-Filler-Paper-100-Sheets/15079153> (any book like this one works but not smaller versions please)



- **Group project and presentations:** You will form groups and will work on designing and building plant growth projects. Instructions will be provided during the first week of class.

GRADING (Number of quizzes and assignments may be adjusted based on student course load)

Instruction	Assessment	Cumulative pts
Lecture	Exams (3+final) 100pts/each	400
	Quizzes (11) 10pts/each	110
	Assignments (3) 10pts each	30
	In-class assignments (5) 5 points each	25
Lab	Groups Project Final Report	10
	Group Project Presentation	20
	Lab reports (8) 20pts/each	160
	Total	775

A = 90 – 100 points

B = 80 – 89.9 points

C = 70 – 79.9 points

D = 60 – 69.9

points F = <59.9

points

Calculation of Final Grades

- The extra credit earned is added to the 775 total points when calculating your final grade over 100 points

BIOL 4411 Plant Physiology lecture schedule

wk	Date	Lecture Topic	Ass / Quiz
1	01/21/2026 01/23/2026	Introduction Take-home assignment	
2	01/26/2026 01/28/2026 01/30/2026	Plant structures Plant structures Plant structures	Quiz 1
3	02/02/2026 02/04/2026 02/06/2026	Genome Organization and Gene Expression Movement of water & solutes Water balance of plants (Soil-Plant-Atmosphere)	Ass 1 Quiz 2
4	02/09/2026 02/11/2026 02/13/2026	Solute transport Solute transport Plant nutrition 1	Quiz 3
5	02/16/2026 02/18/2026 02/20/2026	Exam 1 Plant nutrition 2 Photosynthesis: light reaction 1	
6	02/23/2026 02/25/2026 02/27/2026	Photosynthesis: light reaction 2 Photosynthesis: dark reaction (or carbon reactions) Translocation in Phloem	Quiz 4
7	02/30/2026 03/04/2026 03/06/2026	Respiration 1 Respiration 2 Lipid Metabolism	Quiz 5
8	03/09-14	Spring Break	
9	03/16/2026 03/18/2026 03/20/2026	Assimilation of mineral nutrients Assimilation of mineral nutrients Assimilation of mineral nutrients	Ass 2 Quiz 6
10	03/23/2026 03/25/2026 03/27/2026	Exam 2 Secondary metabolites 1 Secondary metabolites 2	
11	03/30/2026 04/01/2026 04/03/2026	Cell wall formation and expansion Signal transduction Plant hormones (Auxin & Brassinosteroids)	Quiz 7
12	04/06/2026 04/08/2026 04/10/2026	Plant hormones (Gibberellins and Cytokinins) Plant hormones (Absciscic acid & Ethylene) Signal from sunlight (Phytochrome and red light)	Quiz 8
13	04/13/2026 04/15/2026 04/17/2026	Blue-light responses & Stomatal biology Plant development 1 Plant development 2	Ass 3 Quiz 9
14	04/20/2026 04/22/2026 04/18/2026	Exam 3 Seed dormancy, germination, and establishment Control of Flowering and Floral Development	
13	04/27/2026 04/29/2026 04/30/2026	Fruit development Seed development Plant Senescence and Cell Death	Quiz 10
14	05/04/2026 05/06/2026 05/08/2026	Plant ecological interactions Plant ecological interactions	Quiz 11
16		Final (Cumulative)	