

BIO 351: Plant Physiology

Fall 2018, 4 Credits

Lecture: T, R, F 8:00 – 8:50 AM

Lab: Thurs. 1 – 3:50

Lecture Instructor: Ann Impullitti, Ph.D.

Office: CBB 342

Work Phone: 715-346-2772

Email: ann.impullitti@uwsp.edu (this is the best way to reach me)

Office hours: 11:00 – 12:00 M, W, F or by appointment

In general, I have an open door policy. If you have any questions stop by any time and I will answer them, time permitting

How I will contact you: I will use your UWSP email address so please check your email daily. If you use a different email address, make arrangements to have messages forwarded to the account you use.

Introduction

Plant Physiology is the study of how plants function. The course will largely focus on angiosperms (flowering plants), but many of the same concepts can be applied to bryophytes, seedless vascular plants, and gymnosperms. The course will introduce you to most of the basic process required for plant function, such as photosynthesis, water relations in the cell and whole plant, growth, and development. We will also discuss various biotic and abiotic factors that influence plant physiology, and themes of plant biotechnology and plants and people will be discussed throughout the course.

At the completion of this course you should be able to:

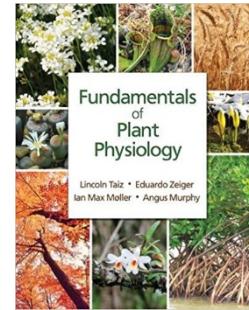
- 1) Demonstrate an understanding of how plants manufacture biological molecules
 - a. Explain the physical nature of light and its importance to photosynthesis
 - b. Explain how plants respond to light (photoreceptors and phytochromes)
 - c. Explain how plants harvest light and produce ATP and NADPH for carbon reduction
 - d. Explain how plants reduce carbon dioxide to organic carbon
 - e. Summarize cellular respiration and explain how plant respiration is different than animal respiration
- 2) Demonstrate how plants acquire and transport water and solutes for growth
 - a. Explain the structure and properties of water
 - b. Demonstrate understanding of the uptake and transport of water (whole plant and plant cells)
 - c. Identify macro and micronutrients required by plants
 - d. Identify plant nutrient deficiencies and explain how they could be rectified
 - e. Explain mechanisms for procurement and transport of nutrients by plants
 - f. Demonstrate an understanding of the importance of bacteria and fungi in nitrogen and phosphorous acquisition.
 - g. Explain the translocation of photoassimilates in the phloem
- 3) Demonstrate an understanding of how plants grow and develop
 - a. Describe the organization of plants from cells to organ systems
 - b. Examine plant development from embryo to adult (embryogenesis, seed dormancy, seed germination). Cell wall, structure, and growth will be discussed
 - c. Demonstrate an understanding of the major effects and physiological mechanisms of growth regulators (hormones) in plants

- d. Explain various photoperiod responses by plants, and how flowering and fruit development are initiated
- 4) Demonstrate and understanding of how plants interact with their environment
- a. Describe alternate carbon fixation pathways (CAM and C4)
 - b. Predict how the environment might impact photosynthetic processes
 - c. Explain constitutive and induced defense responses to pathogens, herbivores, and insects
 - d. Explain how plants acclimate or adapt to drought, heat, cold, salinity or other possible stressors

Course Materials

For lecture

Textbook: Taiz, L, et al. *Fundamentals of Plant Physiology*, 1st ed. Sinauer Associates, Inc. Wiley
ISBN: 978-1605357904



For Lab

Lab handouts will be posted on D2L. Please print and bring to lab

Student expectations and attendance

I will not formally take attendance in lecture, but you are expected to attend all lectures. Furthermore, I am up front of you every day, meaning that I see and look at my audience daily and will know if you are not in attendance on a regular basis. Please note that there is also a strong correlation with attendance and being successful as an undergraduate.

Attendance in lab is mandatory. You must notify me at least one week prior to an excused event (university sponsored activity, religion holiday, etc) in order for the lab to be considered excused. Make-up labs are not possible even for excused absences. Inclement weather and oversleeping are two examples of unexcused absences. If you have an unexcused absence you may be able to study the lab material on your own time, but you will not receive points for the lab (or abstract). **An unexcused absence will reduce your grade by half of a letter grade (i.e. B → B-); two unexcused labs will result in a full letter grade deduction.**

Assessment

Exams (300 pts)

- Three in class exams (100 pts/exam). Exams are based on lectures and labs. Exams may be composed of T/F, multiple choice, fill in the blank, short answer, data interpretation, problem solving, and essay.
 - A makeup exam will be given if you have a conflict due to a religious observance or an UWSP sponsored event. In cases such as these, you need to make arrangement with me **at least 1 week before the exam. The rescheduled test must be taken 24hrs before the scheduled time. NO EXCEPTIONS**
 - If you miss an exam for any other reason (car troubles, illness, family emergency, alarm clock failure, etc.), you will receive a zero on the exam. This zero will be replaced with the percentage you earn on the final exam. For example, you missed lecture exam #1 and earned a 75% (112.5/150pts) on the final exam. Exam #1 will now be replaced with 75pts.

Final Exam (150 pts)

- The final exam is cumulative. Biology is a discipline in which you are constantly building on prior knowledge, and therefore on the final you will be expected to integrate concepts and ideas from throughout the semester.

Journal Club (50 pts)

- 25-30 min of class on some Friday's will be set aside for a journal club. Journal club Friday's will provide us with time to have an active discussion about classic and current topics in plant physiology. Two students will lead the discussion and be responsible for providing a short background, looking up important methodology to explain to the group, and presenting the results. Nothing needs to be memorized, you can prepare notes, bring references etc. The students presenting can earn a maximum of 25 pts for leading the discussion. The presentations should be approx. 15 min, with an additional 10 min of class for discussion/questions. Journal articles are your choice, but selecting an appropriate and feasible article can be a challenge. I would suggest each person finding three articles (6 total) and then meeting with each other to narrow your choices to only three. Once you have three, schedule a 10 minute meeting with me and we will identify the best article for your presentation. One week prior to your presentation date meet with me to discuss the paper, go through any questions that you may have, and provide me with a brief outline of your presentation. This meeting is worth 10 of the 25 pts.
- You will also be assigned an 'audience' grade throughout the semester for a maximum of 25 pts. Your grade will be based on your participation (not your background/depth of knowledge). You will be expected to read the article and prepare a list of 3 questions about the paper and a combination of 3 critiques or things that you have learned from the paper. I will then collect these questions at the end of the class.

Abstracts and Supporting documents (Lab) (240 pts)

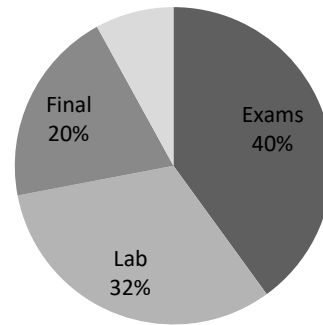
- Lab exercises will require an abstract with attached figures, data tables, and/or diagrams as documentation. The completed abstract is due on the date announced in class. You will be required to turn in all of the abstracts, but you will be randomly selected from the stack a total of 6 times for grading. (6 x 40 pts) More details will be supplied in lab
- Late abstracts will receive penalties...so turn these in promptly. Early submissions are encouraged

Membrane Permeability
Plant Pigments
Mineral Nutrition
Stomata
Photosynthesis: C3 vs C4
Photosynthesis: Light vs Sun
Group Photosynthesis Experiment

Bean Branch Initiation
Root Initiation
Chloroplast Isolation and Fractionation
Chlorophyll Fluor and CCI
Nitrate Reductase
Developmental Changes during Germination
qPCR and GMO

Grading

| | | |
|-----|------------|-----------|
| A | >93% | > 688 |
| A - | 90 - 92.9% | 666 - 687 |
| B+ | 87 - 89.9% | 644 - 665 |
| B | 83 - 86.9% | 614 - 643 |
| B- | 80 - 82.9% | 592 - 613 |
| C+ | 77 - 79.9% | 570 - 591 |
| C | 73 - 76.9% | 540 - 569 |
| C- | 70 - 72.9% | 518 - 539 |
| D+ | 67 - 69.9% | 495 - 517 |
| D | 63 - 66.9% | 466 - 494 |
| D- | 60 - 62.9% | 444 - 465 |
| F | <59.9 | > 443 |



BIO351 and UWSP Policies

TECHNOLOGY GUIDELINES: Research supports that having visual access to a cell phone diminishes our ability to learn. Checking social media, texts, emails, and messages is unprofessional and disrespectful to our class community. Please turn off your phone during class; I will do so as well. If I notice that you are using your phone during class I may ask you to share what you are researching or ask you to put it away. Thank you for following these guidelines as they help create a positive learning community.

ATTENDANCE: Attending class will likely be the single most important factor in determining your performance and grade in the course, so plan to attend every class. In most class meetings you will have at least one project, exercise, test, and/or discussion that will impact your grade, and your class discussions will count toward participation. The relationship between attendance and achievement in education has been extensively documented in peer-reviewed research. ***I am not able to re-teach the material to you in the event that you are absent, but you can ask a classmate to share notes.***

ACADEMIC INTEGRITY: Academic dishonesty in any form will not be tolerated! It is your responsibility to be aware of your rights and responsibilities as a UWSP student. Please take the time to read and understand the information found here (and let me know of any questions):

<http://www.uwsp.edu/dos/Documents/CommunityRights.pdf>. Cheating or plagiarism related to any of the course assessments will result in a score of zero for that assessment.

ACCOMODATIONS: I will be happy to help you if you need special accommodations to succeed in this course. Please visit the UWSP Student Disability and Assistive Technology Center (located in LRC 609) to document your needs and contact me so that appropriate arrangements can be made. More information:

<http://www.uwsp.edu/disability/Pages/default.aspx>