

IB 420 (CPSC 484) – PLANT PHYSIOLOGY - SPRING 2021 – 3 CREDIT HOURS

Prof. Matthew Brooks

Office: 161A E.R. Madigan Laboratory

E-mail: mb5886@illinois.edu

Office hours: By appointment

Prof. Justin McGrath

Office: 197A E.R. Madigan Laboratory

E-mail: jmcgrath@illinois.edu

Office hours: By appointment

Meetings: Class time is scheduled on Tuesdays and Thursdays from 9:30 to 10:50. However, we will meet online during only the dates listed in the course meeting schedule at the end of this document. Most weeks we will meet only on Thursday, and the three dates we will meet on Tuesday are indicated on the schedule. In place of meeting on most Tuesdays, recorded lectures will be provided to be viewed at the student's convenience *before* the Thursday session.

Online meetings will use this Zoom link:

<https://illinois.zoom.us/j/82787320546?pwd=SFdlREdCQllmSHppbXR0T1VsMVBLQT09>

COURSE DESCRIPTION AND OBJECTIVES

This course is designed to guide you toward an understanding and appreciation of plant physiology. Physiology refers to the physical, mechanical, and biochemical functions of living organisms. It is a sub-discipline of biology that investigates the way organisms work from the molecular and cellular to the organ to the whole-organism levels. The focus of this course is on vascular land plants, although references to other autotrophic organisms may be made to understand underlying principles. As much as possible the concepts will be presented in the context of how plants interact with their environment.

COURSE POLICIES, EXPECTATIONS, AND REQUIREMENTS

Prerequisites:

IB 103 or IB 150 and MCB 150; CHEM 232; IB 202 recommended; or consent of instructor.

Student Commitment:

IB 420/CPSC 484 is an online, undergraduate-level, 16-week, 3-credit hour course. The student is expected to devote at least 3 hours per week learning the topics of the course through video lectures and readings, and at least 3-5 additional hours per week on homework assignments and class projects. The instructor will be available for consultation online by appointment.

Required Text:

Lincoln, T., Eduardo, Z., Ian, M.M. and Angus, M. (2014). *Plant Physiology and Development*, 6th Edition. Sinauer Associates, Sunderland, MA

Available from the university bookstore or other online booksellers. You will need either the physical book *or* e-book, but not both.

Evaluation and Feedback:

Constructive feedback during the course is essential for effective learning. If at any time you are

concerned about your performance in the class, please contact one of the instructors. Evaluation will be based on the criteria shown on the next page:

Grading:	Quizzes	12 x 10 pts	24 %
	Homework assignments and micro-essays	13 x 10 pts	26 %
	Presentation	100 pts	20 %
	Midterm Exam	75 pts	15 %
	<u>Final exam</u>	<u>75 pts</u>	<u>15 %</u>
	Total	500 pts	100 %

Your final grade will be assigned based on the following grading scale:

94-100 %	A	83-86 %	B	70-76 %	C
90-93 %	A-	80-82 %	B-	60-69 %	D
87-89 %	B+	77-79 %	C+	Below 60 %	F

A few notes about...

... online etiquette

The interactive components of this online course will take place using a combination of Zoom and the course Web site on Moodle (learn.illinois.edu). It is expected that you will treat everyone just as you would in a physical classroom. In addition, you should ensure that nothing that could be perceived as offensive is visible if you turn on your video (which can happen by mistake) that your microphone is muted unless you are speaking and that background noise is kept to a minimum. Violations will result in appropriate disciplinary action.

...attendance

Attendance is expected at the online meetings. If you must miss class for a scheduled event, please notify one of us as early as possible before class. Failure to do so will result in a failing grade (0%) for any in-class quiz and activity which cannot be made up.

...participation

Participation in class discussions and activities is essential. This does *not* mean that you will be graded based on the number of times you speak. Rather, successful discussions result when participants are prepared and engaged. Remember to listen to your classmates, ask questions, think about what you want to say before you speak, yield the spotlight to others, and be respectful.

...late work

Missed Exams may be made up only if you have an excused absence. Late work will not be accepted except under extreme circumstances. If an assignment is due at the beginning of class and you are late for class, your assignment will be considered late.

...group work and academic integrity

Science is a collaborative endeavor. Each of you brings a unique set of interests and experiences to this course. We can all learn from each other and I encourage you to discuss the readings with your classmates and seek their feedback.

According to the Student Code, "It is the responsibility of each student to refrain from infractions of academic integrity, from conduct that may lead to suspicion of such infractions, and from conduct that aids others in such infractions." Please know that it is my responsibility as an instructor to uphold the academic integrity policy of the University, which can be found here: <https://studentcode.illinois.edu/article1/part4/1-401/>

...accommodations

Disability Accommodations: To obtain disability-related academic adjustments and/or auxiliary aids, students with disabilities must contact the course instructor and the Disability Resources and Educational Services (DRES) as soon as possible. To contact DRES you may visit 1207 S. Oak St., Champaign, call 333-4603 (V/TTY), or e-mail a message to disability@illinois.edu.

Student Learning Outcomes:

At the end of this semester, students will be able to do the following:

- Understand physiology functioning of plant responses to their environment, including variable environmental conditions, water transport, and solute uptake and partitioning.
- Critically understand the basic metabolic pathways involved in primary plant function, including, but not limited to, photosynthesis, photorespiration, respiration, sugar/starch/lipid synthesis and breakdown.
- Understand the determinants and mechanisms of plant growth, development and movements.
- Demonstrate competencies in understanding plant physiological response to and interactions with biotic and abiotic stresses.

Class Format:

The lectures for the course will consist of a series of short pre-recorded lectures that will be posted to the class Web site by Friday of the previous week. These can be watched at your convenience, but each video for that week should be viewed before the online Thursday meeting.

The format of each class will include the following:

Announcements and questions on lecture material (about 15 minutes)

This is time allocated to announcements of upcoming class activities, follow-up questions from previous lectures, and clarification of information previously presented. Questions can also be posted to the discussion board for that week.

Quiz on weeks lecture and reading (about 10 to 15 minutes)

These will be short quizzes on the lecture and reading material from that week. The primary goal is to ensure that students have done the work for that week.

In-class activities* (about 30 to 35 minutes)

This time will be dedicated to students working together to answer questions or work on activities related to the lecture material. The activities may include, but are not limited to, hands-on activities, worksheets, data and figure analysis, and discussion of literature.

**Note that multiple in-class activities may be nested within the lecture.*

Student presentations (20 minutes)

Students will be randomly assigned a partner and together prepare a 7 to 10 minute presentation. There will be a demonstration by the instructors the third week of class and student presentations will begin the following week. To ensure that there are no technical issues during the scheduled class time, students must pre-record their presentations and share the videos with the instructors by the end of Tuesday on the week of the presentation. Additional details will be available on the course Web site.

All materials and lecture slides will be available on the class Web site at <https://learn.illinois.edu/>

Course meeting schedule

All meetings except those indicated will be on Thursdays.

	Date	Chapter/Topic (Pages)	Presentation groups
Tuesday	26 Jan	Course introduction	
	28 Jan	Ch. 1: Plant and Cell Architecture (1-10, 23-29, 39-47)	
	4 Feb	Ch. 2: Genome Structure and Gene Expression Ch. 3: Water and Plant Cells Ch. 4: Water Balance of Plants	
	11 Feb	Ch. 10: Stomatal Biology Ch. 5: Mineral Nutrition (131-140) Ch. 6: Solute Transport Paper: Elevated CO ₂ concentration effects on nutrient dynamics	
	18 Feb	Ch 7: Photosynthesis: The Light Reactions Ch 8: Photosynthesis: The Carbon Reactions, pt. 1 (203-220)	1 & 2
	25 Feb	Ch. 8: Photosynthesis: The Carbon Reactions, pt.2 (220-241) Ch. 9: Photosynthesis: Physiological and Ecological Considerations Paper: Photorespiratory bypass	3 & 4
	4 Mar	Ch. 11: Translocation in the Phloem Ch. 12: Respiration and Lipid Metabolism (317-321, 329, 337, 340-350)	5 & 6
	11 Mar	Ch. 13: Assimilation of Inorganic Nutrients Midterm exam review	7 & 8
Tuesday	16 Mar	Midterm exam	
	18 Mar	Ch. 14: Cell Walls: Structure, Formation, and Expansion	9 & 10
	25 Mar	Ch. 15: Signals and Signal Transduction Paper: Systemic vs. local signaling	11 & 12
	1 Apr	Ch. 16: Signals from Sunlight Ch. 23: Biotic Interactions (693-706, 710-724, 726-727)	13 & 14
	8 Apr	Ch. 24: Abiotic Stress Ch. 22: Plant Senescence and Cell Death	15 & 16
	15 Apr	Ch. 18: Seed Dormancy, Germination, and Seedling Establishment	17 & 18
	22 Apr	Ch. 19: Vegetative Growth and Organogenesis Ch. 20: The Control of Flowering and Floral Development (591-608)	19 & 20
	29 Apr	Ch. 20: The Control of Flowering and Floral Development (608-621) Ch. 21: Gametophytes, Pollination, Seeds, and Fruits	21 & 22
Tuesday	4 May	Final exam review	
	TBD	Final exam	