PLB/BMB 866 Molecular Plant Physiology Fall 2024

Class Meetings

Tuesday and Thursdays, 2:40 PM to 4:00 PM in room 247 Plant Biology Laboratories and by Zoom. This officially is an in-person course but in many cases you will watch a video of past lectures and come prepared to discuss them at the class meeting. Zoom will be enabled for the occasional time you can meet by Zoom but not in person. Please inform the lecturer if you must be away from both the lecture room and Zoom during the scheduled class period for any reason.

Zoom address

https://msu.zoom.us/j/98950295048?pwd=OGtCS2RKYkdBSWprcGUxTHB3TVN5dz09

Meeting ID: 989 5029 5048

Passcode: 697723

Teaching Team

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Course Description

PLB 866 is designed for first year graduate students in the molecular plant sciences program but is open to anyone wanting a comprehensive treatment of molecular plant physiology. This is a core course in the Molecular Plant Sciences program. The main topics will be molecular (including biochemical) aspects of plant physiology. Topics include cell biology, photosynthesis, cell wall metabolism, lipid metabolism, and signaling and sensing. A quantitative understanding of plant processes will be emphasized through a series of homework exercises.

Course Goals

This course is designed to provide the foundational understanding of a number of plant physiological processes. The course will be run in a way that will help students prepare for their comprehensive oral exam. Writing skills are emphasized in PLB 856 and students in the MPS program are required to take a bioinformatics course, which will require working with big data sets. To complement these skills, PLB 866 will emphasize quantitative understanding exercises but not writing exercises nor big data skills. As a result of taking this course students should be familiar with a wide range of plant physiological processes and be able to analyze data, form hypotheses, and discuss molecular plant physiological issues at a graduate level. The course should also be useful for understanding seminars that you will attend as part of the MPS or your departmental seminar series. A previous course in plant physiology would be helpful but is not required for this course.

Student Responsibility

Study at MSU places a premium on self-motivation, the instructors will provide information, exercises, and oversee discussions and debate designed to help you learn concepts and skills related to scientific reasoning. You will be responsible for making the most of these resources and seeking to understand both the knowledge base and the scientific practices in biology.

Instructor Responsibility

Instructors will work to provide students with up-to-date, relevant information on issues in molecular plant physiology. Instructors will respond to issues around compliance with the Americans with Disabilities Act. Please contact Professor Sharkey if you need accommodation.

Required Course Materials

Desire2Learn (D2L) and Electronic Communications

Course materials will be posted on D2L (https://d2l.msu.edu/). We will also use the D2L mail system to send course announcements so you should be sure that this system is connected to your e-mail account, or you should check the D2L mail system regularly.

Textbook, other reading materials

There are two excellent texts that cover portions of the material in this class.
Plant Biochemistry, by Hans-Walter Heldt and Birgit Piechulla.
The other is
Biochemistry and Molecular Biology of Plants, by Bob B. Buchanan; Wilhelm Gruissem; Russell L. Jones (2nd edition, 2015).
Most of the reading material will be recent reviews and primary literature. These will be available from the MSU Library web site.

Coursework

There are two types of graded coursework in this course.

Exams

- There will be three exams in this course.
- Exams will be mostly short answer questions and some questions requiring longer answers or drawing.
- Exams will be open book – take home exams due at the end of the day listed on the schedule.
- Exams will be worth 80% of your grade.

Quantitative exercises

- Ten quantitative exercises will be worth 20% of your grade. These will be mostly physical chemistry problem sets designed to be useful in plant physiological research.
- Many of the problem sets will require use of Excel. You have access to Excel as a member of the university. Some students use R or Python. This is acceptable.
- Problem sets will be discussed in class

Attendance policy

- Attendance is expected at all class meetings, however, as graduate students you may have opportunities to attend national meetings or other activities that justify missing class. Let Professor Sharkey know of the times you will be absent.

Group work

Group study can significantly enhance your learning experience. You are encouraged to study for exams in groups but the exams themselves will be only your own work. You are encouraged to discuss the quantitative exercises, but each student must write out answers or create spreadsheets with answers on their own.
Use of AI will be discussed in class and guidance may differ among instructors.

Grades

Your grade will be determined by your performance on the written exams and the assigned homework.

Grade	Percentage Earned
4.0	≥ 90%
3.5	≥ 85%
3.0	≥ 80%
2.5	≥ 75%
2.0	≥ 70%
1.5	≥ 65%
1.0	≥ 60%
0.0	≤60%

This grading scale shows the percentage you must receive to guarantee a particular grade. The grades in the course will be adjusted if necessary based on the final distribution of scores. This adjustment may raise your grade from the scale shown here, but it will not lower your grade.

Policy on Classroom Etiquette

Excerpts from Academic Freedom for Students at Michigan State University

- Article 2: Academic Rights and Responsibilities
    - III. A. *The student is responsible for learning the content of a course of study according to standards of performance established by the faculty and for adhering to standards of professional behavior established by the faculty.*
    - III.B.4. *The student's behavior in the classroom shall be conducive to the teaching and learning process for all concerned.*
    - III.B.10. *The student and the faculty share the responsibility for maintaining professional relationships based on mutual trust and civility.*
- Faculty have the right to remove students from the classroom for disruptive conduct.

Academic Integrity

Academic dishonesty of any kind will result in a zero, or other penalty grade, for the assignment or the course, and will be reported to the Dean of your college.
MSU states the following (in part) about academic honesty:

- *"Academic honesty is central to the educational process and acts of academic dishonesty are serious offenses within the University community. Suspension from the University could be the consequence for acts of academic dishonesty.*

Integrity is also essential to the conduct of science.

Schedule of class meetings (as of August 13, 2023 To be updated for 2024)

	Topic	Instructor
8/29/23	Introduction/cell biology of plants	Sharkey
8/31/23	Red and blue light sensing	Sharkey
9/5/23	Light absorption	Sharkey
9/7/23	Photosynthetic electron transport/respiration	Sharkey
9/12/23	Calvin Benson cycle	Sharkey
9/14/23	Rubisco	Sharkey
9/19/23	Photorespiration/respiration	Sharkey
9/21/23	C4 CAM	Sharkey
9/26/23	Polysaccharides	Sharkey
9/28/23	Exam	
10/3/23	Cellular secretory pathway	Kim
10/5/23	Cell walls	Kim
10/10/23	Cell walls	Kim
10/12/23	Lipids	Benning
10/17/23	Lipids	Benning
10/19/23	Lipids	Benning
10/24/23	Break	
10/26/23	Hormones	Mostofa
10/31/23	Hormones/ubiquitination	Mostofa
11/2/23	Hormones/ubiquitination	Mostofa
11/7/23	Exam	
11/9/23	Tropisms circumnutation	Sharkey
11/14/23	Water relations/salinity	Sharkey
11/16/23	Long distance transport, phloem	Sharkey
11/21/23	The clock/circadian rhythms	Sharkey
11/23/23	Thanksgiving	
11/28/23	Sugar sensing	Sharkey
11/30/23	Heat shock responses	Sharkey
12/5/23	Reactive oxygen	Sharkey
12/7/23	Plant growth	Sharkey