PLB/BMB 866 Molecular Plant Physiology Fall 2025

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 graduate level grounding in molecular plant physiology. This is a core course in the Molecular Plant Sciences program. The main focus will be molecular and biochemical aspects of plant physiology. Topics include cell biology, photosynthesis, metabolism, signaling and sensing. A quantitative understanding of plant processes will be emphasized through a series of take-home 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 utilize quantitative understanding exercises but not focus on the development of advanced writing or 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, and should provide a window into

the research conducted in plant-related departments at MSU. A previous course in plant physiology is helpful but 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 Professors Shachar-Hill and Skirycz 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.
And
Biochemistry and Molecular Biology of Plants, by Bob B. Buchanan; Wilhelm Gruissem; Russell L. Jones (2nd edition, 2015).
Much 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, each weighed equally.
- Exams will be worth 80% of your grade.
- Exams will be mostly short answer questions with 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.

Quantitative exercises

- Ten quantitative exercises will be assigned alongside the lectures, each weighted equally.
- Quantitative exercises will be worth 20% of your grade.
- The quantitative exercises are designed to be useful for your graduate research in the plant-related departments at MSU.

- 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 Professors Shachar-Hill and Skirycz 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 amongst the group, but each student must write out and submit 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 quantitative exercises.

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

Integrity is essential to the conduct of science. 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."*

Lecture schedule		
Molecular	Topic	Instructor
8/26/25	Introduction/cell biology/energy and carbon flows	Shachar-Hill
8/28/25	Plastid structure and function	Shachar-Hill
9/2/25	Light absorption/ sensing / electron transport	Shachar-Hill
9/4/25	Rubisco/ Calvin Benson cycle	Shachar-Hill
9/9/25	Photorespiration/respiration/core metabolism	Shachar-Hill
9/11/25	The analysis of metabolic flux	Shachar-Hill
9/16/25	Sugars and Polysaccharides,	Shachar-Hill
9/18/25	Long distance transport and nitrogen	Shachar-Hill
9/23/24	Exam 1	Shachar-Hill
9/25/25	Algal/ Bacterial photosynthesis	Schmollinger
9/30/25	Plant nutrition (macro and micronutrients)	Schmollinger
10/2/25	Water relations/salinity	Schmollinger
10/7/25	Growth	Schmollinger
10/9/25	Heat shock responses	Schmollinger
10/14/25	Reactive oxygen	Schmollinger
10/16/25	The clock/circadian rhythms	Schmollinger
10/21/25	Break	
10/23/25	Sugar sensing	Schmollinger
10/28/25	Exam 2	Schmollinger
10/30/25	Plant – microbe interactions	Skirycz
11/4/25	Plant – insect interactions	Skirycz / Fischer
11/6/25	Germination and seedling establishment	Skirycz
11/11/25	Flowering	Skirycz
11/13/25	Senescence	Skirycz
11/18/25	Small molecule hormones	Skirycz
11/20/25	Peptide hormones	Skirycz
11/25/25	Lipids	Skirycz
11/27/24	Thanksgiving	
12/2/24	Exam 3	Skirycz
TBA	Final Discussion	all instructors