

Course Syllabus

Bi 180: Plant and Soil Science

Course Syllabus – Fall Quarter / 2024

California Institute of Technology

Lectures: Room 101 Kerckhoff (Bldg. 27) M,W 2:00-2:55 PM

Laboratory: Room 347 Kerckhoff (Bldg. 27) F 2:00-3:30 PM

Where to meet initially for lab (101 or 347 or elsewhere – sometimes we will meet outside on campus!) will be announced in the Wednesday lectures

Course Instructor

Prof. Elliot Meyerowitz

[Contact Information: Office 158 Church, x6889, meyerow@caltech.edu](mailto:meyerow@caltech.edu)

Teaching Assistant(s)

@caltech.edu / Office Hours:

Course Description

Plants comprise most of the mass of living things on land, serve as the ultimate source of almost all human food and energy, and are a dominating force in the carbon and oxygen cycles. This lecture, reading and lab course will introduce topics in plant systematics, evolution, genetics, genomics, development, and ecology, with emphasis on plant interactions with soil and the bacteria, fungi, and animals that inhabit it. There are two hours of lecture a week, and 90 minutes of lab. Lab sections will include walking the Caltech campus and area to observe and experiment with living plants, and doing experiments in the lab with plants, soils, and soil organisms.

Learning Outcomes

By the end of this course, students who paid attention will be able to:

- Understand the general structure and function of flowering plants
- Know the rudiments of plant taxonomy
- Know basic plant development and metabolism
- Have an introductory knowledge of soil composition and its interactions with plants
- Know the basics of the carbon and nitrogen cycles, and their relation to climate change

Required Text

Textbook: Stern's Introductory Plant Biology, 15th Edition, James Bidlack and Shelley Jansky

ISBN10: 1260240835

ISBN13: 9781260240832

Copyright: 2021

An earlier and less expensive edition will be good enough! You can buy the 13th edition for about \$7 (including shipping) on abebooks.com

The library will be requested to get reserve copies.

Course Website or Learning Management System

Canvas will be used.

Assessment Rubric

Each student has to give a 5-minute lab presentation on a collected plant, giving the full phylogeny, leaf and flower structure (with literature references), and some microscope observations. Powerpoint or Keynote for microscope photos, and explanation of what we are seeing. 15% of grade. Sign up link:

Midterm exam, take-home, 2 hours. 30% of the grade

Final exam, take-home, 2 hours, 35% of the grade

Attendance at lectures: 10% of the grade (0 points for missing, 0.5 points for attending each lecture).

Attendance at the laboratory: 10% of the grade (0 points for missing, 1 point for attending each lab session). As there are 9 lab sessions (November 29 is a holiday) everyone will start with 1 point.

Attendance will be recorded by each student logging in to a Google Form - instructions will be provided at the start of each lecture and lab.

Attendance and Participation

Attendance at lectures and labs is graded. Lectures will not be recorded unless this is required for Covid policies, and if recorded, will only be available to students who have a valid requirement to quarantine supported by the Dean's Office.

Academic Integrity

Caltech's Honor Code: "No member of the Caltech community shall take unfair advantage of any other member of the Caltech community."

Understanding and Avoiding Plagiarism: Plagiarism is the appropriation of another person's ideas, processes, results, or words without giving appropriate credit, and it violates the honor code in a fundamental way. You can find more information at:

<https://writing.caltech.edu/resources/plagiarism>.

All instances of plagiarism or other academic misconduct will be referred to the [Board of Control](#) for undergraduates. For graduate students, contact the [Graduate Office](#).

Collaboration Policy

Collaboration on homework assignments is encouraged! You may consult outside reference materials, other students, the TA, or the instructor.

Exams should be entirely your own work, without discussion of the problems or solutions with others, and without use of ChatGPT or similar chatbot programs. You can study for the exams with others, though.

PRELIMINARY Course Schedule

Week	Date	Lecture Topic	Lecturer	Textbook Reading
1	September 30	Why study plants?: the importance of plants in global climate and human society	Meyerowitz	Chapter 1. For anyone without a previous Biology course, read Chapter 2 as well Chapters 16, 23, 24
1	October 2	The plant kingdom: plants, algae, and more	Meyerowitz	Feel free to explore chapters 20-22 as well, if interested
2	October 7	Plants in the carbon oxygen and nitrogen cycles	Meyerowitz	Chapter 25

2	October 9	Plants in the carbon oxygen and nitrogen cycles	Meyerowitz	Chapter 26
3	October 14	Plant Cells, Tissues and Organs 1	Meyerowitz	Chapters 3, 4
3	October 16	Plant Cells, Tissues and Organs 2	Meyerowitz	Chapter 12
4	October 21	Photosynthesis 1	Fischer	Chapter 10
4	October 23	Photosynthesis 2	Fischer	
5	October 28	Plant Life Cycle: Flowering Plant Reproduction, Meristems	Meyerowitz	Chapters 5, 6
5	October 30	Structure and Development of Flowers	Meyerowitz	Chapters 7, 8

October 30
MIDTERM
OUT

November 4
MIDTERM
DUE

6	November 4	Plant Development: Introduction to Plant Hormones	Meyerowitz	Chapter 13
6	November 6	Plant Development and Mechanics: Morphogenesis and Mechanical Responses	Meyerowitz	Chapter 11
7	November 11	Plant Gene Editing	Demirer	
7	November 13	Marine Sediments and Plants in the Sea	Orphan	
8	November 18	Soils: Classification, Distribution, Structure, Formation	Fu	Chapter 5, 9
8	November 20	Soils: The Rhizosphere – Bacteria, Nitrogen Fixation	Newman	Chapter 17
9	November 25	Soils: The Rhizosphere – Fungi and Mycorrhizal Associations	Dr. John Marken	Chapter 19
9	November 27	Soils: Arthropods in Soil and Leaf Litter, Bioturbation	Parker	

10	December 2	TBA	
10	December 4	Mapping Plants from Space	Frankenberg
	December 9	FINAL OUT	
	December 13	FINAL DUE	

Lab Schedule: 2PM-3:25PM Every Friday

Meeting place to be announced in Wednesday Lecture - either 101 KRK, 347 KRK, or ?

October 4: CAMPUS TOUR 1- Tour on our experimental subjects - campus plants. Tour should last until 3:25 or so.

October 11: CAMPUS TOUR 2 AND OBSERVATIONS IN LAB

October 16: PLANT TISSUES AND CELLS – MICROSCOPY LAB

October 25: WATER MOVEMENT IN PLANTS -

November 1:

November 8: SOIL INTRODUCTION – SOIL CONTENT AND STRUCTURE

November 15: PLANT GENE EDITING GÖZDE DEMIRER

November 22: SOIL BACTERIA JOHN MARKEN, COLLECT LEAF LITTER FOR PARKER

December 6: SOIL ARTHROPODS JOE PARKER

Wellness Policy

While COVID-19 remains a concern, all members of the Caltech community, including students and others, are required to [promptly report](#) to the Institute if they have become ill with [COVID-like symptoms](#) or have been exposed to someone who has tested positive for COVID-19.

Furthermore, any individual, regardless of vaccination status, who is ill or has been exposed to COVID-19 should stay home or return home if they have already reported on-site (including not attending class or other meetings in person), and report their status through the [Caltech COVID-19 Reporting Application](#). Individuals who have reported their status through the COVID-19 Reporting Application will receive personal follow up and guidance from Student Wellness Services on next steps. For additional information on the Institute's COVID-19 preventative health measures and requirements, visit the [Caltech Together](#) website.

If you would like to ask about flexibility with coursework for a temporary or minor wellness issue, please contact Dr. Meyerowitz or the TA directly. The Deans' Office, Student Wellness Services (SWS) and Caltech Accessibility Services for Students (CASS) are available to help you with illness and health conditions that may impact your coursework:

- [Student Wellness Services](#) will assess and treat illnesses and medical conditions and communicate (with student's permission) with the Deans' Office if needed. CASS, part of SWS, can recommend and provide for accommodations needed due to temporary or long-term disabilities. Policies about academic extensions for medical reasons can be found [here](#).
- [The Deans' Office](#) may recommend academic exceptions in cases of significant family or personal emergencies, or moderate to severe illness or medical conditions that make it difficult to keep up with coursework. Please reach out to a dean as soon as possible if you experience these conditions.

Students with Documented Disabilities

Students who may need an academic accommodation based on the impact of a disability must initiate the request with Caltech Accessibility Services for Students (CASS). Professional staff will evaluate the request with required documentation, recommend reasonable accommodations, and prepare an Accommodation Letter for faculty dated in the current quarter in which the request is being made. Students should contact CASS as soon as possible, since timely notice is needed to coordinate accommodations. For more information: <https://cass.caltech.edu/>, cass@caltech.edu. If you are having difficulties with access or other challenges in the class you think might be related to a disability, but do not yet have a diagnosis, please feel free to reach out to CASS to learn more about resources.

My Status as a “Responsible Employee”

As a faculty member, I am required to notify the Institute's Equity and Title IX Office when I become aware of discrimination, sexual harassment, or sex- or gender-based misconduct involving our community members. If one of my students shares such an experience with me, I can help connect them to support resources but will not be able to keep that information confidential as part of fulfilling my responsibility to make sure my students are offered the opportunity to access information and support by the Institute. For more information, you can email equity@caltech.edu, go to equity.caltech.edu, or review the Institute's [Sex- and Gender-Based Misconduct Policy](#).

If you have experienced such prohibited conduct and want to report it or speak to a confidential resource, consult the [Equity and Title IX Office's webpage on reporting](#) for guidance.

Academic Resources for Students

- Tutoring: The undergraduate dean's office provides a free peer tutoring service; If the course isn't listed, students can talk with the dean's office to arrange for a tutor; <https://deans.caltech.edu/>

- Writing: The Hixon Writing Center provides professional writing tutors as well as peer tutors, individual and group writing space, and additional resources; <https://writing.caltech.edu>
- Registrar & FERPA: The registrar can answer questions about degree progress, privacy of student records, and course enrollment procedures; <https://registrar.caltech.edu>. The website also lists *Option Representatives* for option-specific advising, policies, and information.
- Library: Borrow books, retrieve journal articles, receive guidance about research; <https://library.caltech.edu/>
- Dean of Undergraduate Students: Wide-ranging assistance addressing issues (academic and other) for undergraduates; <https://deans.caltech.edu>
- Dean of Graduate Studies: Wide-ranging assistance addressing issues (academic and other) for graduate students; <https://gradoffice.caltech.edu>

Additional Resources for Students

- Student Wellness Center: Wide variety of health and wellbeing services; <https://wellness.caltech.edu/>
- Counseling Services: Free for all students, regardless of insurance plan; <https://counseling.caltech.edu>
- Occupational Therapy: Individual sessions and consultations on building healthy habits and routines, time management, planning and organization, and more. Free for all students; <https://ot.caltech.edu>
- Center for Inclusion and Diversity: Resources concerning navigating diversity and inclusion, including staff who can speak with students about challenges of harassment and discrimination; <https://diversity.caltech.edu/>
- Title IX: Caltech's Title IX Coordinator (titleix@caltech.edu) works with students on issues related to sexual harassment, sexual misconduct, and sex discrimination; <https://titleix.caltech.edu/>
- Caltech Accessibility Services for Students: The Accessibility Services Specialist works with students with temporary medical conditions, or mental, physical or learning disabilities on accommodation requests and services; <https://cass.caltech.edu>
- Residential Support: Resident Associates (RAs) and Residential Life Coordinators (RLCs) are also resources for TAs and students; <https://residentialexperience.caltech.edu/>
- Career Advising and Experiential Learning: Provides resources to help students make career decisions and implement career plans; <https://career.caltech.edu/>