

Plant Growth and Development

CPSC 486
MWF @ 9:00 - 9:50 am
Fall 2020

Instructor: Dr. Sarah R. Hind
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Office Hours: By appointment

Grading: 3 credit hours

Prerequisites: IB 103; CPSC 352 or IB 204, or equivalent

Course Description:

Plant growth and development is a complex and highly regulated process that occurs over various spatiotemporal scales. This advanced interdisciplinary course integrates genetic, molecular, cellular, biochemical, anatomical, and physiological information in order to explore the life of a plant from its embryonic origins to its final death. The format of the course includes lectures and both small- and large-group discussions, and requires weekly reading from the textbook and selected primary literature articles.

Specific Learning Objectives:

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

1. Recognize key plant structures and describe the origin, development, function, and/or purpose of each.
2. Distinguish between the different plant hormones by comparing their mechanisms and regulation of synthesis, perception, and signaling.
3. Trace the lifecycle of plants from the formation of the embryo through the death of the plant.
4. Illustrate the various means by which plants sense and respond to changing environmental conditions.
5. Identify how interactions with other organisms and with their environment affects plant growth and development.
6. Read, interpret, and analyze the experimental evidence from primary literature articles.
7. Develop critical questions, lead comprehensive discussions, and create insightful responses about current scientific advances related to the course topics.

Required Texts:

Plant Physiology and Development by Lincoln Taiz, Eduardo Zeiger, Ian M. Møller, Angus Murphy, 6th Edition (ISBN: 9781605352558) or 6th International Edition (ISBN: 9781605357454). Oxford University Press. The textbook also has a companion website with additional content that can be accessed at <http://6e.plantphys.net/index.html>.

A copy of the textbook has been placed on reserve at the Funk ACES Library.

Course Website:

The course website is located on the University of Illinois Compass 2g system. To access the course webpage, go to the following website: <https://compass.illinois.edu>. You can log in using your University of Illinois NetID and password. This website provides important course information, discussion board and assessments, and materials related to lectures and readings.

Classroom Rules:

Students are expected to abide by University policy set forth in Article 1, part 2 of the student code: *"It is expected that students enrolled in the University will conduct themselves at all times in accordance with accepted principles of responsible citizenship and with due regard for the rights of others"* (<http://studentcode.illinois.edu/article1/part2/1-201/>). Additionally, the University has committed to cultivating a diverse and equal opportunity community through its *"Inclusive Illinois: one campus, many voices"* campaign, and all members of the University of Illinois community are encouraged to commit to the vision statements found at <https://www.inclusiveillinois.illinois.edu/commitment.html>. In order to define the specific behavior and conduct that we expect from each other, we will discuss and generate our classroom rules during the first week of class, and the rules will be posted on the Compass course website for the remainder of the semester.

Class Format and Procedures:

It is expected that you will complete the textbook and article readings **before** coming to class. Students are expected to participate in class activities in a respectful manner as outlined in the course rules, and to abide by the university student code of conduct. Lecture outlines will be posted by 11:59 pm the night before the class meeting.

Class Attendance and Participation Policy:

In accordance with University policy set forth in Article 1, Part 5 of the student code: *"Regular class attendance is expected of all students at the University"* (<http://studentcode.illinois.edu/>). For scheduled events, such as religious observances and university-sponsored extracurricular activities, please provide a written absence request **at least one week prior to the date of absence**. The policy and request forms for accommodation for religious observances can be found at <http://odos.illinois.edu/community-of-care/resources/faculty/religious-observances/>. In the case of unplanned absences, students whose absences meet the criteria outlined in the student code may contact the Student Assistance Center to request an absence letter: <http://odos.illinois.edu/community-of-care/resources/students/absence-letters/>. For all absences, please contact me as soon as possible to arrange alternative assignments.

Grading Procedures:

Assignment	# per semester	Points per assignment (total of 1000 points)	% of final grade
In-Class Exams	3 (4 total)	100	30%
Weekly Online Quizzes	10 (12 total)	20	20%
Weekly Online Discussion Board Posts	15	10	15%
Article Summary	1	100	10%
In-Class Article Presentation	1	100	10%
Post-Class Online Discussion Facilitation	1	50	5%
In-Class Assignments	10	10	10%

Grades:

Letter Grade	Range	Points
A	100-93	1000-925
A-	92-90	924-895
B+	89-87	894-865
B	86-83	864-825
B-	82-80	824-795

Letter Grade	Range	Points
C+	79-77	794-765
C	76-70	764-695
D	69-60	694-595
F	<59	<594

In-Class Exams and Final Exam:

The exams will test student competency on the material presented in the readings and during class. There will be 3 exams and a final exam each worth 100 points, and you will have 50 minutes to complete the exams. Each exam will be held on Fridays during the regularly scheduled class time, with the exception of the final exam that will be given at the scheduled final exam time. The lowest exam grade will be dropped at the end of the semester, and **no make-up exams will be given**. Question types may include but are not limited to the following: multiple choice, true/false, short answer, matching, fill in the blanks, and essay. For the final exam, approximately half of the questions will be related to the material covered after Exam #3, and the rest of the questions will focus on content from the rest of the semester (i.e. cumulative). If you feel that an exam question has been graded incorrectly, it must be brought to the instructor's attention within one week after receiving the corrected exam.

Weekly Online Quizzes:

Each week, except weeks when there is an exam scheduled, you will be tested on the material covered in the readings and during our class sessions. Each quiz will consist of 10 questions worth 20 points total, and you will have 20 minutes to complete the quiz. Quizzes will be available on the Compass 2g website immediately following the end of class on Fridays, and due by 11:59 pm on Tuesday evenings. The 10 highest scores will be included in your final grade, and there will be **no make-up quizzes**.

Weekly Online Discussion Board Posts:

Students will be responsible for posting at least 4 responses to 2 threads on the Discussion Board each week. Individual postings will be awarded between 1 and 3 points, depending on the quality of the response. Postings are due by 11:59 on Tuesday evenings. While you are encouraged to keep the Discussion threads going indefinitely, there will be no credit given for responses posted after the weekly deadline.

When posting an original response to a thread prompt, you should include some or all of the following components: mention specific information from course readings or articles; make connections to content covered previously in the course; include critical analysis of the material; and/or relate the information to topics or experiences outside the scope of the course. When posting a reply to other students' posts, you should discuss one point that you either agree or disagree with, and introduce new or relevant information. For all posts, you should mention the source of your information, which can include the textbook, journal articles, or reputable websites, and include the reference or attach the source to your post.

Textbook and Article Readings:

Throughout the semester, you will be responsible for reading recent journal articles related to the course topics. Articles will be discussed on Fridays as noted in the Schedule. You will be assigned one article to present to the class (see below) and you will have input on the article selection. Article readings will be posted on the course website at least 3 weeks in advance.

Article Summary, In-Class Presentation, and Online Discussion Board Project:

This project will develop your ability to read, understand, interpret, and explain primary literature articles related to the course topics. The project consists of 3 parts: writing an Article Summary; presenting the in-class Presentation and Discussion of the article; and leading the post-class Discussion of the article, including threads from that week's lecture, via the weekly online Discussion Board. You will complete this project in small groups, and may provide suggestions related to your preferred topic and article; however, the instructor will make the final decisions regarding groupings, topics, and articles.

The Article Summary about your assigned article will be due by 11:59 pm on the Tuesday before the in-class Discussion. Your summary should be 2-3 pages double-spaced in length, formatted using 11 pt Times New Roman or Calibri fonts, and with 1 inch margins. You can submit your assignment as a Word, PDF, or comparably formatted document. The Summary will be worth 100 points, and the grading rubric can be found on the course website. Each student must **independently** write and submit a Summary.

The Presentation for in-class Discussion of the article will be due by 11:59 pm on the Tuesday before your in-class Discussion so that the instructor can review it and provide informal feedback. Your presentation should be made using a standard presentation program, such as Powerpoint, WPS Presentation, Keynote, or Prezi. Your presentation should run for a total of 25 minutes, followed by 10 minutes dedicated to small-group discussion of the questions generated by the presenters and 10 minutes for the whole-class discussion. The Presentation will be worth 100 points, and the grading rubric can be found on the course website. Though

students will complete the presentation as a group, **each student must submit a copy** of the assignment in order to receive their grade.

Facilitation of the post-class Discussion will occur immediately after the presentation until the following Tuesday evening at 11:59 pm. The presenters are responsible for responding to the postings made by their peers on the weekly Discussion Board. These responses must be posted by the Thursday following the presentation (i.e. two days after the deadline for posts has passed). The Discussion portion will be worth 50 points, and the grading rubric can be found on the course website. **All group members must participate** in responding to the discussion posts.

In-Class Assignments/Attendance:

Attendance will not be taken per se, but short in-class assignments, worth 10 points each, will be given throughout the semester. These assignments cannot be made up.

Extra Credit:

Opportunities for earning extra credit may be given throughout the semester at the discretion of the instructor.

Academic Integrity, Plagiarism Policy, and Academic Misconduct:

The University of Illinois at Urbana-Champaign *Student Code* should also be considered as a part of this syllabus. Students should pay particular attention to Article 1, Part 4 on Academic Integrity: *"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"*. You can read the code at the following website:

<http://studentcode.illinois.edu/>. Academic dishonesty may result in a failing grade. Every student is expected to review and abide by the Academic Integrity Policy found in the *Student Code*. Ignorance is not an excuse for any academic dishonesty – it is your responsibility to read this policy to avoid any misunderstanding. Do not hesitate to ask me if you are ever in doubt about what constitutes plagiarism, cheating, or any other breach of academic integrity.

You are **encouraged** to study together to learn concepts covered in the course. Additionally, you are required to complete the Article Presentation and Discussion in a small group. However, while students may collaborate in discussions of the course materials, documents submitted for grading (such as Quizzes, Exams, and Article Summaries) must represent **individual student work**. For violations of the above-listed policies, the penalty may include failure of the assignment, failure of the course, and University disciplinary action.

For the online weekly quizzes, you may use your notes, your textbook, and the materials posted on the Compass 2g website; however, these materials may not be used to complete the in-class exams. Talking or discussion with others is not permitted during the quizzes or exams, nor may you compare papers, copy from others, or collaborate in any way. Any inappropriate behavior during the timed quizzes or exams may result in failure of the assignment, and could also lead to failure of the course and/or University disciplinary action.

Accommodations for Students with Disabilities or Accessibility Needs:

To obtain disability-related academic adjustments and/or auxiliary aids, students with disabilities must contact me and the Disability Resources and Educational Services (DRES) as soon as possible to ensure that disability-related concerns are properly addressed from the beginning of the course. If you need particular accommodations for any sort of disability, please speak to me after class, or make an appointment to see me. DRES provides students with academic accommodations, access, and support services. To contact DRES you may visit 1207 S. Oak St., Champaign, call 217-333-4603 (V/TDD), e-mail a message to disability@uiuc.edu, or visit their website at <http://www.disability.illinois.edu/>.

Emergency Response Recommendations:

Emergency response recommendations can be found at the following website: <http://police.illinois.edu/emergency-preparedness/>. I encourage you to review this website and the campus building floor plans website <http://police.illinois.edu/emergency-preparedness/building-emergency-action-plans/> within the first 10 days of class.

Family Educational Rights and Privacy Act (FERPA):

Any student who has suppressed their directory information pursuant to *Family Educational Rights and Privacy Act* (FERPA) should self-identify to the instructor to ensure protection of the privacy of their attendance in this course. See <http://registrar.illinois.edu/academic-records/ferpa/> for more information on FERPA.

Sexual Misconduct Policy and Reporting

The University of Illinois is committed to combating sexual misconduct. Faculty and staff members are required to report any instances of sexual misconduct to the University's Title IX and Disability Office. In turn, an individual with the Title IX and Disability Office will provide information about rights and options, including accommodations, support services, the campus disciplinary process, and law enforcement options. A list of the designated University employees who, as counselors, confidential advisors, and medical professionals, do not have this reporting responsibility and can maintain confidentiality, can be found here: wecare.illinois.edu/resources/students/#confidential/. Other information about resources and reporting is available here: wecare.illinois.edu/.

Stress Management:

As members of the Illinois community, we each have a responsibility to express care and concern for one another. If you are feeling overwhelmed by academic or personal stress, or if you encounter a classmate whose behavior concerns you, there are many ways to receive assistance. I encourage you to seek support from me or from one of the services listed below:

- Academic and personal support for students through the Student Assistance Center: <http://odos.illinois.edu/community-of-care/student-assistance-center/> (217-333-0050)
- Counseling support for academic, relational, and emotional concerns through the Counseling Center: <https://counselingcenter.illinois.edu/counseling> (217-333-7557)
- Mental health, wellness, and stress management programs through the McKinley Health Center: <http://mckinley.illinois.edu> (217-333-2701)

Schedule:

Week	Monday	Wednesday	Friday	Readings and Assignments
1	Course Introduction	Plant Architecture	Cell Architecture	Chapter 1 Quiz #1
2	Genome Structure	Gene Expression	Gene Expression cont.	Chapter 2 Quiz #2
3	Hormones	Hormones cont.	Instructor Article Presentation	Chapter 15 Article #1 Quiz #3
4	Signal Transduction	Signal Transduction cont.	Exam #1	Chapter 15
5	Cell Wall Structure	Cell Wall Formation and Expansion	Group 1 Article Presentation	Chapter 14 Article #2 Quiz #4
6	Signals from Sunlight	Signals from Sunlight cont.	Group 2 Article Presentation	Chapter 16 Article #3 Quiz #5
7	Embryogenesis	Embryogenesis cont.	Group 3 Article Presentation	Chapter 17 Article #4 Quiz #6
8	Seeds	Seedlings	Exam #2	Chapter 18
9	Vegetative Growth	Organogenesis	Group 4 Article Presentation	Chapter 19 Article #5 Quiz #7
10	Control of Flowering	Floral Development	Group 5 Article Presentation	Chapter 20 Article #6 Quiz #8
11	Gametophytes and Pollination	Seeds and Fruits	Group 6 Article Presentation	Chapter 21 Article #7 Quiz #9
12	Plant Senescence	Plant Cell Death	Exam #3	Chapter 22
13	Beneficial Biotic Interactions	Beneficial Biotic Interactions cont.	Group 7 Article Presentation	Chapter 23 Article #8 Quiz #10
14	Harmful Biotic Interactions	Harmful Biotic Interactions cont.	Group 8 Article Presentation	Chapter 23 Article #9 Quiz #11
15	Environmental Interactions	Environmental Interactions cont.	Group 9 Article Presentation	Chapter 24 Article #10 Quiz #12
Final Exam at the schedule exam time				

Appendix A: Article Selections for Spring 2019

Week	Lecture Topic	Article
4	Signals and Signal Transduction (Article #1)	Changes in endogenous phytohormones regulated by microRNAtarget mRNAs contribute to the development of Dwarf Autotetraploid Chinese Cabbage (<i>Brassica rapa</i> L. ssp. <i>pekinensis</i>). (2018) <i>Molecular Genetics and Genomics</i>
5	Cell Walls (Article #2)	Increased drought tolerance in plants engineered for low lignin and low xylan content. (2018) <i>Biotechnology for Biofuels</i> .
6	Signals from Sunlight (Article #3)	Regulation of flowering by green light depends on its photon flux density and involves cryptochromes. (2018) <i>Physiologia Plantarum</i> .
7	Embryogenesis (Article #4)	Mitogen-activated protein kinases MPK3 and MPK6 are required for stem cell maintenance in the <i>Arabidopsis</i> shoot apical meristem. (2019) <i>Plant Cell Reports</i> .
8	Seeds and Seedlings (Article #5)	The Interrelationship between Abscisic Acid and Reactive Oxygen Species Plays a Key Role in Barley Seed Dormancy and Germination. (2017) <i>Frontiers in Plant Science</i> .
9	Vegetative Growth and Organogenesis (Article #6)	Plant roots use a patterning mechanism to position lateral root branches toward available water. (2014) <i>Proceedings of the National Academy of Sciences</i> .
10	Control of Flowering and Floral Development (Article #7)	Dosage imbalance of B- and C-class genes causes petaloid-stamen relating to F1 hybrid variation. (2018) <i>BMC Plant Biology</i> .
11	Gametophytes, Pollination, Seeds, and Fruits (Article #8)	Melatonin promotes ripening of grape berry via increasing the levels of ABA, H ₂ O ₂ , and particularly ethylene. (2018) <i>Horticulture Research</i> .
12	Plant Senescence and Cell Death (Article #9)	Autophagy counteracts instantaneous cell death during seasonal senescence of the fine roots and leaves in <i>Populus trichocarpa</i> . (2018) <i>BMC Plant Biology</i> .
13	Biotic Interactions (Article #10)	The interactive effects of arbuscular mycorrhiza and plant growth-promoting rhizobacteria synergistically enhance host plant defences against pathogens. (2017) <i>Scientific Reports</i> .
14	Biotic Interactions (Article #11)	Dynamic root exudation of sorgoleone and its in planta mechanism of action. (2009) <i>Journal of Experimental Botany</i> .
15	Abiotic Stress (Article #12)	Melatonin enhances plant growth and abiotic stress tolerance in soybean plants. (2015) <i>Journal of Experimental Botany</i> .