

Plant Cell Biology Syllabus

Department of Biology

BIOL 4220 Fall 2025

Dalhousie University acknowledges that we are in Mi'kma'ki, the ancestral and unceded territory of the Mi'kmaq People and pays respect to the Indigenous knowledges held by the Mi'kmaq People, and to the wisdom of their Elders past and present. The Mi'kmaq People signed Peace and Friendship Treaties with the Crown, and section 35 of the Constitution Act, 1982 recognizes and affirms Aboriginal and Treaty rights. We are all Treaty people.

Dalhousie University also acknowledges the histories, contributions, and legacies of African Nova Scotians, who have been here for over 400 years.

Course Instructor(s)

Name	Email	Office Hours
Arunika Gunawardena	arunika.gunawardena@dal.ca	Tuesdays and Thursdays from 12 to 1pm My office (LSC room 6076b)
Cora Mitchell	cora.mitchell@dal.ca	Tuesdays and Thursdays from 3 to 4 pm LSC room 6076

Please note that lectures and labs are subject to change due to administrative or weather-related disruptions.

Course Description

This course covers the structure, function, and dynamic properties of plant cellular components including constituent organelles, cytoskeleton, and the cell wall. Current areas of research such as programmed cell death, cell signaling and cellular trafficking are discussed in depth. The course consists of lectures, discussions and student seminars.

Course Prerequisites

BIOL 2020.03 (or BIOA 2001.03) and BIOL 2004.03 or permission of the instructor.

Course Exclusions

None

Student Resources

Arunika Gunawardena: Office hours are Tuesdays and Thursdays from 12 to 1 pm in room LSC 6076b (my office). If you are unavailable during those hours, email Arunika and make an appointment.

Cora Mitchell: Office hours are Tuesdays and Thursdays from 3 to 4 pm in room LSC 6076. If you are unavailable during those hours, email Cora and make an appointment.

Course Structure

Course Delivery

In-person (lectures will not be recorded, all lecture slides and supporting documents will be uploaded on the class website prior to the lecture).

Lectures

Tuesdays and Thursdays from 10.05 to 11.25, LSC Common Area 220

Laboratories

Lecture-based course but two labs will be conducted on advanced microscopy and plant tissue culture (LSC 6076, 6081, 7032 and 1055)

Tutorials

No

Course Materials

The following chapters of these two textbooks are recommended for this course and they are available in the library on a short-term loan (2 hrs):

For plant cell: Chapter 3 from 'Biology of Plants by Raven, Evert and Eichhorn' or Chapter 2 from 'Introduction to Botany' by Murray Nabors

For plant cell and programmed cell death: A selection of articles will be employed throughout the course. These articles will be selected from the online resources available at Dalhousie University or posted on the class website. In addition, students are responsible for finding literature for their seminars. Required journals can be accessed online through Dalhousie libraries website.

Plant programmed cell death edited by Arunika Gunawardena and Paul McCabe (available in the library on a short-term loan (2 hrs)

Suggested Journals for finding literature for seminar presentations: The Plant Cell, Annual Review of Plant Biology, Journal of Experimental Botany, Journal of Plant Physiology, Planta, Plant and Cell Physiology, Plant Cell and Environment, Plant Cell Reports, Plant Cell, Tissue and Organ Culture, Plant Molecular Biology, Plant Physiology, Trends in Plant Science, Plant Physiology and Biochemistry, The Plant Journal: for Cell and Molecular Biology, American Journal of Botany, Botany, PLoS One, BMC plant biology, Journal of experimental botany

Course website: BIOL4220 & BIOL5220 - Plant Cell Biology

All lecture slides and supporting documents will be uploaded on the class website prior to the lecture. Updates and announcements will also be posted regularly on the class website.

Assessment

Assessment	Weight (% of final grade)	Date	Length/exam
Mid-term exam (in class)	35 %	14 Oct	75 mins
Quiz	10 %	28 Oct	15 mins
Seminar (Seminar presentation file due date)	25%	Starts from 30 Oct 29 Oct	25 mins
Attendance and participation in class discussions	5 %		
Final exam (in class)	25 %	09 Dec	60 mins

Other course requirements

Class participation and 90 % attendance are required to pass the course.

Conversion of numerical grades to final letter grades follows the

Dalhousie Grade Scale

A+ (90-100)	B+ (77-79)	C+ (65-69)	D (50-54)
A (85-89)	B (73-76)	C (60-64)	F (0-49)
A- (80-84)	B- (70-72)	C- (55-59)	

Course Policies on Missed or Late Academic Requirements

The student must notify (in writing) the professor prior to the academic requirement deadline and must submit a completed Student Declaration of Absence (SDA) form. No more than two (2) separate SDA forms may be used.

Quizzes

- If the quiz is missed for a valid reason, a make-up quiz will be given. If the make-up quiz is also missed the points will be redistributed to the final exam.

Seminar

- A seminar topic related to programmed cell death will be assigned to each student (10 mins long PowerPoint presentation followed by 5-10 mins questions).

15 %: Submitted on time, content, and organization

10 %: Delivery and answers to questions (includes evaluation by students too)

A seminar topic and the presentation date will be announced on the 16 October. All the students should submit their seminar presentation files by 6 pm on the 29 October (penalty for late submission: 5 % reduction per day). Presentations and discussions are scheduled from 30 October until 04 December. Students are highly advised to stick to the assigned dates. If a student is unable to present on the given date due to a valid reason, the student should inform the professor ASAP.

- If a student misses more than two seminar presentations, the student will not have enough materials to prepare for the final exam. Therefore, participation in students' presentations is mandatory.

Exams

One makeup exam will be scheduled for any student(s) provided the examination was missed due to a valid reason

Course Policies related to Academic Integrity

A seminar topic will be assigned to each student, and they are not allowed to work together on presentations.

No plagiarism software will be used; however, students will be well informed that this course is governed by the academic rules and regulations outlined in the University Calendar by Senate.

Learning Objectives

After taking this course, a student will be able to:

- Describe the structure and dynamics of plant specific organelles such as the vacuole, chloroplasts and cell wall
- Obtain in-depth knowledge of advanced microscopic techniques such as transmission electron microscopy and its uses in plant cell biology
- Compare and contrast plant and animal programmed cell death
- Describe in detail different examples of programmed cell death in plant development
- Learn about current research on plant programmed cell death and their global applications
- Describe the cell signaling pathways involved in plant programmed cell death
- Design experiments to detect programmed cell death
- Develop better group discussions and oral presentation skills

Course Content

Week	Date	Lesson Topic(s)	Reading/Assessment
1	23 September	Introduction	
1	25 September	Plant cell I	Chapter 3 from 'Biology of Plants by Raven, Evert and Eichhorn' or Chapter 2 from 'Introduction to Botany' by Murray Nabors
2	30 September	Holiday	
2	02 October	Plant Cell II	Chapter 3 from 'Biology of Plants by Raven, Evert and Eichhorn' or Chapter 2 from 'Introduction to Botany' by Murray Nabors
3	07 October	Plant Cell III	Chapter 3 from 'Biology of Plants by Raven, Evert and Eichhorn' or Chapter 2 from 'Introduction to Botany' by Murray Nabors
3	09 October	Microscopy lab	
4	14 October	Mid-term exam	
4	16 October	Programmed cell death (PCD) I (A seminar topic and the presentation date will be announced)	Relevant readings and supporting documents will be provided before the class for PCD lectures and presentations
5	21 October	Programmed cell death (PCD) II	Relevant readings and supporting documents will be provided before

			the class for PCD lectures and presentations
5	23 October	PCD examples and presentation guidelines	
6	28 October	Quiz and PCD in leaf morphogenesis	
6	30 October	Xylem differentiation (Student seminar presentations followed by discussions until 04 December) Seminar presentation files due by 6 pm on the 29th of October	
7	04 November	Leaf senescence	
7	06 November	Aerenchyma formation (cortical and vascular)	
	10-14 November	Study week	
8	18 November	Hypersensitive cell death (virus) and (bacteria) and (fungus)	
8	20 November	UV induced PCD, Salt induced PCD, and Heat induced PCD	
9	25 November	Shedding of root cap cells, Self-incompatibility induced PCD and Anther dehiscence/tapetum degeneration	
9	27 November	Degradation of suspensor/endosperm, Degradation of aleurone layer, Megasporogenesis and PCD (PCD during formation of female gametophyte) (3)	
10	02 December	Caspases and plant programmed cell death, Comparison of plant and animal programmed cell death, Types of programmed cell death in plants	
10	04 December	Programmed cell death in unicellular organisms (1), PCD research- graduates (1) and Review	
11	09 December	Final exam	

University Policies and Statements

Recognition of Mi'kmaq Territory

Dalhousie University would like to acknowledge that the University is on Traditional Mi'kmaq Territory. The Elders in Residence program provides students with access to First Nations elders for guidance, counsel, and support. Visit or e-mail the Indigenous Student Centre at 1321 Edward St or elders@dal.ca. Additional information regarding the Indigenous Student Centre can be found at: https://www.dal.ca/campus_life/communities/indigenous.html

Internationalization

At Dalhousie, 'thinking and acting globally' enhances the quality and impact of education, supporting learning that is "interdisciplinary, cross-cultural, global in reach, and orientated toward solving problems that extend across national borders." Additional internationalization information can be found at: <https://www.dal.ca/about-dal/internationalization.html>

Academic Integrity

At Dalhousie University, we are guided in all our work by the values of academic integrity: honesty, trust, fairness, responsibility, and respect. As a student, you are required to demonstrate these values in all the work you do. The University provides policies and procedures that every member of the university community is required to follow to ensure academic integrity. Additional academic integrity information can be found at: https://www.dal.ca/dept/university_secretariat/academic-integrity.html

Accessibility

The Student Accessibility Centre is Dalhousie's centre of expertise for matters related to student accessibility and accommodation. If there are aspects of the design, instruction, and/or experiences within this course (online or in-person) that result in barriers to your inclusion, please contact the Student Accessibility Centre (https://www.dal.ca/campus_life/academic-support/accessibility.html) for all courses offered by Dalhousie with the exception of Truro. For courses offered by the Faculty of Agriculture, please contact the Student Success Centre in Truro (<https://www.dal.ca/about-dal/agricultural-campus/student-success-centre.html>)

Conduct in the Classroom – Culture of Respect

Substantial and constructive dialogue on challenging issues is an important part of academic inquiry and exchange. It requires willingness to listen and tolerance of opposing points of view. Consideration of individual differences and alternative viewpoints is required of all class members, towards each other, towards instructors, and towards guest speakers. While expressions of differing perspectives are welcome and encouraged, the words and language used should remain within acceptable bounds of civility and respect.

Diversity and Inclusion – Culture of Respect

Every person at Dalhousie has a right to be respected and safe. We believe inclusiveness is fundamental to education. We stand for equality. Dalhousie is strengthened in our diversity. We are a respectful and inclusive community. We are committed to being a place where everyone feels welcome and supported, which is why our Strategic Direction prioritizes fostering a culture of diversity and inclusiveness (Strategic Priority 5.2). Additional diversity and inclusion information can be found at: <http://www.dal.ca/cultureofrespect.html>

Student Code of Conduct

Everyone at Dalhousie is expected to treat others with dignity and respect. The Code of Student Conduct allows Dalhousie to take disciplinary action if students don't follow this community expectation. When appropriate, violations of the code can be resolved in a reasonable and informal manner - perhaps through a restorative justice process. If an informal resolution can't be reached, or would be inappropriate, procedures exist for formal dispute resolution. The full Code of Student Conduct can be found at: https://www.dal.ca/dept/university_secretariat/policies/student-life/code-of-student-conduct.html

Fair Dealing Policy

The Dalhousie University Fair Dealing Policy provides guidance for the limited use of copyright protected material without the risk of infringement and without having to seek the permission of copyright owners. It is intended to provide a balance between the rights of creators and the rights of users at Dalhousie. Additional information regarding the Fair Dealing Policy can be found at: https://www.dal.ca/dept/university_secretariat/policies/academic/fair-dealing-policy-.html

Originality Checking Software

The course instructor may use Dalhousie's approved originality checking software and Google to check the originality of any work submitted for credit, in accordance with the Student Submission of Assignments and Use of Originality Checking Software Policy. Students are free, without penalty of grade, to choose an alternative method of attesting to the authenticity of their work and must inform the instructor no later than the last day to add/drop classes of their intent to choose an alternate method. Additional information regarding Originality Checking Software can be found at: <https://www.dal.ca/about/leadership-governance/academic-integrity/faculty-resources/ouriginal-plagiarism-detection.html>

Student Use of Course Materials

Course materials are designed for use as part of this course at Dalhousie University and are the property of the instructor unless otherwise stated. Third party copyrighted materials (such as books, journal articles, music, videos, etc.) have either been licensed for use in this course or fall under an exception or limitation in Canadian Copyright law. Copying this course material for distribution (e.g. uploading to a commercial third-party website) may lead to a violation of Copyright law.

Faculty of Science

Student Resources and Support

University Policies and Programs

Important Dates in the Academic Year (including add/drop dates):

http://www.dal.ca/academics/important_dates.html

Classroom Recording Protocol: <https://www.dal.ca/content/dam/www/about/leadership-and-governance/university-policies/class-recording-protocol.pdf>

Dalhousie Grading Practices Policies:

<https://www.dal.ca/content/dam/www/about/leadership-and-governance/university-policies/grading-practices-policy.pdf>

Grade Appeal Process: https://www.dal.ca/campus_life/academic-support/grades-and-student-records/appealing-a-grade.html

Sexualized Violence Policy: <https://www.dal.ca/content/dam/www/about/leadership-and-governance/university-policies/sexualized-violence-policy.pdf>

Scent-Free Program: <https://www.dal.ca/dept/safety/programs-services/occupational-safety/scent-free.html>

Learning and Support Resources

General Academic Support – Advising (Halifax): https://www.dal.ca/campus_life/academic-support/advising.html

General Academic Support – Advising (Truro): https://www.dal.ca/campus_life/ssc.html

Student Health & Wellness Centre: https://www.dal.ca/campus_life/health-and-wellness.html

On Track (helps you transition into university, and supports you through your first year at Dalhousie and beyond): https://www.dal.ca/campus_life/academic-support/On-track.html

Indigenous Student Centre: https://www.dal.ca/campus_life/communities/indigenous.html

Mi'kmaq and Indigenous Relations: <https://www.dal.ca/about/mission-vision-values/mikmaq-indigenous-relations.html>

Elders-in-Residence (The Elders in Residence program provides students with access to First Nations elders for guidance, counsel, and support. Visit the office in the Indigenous Student

Centre or contact the program at elders@dal.ca or 902-494-6803:

<https://www.dal.ca/about/mission-vision-values/mikmag-indigenous-relations/elders-in-residence-and-traditional-knowledge-keepers.html>

Black Student Advising Centre: https://www.dal.ca/campus_life/communities/black-student-advising.html

International Centre: https://www.dal.ca/campus_life/international-centre.html

LGBTQ2SIA+ Collaborative: <https://www.dal.ca/about/mission-vision-values/equity-diversity-inclusion-and-accessibility/about-office-equity-inclusion/community-specific-groups/lgbtq2sia-collaborative.html>

Dalhousie Libraries: <http://libraries.dal.ca/>

Copyright Office: <https://libraries.dal.ca/services/copyright-office.html>

Dalhousie Student Advocacy Services: <https://www.dsu.ca/dsas?rq=student%20advocacy>

Dalhousie Ombudsperson: https://www.dal.ca/campus_life/safety-respect/ombudsperson.html

Human Rights and Equity Services: <https://www.dal.ca/about/mission-vision-values/equity-diversity-inclusion-and-accessibility/about-office-equity-inclusion/human-rights-and-equity-services.html>

Writing Centre: https://www.dal.ca/campus_life/academic-support/writing-and-study-skills.html

Study Skills/Tutoring: http://www.dal.ca/campus_life/academic-support/study-skills-and-tutoring.html

Faculty of Science Advising Support: <https://www.dal.ca/faculty/science/current-students/undergrad-students/degree-planning.html>

Safety

Biosafety: <http://www.dal.ca/dept/safety/programs-services/biosafety.html>

Chemical Safety: <https://www.dal.ca/dept/safety/programs-services/chemical-safety.html>

Radiation Safety: <http://www.dal.ca/dept/safety/programs-services/radiation-safety.html>

Laser Safety: <https://www.dal.ca/dept/safety/programs-services/radiation-safety/laser-safety.html>