

Biology 4608F Course Outline Environmental Plant Physiology Fall Term 2025

1. Course Information

Class:

Room:

Delivery: This course is seminar- and discussion-based, grounded in problem-based learning. Classes will feature a mix of:

- Mini-lectures (20–30 min)
- Group-based discussion and analysis of primary research
- Active learning activities (case studies, simulations, data workshops)
- Group project time

Delivery Mode: In-person (unless otherwise specified)

OWL Quizzes: Weekly, asynchronous (replacing the final exam)

Participation: Active, thoughtful engagement is expected

List of Prerequisites: **Biology 2601A/B**, registration in a Biology module and completion of at least **1.5 Biology courses at the 3000-level or above**. Biology 3603A/B and Biology 3660A/B are recommended. Priority to year 4 HSP Modules offered by the Department of Biology

Unless you have either the requisites for this course or written special permission from your Dean or Dean's Designate (Department/Program Counsellors and Science Academic Counselling) to enroll in it, you may be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees if you are dropped from a course for failing to have the necessary prerequisites.

2. Instructor Information

Instructors	Email	Office	Phone	Office Hours
Instructor: Dr. Joshua Frank-Webb	jfrank22@uwo.ca			
TA:				

Office hours will take place via Zoom. Please email Dr. Frank-Webb or the TA in advance to arrange a specific time for the meeting, and you will receive a Zoom link. Students can also use the Forum on Brightspace to pose questions and discuss topics amongst themselves. When contacting their instructors, students must use their Western (@uwo.ca) email addresses. Emails will be monitored daily; students will receive a response in 24 – 48 hours.

3. Course Syllabus, Schedule

This course explores the complex physiological processes that underlie how plants grow, develop, and respond to environmental challenges, with a particular focus on current climate, urbanization, and ecological stress contexts. Through engagement with primary literature, peer discussion, and experimental design, students will be treated as emerging experts—developing research questions, critiquing methods, and connecting knowledge to global sustainability and biotechnological applications.

Learning Outcomes:

From lecture materials and readings, students will be able to describe:

1. Explain key mechanisms of plant cell physiology, signalling, and communication.
2. Evaluate how plants adapt to environmental stresses using cellular, physiological, ecological and evolutionary frameworks.
3. Critically analyze experimental evidence from plant physiology literature.
4. Design and propose an original, collaborative experiment addressing plant-environment interactions.
5. Communicate scientific arguments with clarity, precision, and scholarly tone.
6. Engage actively and professionally in academic collaboration.

Course Units & Weekly Topics

Unit 1: Introduction to Environmental Plant Physiology and Evolutionary Frameworks

- Course overview, expectations, and research-led learning model
- Evolutionary history of plant traits and strategies
- The role of physiology in ecological success and adaptation

Unit 2: Foundations of Plant Cell Physiology

- Membrane structure, transport proteins, osmosis, water potential
- Ion homeostasis, compartmentation, vacuolar dynamics, turgor regulation

Unit 3: Signal Perception and Intracellular Communication

- Receptors, signal transduction, ROS and Ca²⁺ signaling, phosphorylation cascades
- Hormonal integration, crosstalk, feedback loops, long-distance signaling

Unit 4: Hormonal Regulation of Development and Stress Responses

- Auxins, gibberellins, cytokinins, ABA, ethylene, jasmonic acid, and strigolactones
- Hormonal regulation of growth, stomatal control, and defense readiness

Unit 5: Abiotic Stress Physiology – Physical Stressors

(Note: Oct 14 is Thanksgiving)

- Drought and desiccation tolerance
- Salt stress and ion toxicity
- Thermoregulation and temperature sensing

Unit 6: Abiotic Stress Physiology – Light, Oxidative, and Environmental Stressors

- High light, UV stress, photoprotection mechanisms
- Oxidative stress, redox signalling, and antioxidant systems
- Climate variability and composite stress responses

Unit 7: Symbioses and Belowground Communication

- Mycorrhizal associations and nutrient exchange
- Rhizobia and nitrogen fixation
- Soil microbiome signalling and its physiological impact

Unit 8: Defense Responses and Biotic Interactions

- Herbivory and wounding
- Systemic acquired resistance (SAR)
- JA, SA, ET-mediated immunity and signal crosstalk

Unit 9: Evolution of Plant Stress Responses and Adaptation

- Trade-offs and constraints in stress adaptation
- Genetic and epigenetic plasticity
- Local adaptation and experimental evolution in plants

Unit 10: Urban, Global Change Physiology, Biotechnology

- Elevated CO₂, air pollution, urban heat islands
- Physiological resilience and trait innovation
- Biotechnological approaches to climate-adaptive crops

Key Sessional Dates are listed below:

Classes begin: September 4 2025

Reading Week: Nov 3- 9, 2025

Classes end: Dec 9, 2025

Contingency plan

Although the course intends to be delivered in person, should any university-declared emergency require some or all of the course to be delivered online, either synchronously or asynchronously, the course will adapt accordingly. The grading scheme will **not** change. Any assessments affected will be conducted online as determined by the course instructor.

4. Course Materials

Readings: Readings will be assigned from the primary literature and will be posted to the OWL course site. You are expected to have read the assigned paper(s) and considered the main topics for a given week prior to coming to class, in order to be able to follow the material and contribute to discussions. Discussion participation is a significant component of the grade, and attendance is mandatory.

The textbook used in Bio 2601 [Taiz et al. (2023) Plant Physiology & Development, 7th edition, or the 2015 6th edition] will be an excellent resource to support the lecture material.

Required equipment: A laptop or computer for assignments and a stable internet connection are required for access to OWL.

Website: An OWL website has been established for this course. All course documents and information (syllabus, lecture files, instructional documents, required readings, grades, etc.) will be posted to OWL. Students are responsible for checking the course OWL site (<http://owl.uwo.ca>) regularly for updates and announcements.

If students need assistance with the course OWL site, they can seek support on the OWL Help page. Alternatively, they can contact the Western Technology Services Helpdesk, which can be contacted by phone at 519-661-3800 or ext. 83800.

Your marks will be regularly updated under 'Gradebook' in OWL. You may query any apparent inconsistencies between what you thought you received and what is on OWL. When assessing these marks, keep in mind you will not have marks for things that have not yet been marked.

5. Methods of Evaluation

Course assessment: The overall course grade will be calculated as listed below (*with due dates for major assignments):

Component	Weight	Details
Weekly OWL Quizzes (best 9/11)	30%	Short, auto-graded; due Sundays at 11:59 PM
Group Experimental Proposal	20%	Written proposal due Week 9 (Nov 1)
Group Presentation	10%	
Mini-Review Paper (individual)	20%	Due Week 10 (Nov 15)
Participation	15%	Based on discussion leadership & collaboration
Research Article Critique	5%	1–2 page analysis; due Week 5 (Oct 4)

Please read the sections on university and course policies below.

Your final grade for the course will be calculated as the sum of your marks for each of the components. This mark will then be rounded to the nearest integer. No marks will be awarded for arbitrary reasons, and there will be no after-the-fact changes (e.g., of 69 to 70%).

After an assessment is returned, students should wait 24 hours to digest feedback before emailing Dr. Frank-Webb or the TA.

The list below outlines the University-wide grade descriptors.

A+	90-100	One could scarcely expect better from a student at this level
A	80-89	Superior work which is clearly above average
B	70-79	Good work, meeting all requirements, and eminently satisfactory
C	60-69	Competent work, meeting requirements
D	50-59	Fair work, minimally acceptable
F	below 50	Fail

NOTE: To pass this course, you must get at least 50% on both the written components and the in-class participation. If you need accommodations for the exams, they will be made available.

Students must get a passing grade (D or above/50+) on the Critiques Paper and Term Paper to satisfy the Senate requirement that students must demonstrate “some minimal competence in essay writing” in order to pass this essay course. (Please see the following sections for late work and student absence policies for these two-course components).

6. Student Absences and Missed/Late Evaluations

- Class attendance is mandatory, and class participation is a significant component of your final grade (see Section 5). Attendance will be taken each week, and grades for group discussion (and attendance) will be given each week (although the final class participation grade will only be submitted to the Gradebook at the end of the semester).
- If students miss class or any assessment due to illness or another serious circumstance for three weeks or more, they will be required to provide proof of the reason for their absence in order to make up the grade. If you are unable to meet a course requirement due to illness or other serious circumstances, please follow the procedures below:

General information about missed coursework

Students must familiarize themselves with the University Policy on Academic Consideration – Undergraduate Students in First Entry Programs posted on the Academic Calendar:
https://www.uwo.ca/univsec/pdf/academic_policies/appeals/academic_consideration_Sep24.pdf,

This policy does not apply to requests for Academic Consideration submitted for attempted or completed work, whether online or in person. The policy also does not apply to students experiencing longer-term impacts on their academic responsibilities. These students should consult Accessible Education.

Students missing course work for medical, compassionate, or extenuating circumstances can request academic consideration by completing a request at the central academic consideration portal (website above). Note that supporting documentation is always required for academic consideration requests for final examinations.

For procedures on how to submit Academic Consideration requests, please see the information posted on the Office of the Registrar’s webpage:
https://registrar.uwo.ca/academics/academic_considerations/

All requests for Academic Consideration must be made within 48 hours after the assessment date or submission deadline.

When a student mistakenly submits their one allowed Academic Consideration request without supporting documentation for the assessments listed above or those in the Coursework with Assessment Flexibility section below, the request cannot be recalled and reapplied. This privilege is forfeited.

Late assignments

- Late assessments for the quizzes and weekly reading reflections without illness selfreports (or another university recognised absence) will be subject to a late penalty of 5% per day.
- Late assessments for the quizzes and weekly reading reflections with illness selfreports (or with a reported university recognised absence) (and proof, if three or more weeks of class have been missed) should be submitted within 1 week of the original deadline. Additional time can be given on an ad hoc basis as needed.

Missing class

- There will be no late penalties available for missing class. Missed evaluations for class participation without illness self-reports (or another university recognised absence) will result in a grade of zero for that week.
- Missing attendance or missed evaluations for class participation with illness self-reports (or with a reported university recognised absence) (and proof, if three or more weeks of class have been missed) will be re-weighted, i.e., the week of the excused absence will be removed from the students overall score for that category.

NOTE: The illness self-report/reason for missing the class and/or missing an assignment should be emailed to both Dr. Frank-Webb and the TA before the start of the class and/or before the due date for the assignment in order to make up the grade.

You must provide valid medical or supporting documentation to the Academic Counselling Office of your Faculty of Registration as soon as possible. For further information, please consult the University's medical illness policy at:

https://uwo.ca/univsec/pdf/academic_policies/appeals/academic_consideration.pdf.

The Student Medical Certificate is available at:

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform.pdf.

Students will be given an extension to complete the work after their case has been assessed and approved by Academic Counselling Office of your Faculty of Registration.

Note: missed work can only be excused through one of the mechanisms above. Being asked not to attend an in-person course requirement due to potential illness (e.g., COVID-19 symptoms) is not sufficient on its own.

7. Accommodation and Accessibility

Religious Accommodation

When a course requirement conflicts with a religious holiday that requires an absence from the University or prohibits certain activities, students should request an accommodation for their absence in writing at least two weeks prior to the holiday to the course instructor and/or the Academic Advising

office of their Faculty of Registration. Please visit the Diversity Calendars posted on our university's EDID website for the recognized religious holidays:

<https://www.edi.uwo.ca>.

Accommodation Policies

Students with disabilities are encouraged to contact Accessible Education, which provides recommendations for accommodation based on medical documentation or psychological and cognitive testing. The policy on Academic Accommodation for Students with Disabilities can be found at:

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic_Accommodation_disabilities.pdf.

8. Academic Policies

The website for Registrarial Services is <http://www.registrar.uwo.ca>.

In accordance with policy,

https://www.uwo.ca/univsec/pdf/policies_procedures/section1/mapp113.pdf,

the centrally administered e-mail account provided to students will be considered the individual's official university e-mail address. It is the responsibility of the account holder to ensure that e-mail received from the University at their official university address is attended to in a timely manner.

Electronic devices during quizzes and assignments: All quizzes and assignments are “open book” and students are encouraged to use materials from the course in addition to further literature search (for the term paper) to complete those quizzes and assignments.

Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site: http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf.

Plagiarism: Plagiarism is an academic offense and will not be tolerated. Students must write their essays and assignments in their own words. Whenever students take an idea or a passage from another author they must acknowledge their debt both by using quotation marks where appropriate, and by proper and accurate referencing in the form of scientific citations. All required papers will be subject to submission for textual similarity review to the commercial plagiarism detection software under license to the University for the detection of plagiarism. All papers submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com (<http://www.turnitin.com>).

Turnitin: All required papers may be subject to submission for textual similarity review to the commercial plagiarism detection software under license to the University for the detection of plagiarism. All papers submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com (<http://www.turnitin.com>).

Professionalism & Privacy: Western students are expected to follow the Student Code of Conduct. Additionally, the following expectations and professional conduct apply to this course:

- Students are expected to follow online etiquette expectations provided on OWL if we need to move the course to a virtual format.
- All course materials created by the instructor(s) are copyrighted and cannot be sold/shared.
- Recordings are not permitted (audio or video) without explicit permission.
- Permitted recordings are not to be distributed.
- All recorded sessions will remain within the course site or unlisted if streamed.

9. Support Services

Please visit the Science & Basic Medical Sciences Academic Advising webpage for information on adding/dropping courses, academic considerations for absences, appeals, exam conflicts, and many other academic related matters: <https://www.uwo.ca/sci/counselling/>.

Students who are in emotional/mental distress should refer to Mental Health@Western (<https://uwo.ca/health/>) for a complete list of options about how to obtain help.

Western is committed to reducing incidents of gender-based and sexual violence and providing compassionate support to anyone who has gone through these traumatic events. If you have experienced sexual or gender-based violence (either recently or in the past), you will find information about support services for survivors, including emergency contacts at

https://www.uwo.ca/health/student_support/survivor_support/get-help.html.

To connect with a case manager or set up an appointment, please contact support@uwo.ca.

Please contact the course instructor if you require lecture or printed material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Accessible Education at

http://academicsupport.uwo.ca/accessible_education/index.html

if you have any questions regarding accommodations.

Learning-skills counsellors at Learning Development and Success (<https://learning.uwo.ca>) are ready to help you improve your learning skills. They offer presentations on strategies for improving time management, multiple-choice exam preparation/writing, textbook reading, and more. Individual support is offered throughout the Fall/Winter terms in the drop-in Learning Help Centre, and year-round through individual counselling.

Western University is committed to a thriving campus as we deliver our courses in the mixed model of both virtual and face-to-face formats. We encourage you to check out the Digital Student Experience website to manage your academics and well-being: <https://www.uwo.ca/se/digital/>.

Additional student-run support services are offered by the USC, <https://westernusc.ca/services/>.

10. Land acknowledgment

We acknowledge that Western University is located on the traditional lands of the Anishinaabek, Haudenosaunee, Lūnaapéewak and Attawandaron peoples, on lands connected with the London Township and Sombra Treaties of 1796 and the Dish with One Spoon Covenant Wampum. This land continues to be home to diverse Indigenous peoples (e.g. First Nations, Métis and Inuit) whom we recognize as contemporary stewards of the land and vital contributors of our society.