

Department of Biology

BIOLOGY 4608F Course Outline

Environmental Plant Physiology - Fall Term 2026

1. Course Information

Course	BIOLOGY 4608F - Environmental Plant Physiology
Term	Fall 2026
Class	
Location	
Delivery	In-person; seminar- and discussion-based, grounded in problem-based learning

Classes combine mini-lectures (approximately 20-30 minutes), group-based discussion and analysis of primary research, active-learning activities (case studies, simulations, and data workshops), and collaborative project work. Weekly asynchronous OWL Brightspace quizzes replace a cumulative final examination. Active, thoughtful, and professional engagement is expected.

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 is given to Year 4 HSP modules offered by the Department of Biology.

Unless students have either the prerequisites for this course or written special permission from the Department of Biology to enroll in it, they may be removed and withdrawn from this course in accordance with university policy. This may occur after the add/drop deadline, and the course will be marked as withdrawn (WDN) on the academic record. This decision may not be appealed.

2. Instructor Information

Instructor	Email	Office	Phone	Office Hours
Dr. Joshua Frank-Webb	jfrank22@uwo.ca	Zoom	-	By appointment (Zoom)

Office hours will take place via Zoom. Please email Dr. Frank-Webb in advance to arrange a meeting time; a Zoom link will then be provided. Students may also use the course discussion forum in OWL Brightspace to pose course-related questions and discuss topics with classmates.

Students must use their Western (@uwo.ca) email address when contacting the instructor. Email is normally monitored on business days, and students can generally expect a response within 24-48 hours.

3. Course Syllabus, Schedule, and Delivery Mode

This course explores the complex physiological processes that underlie plant growth, development, and responses to environmental challenges, with particular emphasis on climate change, urbanization, ecological stress, and plant-microbe interactions. Through primary literature, peer discussion, data interpretation, and experimental design, students will work as emerging scientists: developing research questions, critiquing methods and evidence, and connecting plant physiology to ecological, sustainability, and biotechnological applications.

Course-Level Learning Outcomes

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 the plant physiology literature.
4. Design and propose an original collaborative experiment addressing plant-environment interactions.
5. Communicate scientific arguments with clarity, precision, and an appropriate scholarly tone.
6. Engage actively and professionally in academic discussion and collaboration.

Course Units and Approximate Sequence

Unit 1: Introduction to Environmental Plant Physiology and Evolutionary Frameworks. Research-led learning; evolutionary history of plant traits and strategies; physiology, ecological success, and adaptation.

Unit 2: Foundations of Plant Cell Physiology. Membrane structure and transport; osmosis and water potential; ion homeostasis; compartmentation; vacuolar dynamics; turgor regulation.

Unit 3: Signal Perception and Intracellular Communication. Receptors; signal transduction; ROS and Ca²⁺ signalling; phosphorylation cascades; feedback; long-distance signalling.

Unit 4: Hormonal Regulation of Development and Stress Responses. Auxin, gibberellins, cytokinins, ABA, ethylene, jasmonates, and strigolactones; growth, stomatal control, and defence readiness.

Unit 5: Abiotic Stress Physiology - Physical Stressors. Drought and desiccation tolerance; salinity and ion toxicity; thermoregulation and temperature sensing.

Unit 6: Abiotic Stress Physiology - Light, Oxidative, and Environmental Stressors. High light and UV stress; photoprotection; oxidative stress, redox signalling, antioxidant systems; composite stresses.

Unit 7: Symbioses and Belowground Communication. Mycorrhizal associations; rhizobia and nitrogen fixation; soil microbiome signalling and physiological impacts.

Unit 8: Defence Responses and Biotic Interactions. Herbivory and wounding; systemic acquired resistance; JA-, SA-, and ET-mediated immunity and crosstalk.

Unit 9: Evolution of Plant Stress Responses and Adaptation. Trade-offs and constraints; genetic and epigenetic plasticity; local adaptation; experimental evolution.

Unit 10: Urban and Global Change Physiology and Biotechnology. Elevated CO₂; air pollution; urban heat islands; physiological resilience; trait innovation; biotechnology for climate-adaptive crops.

Key Sessional Dates

- Classes begin: September 9, 2026
- Fall Reading Week: October 10-18, 2026
- Classes end: December 9, 2026
- Fall examination period: December 11-22, 2026 (this course has no final examination)

Contingency Plan

The course is intended to be delivered in person. If a university-declared emergency requires some or all course activities to move online, delivery may become synchronous or asynchronous as appropriate. The learning outcomes and overall grading scheme will remain unchanged wherever reasonably possible, and any affected assessment arrangements will be communicated through OWL Brightspace.

4. Course Materials

Required readings will be selected from the primary scientific literature and posted or linked through OWL Brightspace. Students are expected to complete assigned readings before class so that they can participate meaningfully in discussion and analysis.

Recommended textbook (not required): Taiz et al., *Plant Physiology and Development*, 7th edition (2023) or 6th edition (2015). Earlier/second-hand editions are acceptable as a supporting reference. Because the textbook is recommended rather than required, students are not required to purchase it; approximate cost will vary by format and seller.

Required technology: regular access to a laptop or computer and a stable internet connection for OWL Brightspace, readings, quizzes, and assignment submission. No paid software, clicker, field trip, or other required learning material is anticipated.

All course materials, announcements, readings, assignment instructions, and grades will be posted to OWL Brightspace. Students are responsible for checking the course site regularly. OWL Brightspace is the primary method for disseminating course information.

5. Methods of Evaluation

Component	Weight	Timing / Due Date	Flexibility
Weekly OWL Brightspace Quizzes (best 7 of 11)	30%	Weekly; due Sundays at 11:59 PM	Best 7/11 + 48-hour no-penalty period
Group Experimental Proposal	20%	November 1, 2026, 11:59 PM	48-hour no-penalty period
Group Presentation	10%	In class; schedule announced in advance	Essential; rescheduled/make-up process below
Mini-Review Paper (individual)	20%	November 15, 2026, 11:59 PM	48-hour no-penalty period
Participation (best 10 of 15)	15%	Assessed across eligible class meetings	Best 10/15
Research Article Critique	5%	October 4, 2026, 11:59 PM	48-hour no-penalty period

Essential Learning Requirements

Because BIOLOGY 4608F is an essay course, students must demonstrate a minimal level of competence in individual scholarly writing. **To pass the course, a student must earn at least 50% on both the individual Research Article Critique and the individual Mini-Review Paper.** These requirements are used to demonstrate the Senate essay-course writing requirement.

The **Group Presentation is also an essential learning requirement** because it directly assesses oral scientific communication, response to questions, and collaborative presentation skills that are not fully assessed elsewhere. If Academic Consideration is granted for a missed essential presentation, a rescheduled or equivalent make-up opportunity will be provided. If an essential learning requirement remains incomplete because of granted Academic Consideration, the applicable Faculty/University process for WDN/INC standing will apply.

Assessment Details

Weekly quizzes (30%). Eleven short, open-book quizzes will reinforce lecture, discussion, and reading material through multiple-choice and short written responses. The best 7 of 11 count toward the final grade. Quizzes are intended to encourage steady learning and critical reflection rather than last-minute memorization.

Group experimental proposal (20%). Groups of approximately 3-4 students will identify a research question and design an original experiment addressing a plant-environment interaction. The proposal will include hypotheses, rationale, methods, expected results, interpretation, limitations, and significance. The task develops scientific reasoning, creativity, experimental design, and collaborative problem-solving.

Group presentation (10%). Groups will present their proposal in class. Presentations should be approximately 12 minutes plus 3 minutes for questions. Visual aids are required. Evaluation will consider scientific content, clarity, delivery, quality of visuals, teamwork, and the group's ability to answer reasonable questions. Peer feedback may be used formatively; the instructor determines the grade.

Mini-review paper (20%). This individual 4-5-page paper (excluding references) asks students to synthesize the current state of knowledge on an environmental plant physiology topic using approximately 8-10 peer-reviewed

sources, or more as appropriate. The emphasis is on synthesis, evidence-based argument, scholarly writing, and identifying gaps or future directions.

Research article critique (5%). This individual, 1-2 page analysis asks students to critically evaluate a selected primary research article, focusing on the hypothesis or research question, experimental design, strength of evidence, interpretation, limitations, and whether the conclusions are justified.

Participation (15%). Participation reflects active and thoughtful contribution to the intellectual work of the course, not simple physical presence. Evidence may include preparation for discussion, asking or answering substantive questions, interpreting data, connecting readings to course concepts, respectful engagement with alternative interpretations, leadership in small-group work, and constructive collaboration. The best 10 of 15 eligible participation scores will count, providing built-in flexibility for occasional absences or lower-participation days.

Information About Missed Coursework and Flexible Completion

Students must familiarize themselves with Western's Academic Consideration policy (https://uwo.ca/univsec/pdf/academic_policies/appeals/academic_consideration_Sep24.pdf) and the Student Absence Portal procedures. Requests that do require Academic Consideration must normally be **submitted within 48 hours after the assessment date or submission deadline**.

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](#).

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.

For the regular take-home assignments and quizzes in this course, the Faculty of Science's Flexible Completion approach is built directly into the grading scheme. Students do not need to request Academic Consideration for the ordinary flexibility described below.

Quizzes. Students are expected to complete all 11 quizzes, but **only the best 7 are used**. Up to two missed quizzes therefore do not require Academic Consideration. Each quiz also has an automatic 48-hour no-late-penalty period after its stated Sunday deadline. After that 48-hour period, the quiz closes and no further submission is accepted. If fewer than 9 quizzes are completed, missing quizzes needed to reach the 9-quiz calculation are recorded as zero.

Take-home written assignments. The Research Article Critique, Group Experimental Proposal, and Mini-Review Paper each include an **automatic 48-hour period** after the stated deadline during which the work may still be submitted without a late penalty. After the 48-hour period, no further submissions are accepted unless an approved accommodation or another University process requires an alternative arrangement. Students do not need to request Academic Consideration merely to use the automatic 48-hour period.

Participation. The best 10 of 15 eligible participation scores count. Up to two missed or lower-scoring participation opportunities therefore do not require Academic Consideration. If fewer than 10 eligible scores are completed, missing scores needed to reach 10 are recorded as zero unless an approved accommodation or applicable University process provides otherwise.

Presentation. The Group Presentation is an **essential learning requirement**. A student who cannot attend the assigned presentation due to an extenuating circumstance must contact the instructor as soon as reasonably possible and, when required, submit an Academic Consideration request through the Student Absence Portal. An approved absence will lead to a rescheduled or equivalent make-up presentation. Where possible, students who know of a university-sanctioned conflict in advance should notify the instructor at least one week before the presentation.

6. Additional Statements

6.1 Religious Accommodation

When a recognized religious holiday requires a student to be absent from the University, or requires or prohibits an activity that makes it impossible to complete an academic requirement scheduled that day, the student is entitled to accommodation. No student will be penalized for an absence for religious reasons, and an alternative means of satisfying the requirement will be arranged in accordance with Western's policy on Accommodation for Religious Holidays. Requests should be submitted through the Student Absence Portal, identifying the conflict and the affected course component. Students remain responsible for finding out what was covered in any class they miss and for keeping up with coursework.

6.2 Academic Accommodation Policies

Students with disabilities are encouraged to contact Accessible Education, which provides accommodation recommendations based on appropriate documentation and assessment. Students may also contact the instructor if course materials are required in an alternate format or if other arrangements can improve accessibility.

6.3 General Academic Policies

Students are responsible for monitoring their official Western (@uwo.ca) email account and the course OWL Brightspace site. Requests for relief from academic decisions are governed by the applicable University policies and procedures.

This course does not include an in-person test or final examination. If an in-person assessment is added only through an approved course change, Faculty of Science rules concerning unauthorized electronic devices will apply.

6.4 Scholastic Offences and Academic Integrity

Scholastic offences are taken seriously. Students are responsible for understanding Western's Policy on Scholastic Offences and the undergraduate procedures that apply to academic integrity matters. Students must acknowledge sources appropriately and complete submitted work in accordance with the instructions for each assessment.

Use of generative AI tools. Unless the instructor explicitly states otherwise for a particular learning activity or assessment, generative AI tools (including ChatGPT, Microsoft Copilot, Google Gemini, or similar systems) are not permitted in the completion of course assessments. Use for content generation, problem solving, translation, summarization, or other assessed work without explicit permission may be treated as a scholastic offence. If AI use is permitted for a specific task, the permitted purposes, limits, and any disclosure or citation expectations will be communicated in advance.

Turnitin. Required written work may be submitted for textual similarity review using Turnitin under the University's licence. Submitted papers may be included as source documents in the reference database for the purpose of detecting similarity in subsequently submitted work.

6.5 Professionalism, Privacy, and Course Materials

- Students are expected to communicate respectfully and professionally in class, online discussions, group work, and email.
- Course materials created by the instructor are protected by copyright and may not be sold, reposted, or distributed without permission.
- Audio or video recording of class activities is not permitted without explicit permission or an approved accommodation.
- Any recording permitted for accommodation or instructional purposes must not be distributed outside the course.

6.6 Support Services

Science & Basic Medical Sciences Academic Advising can assist with adding/dropping courses, academic consideration, requests for relief, examination conflicts, and other academic matters. Western also provides Mental Health@Western, gender-based and sexual violence support, Accessible Education, Learning Development and Success, the University Students' Council, and the Science Students' Council. Current contact information and links are available through Western's official student-support webpages and OWL Brightspace.

7. Land Acknowledgement

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, including First Nations, Métis and Inuit peoples, whom we recognize as contemporary stewards of the land and vital contributors to our society.

Instructor Note on Course Design

Environmental Plant Physiology is intentionally discussion-centred. The course is designed to move beyond memorizing isolated pathways toward using physiological mechanisms to explain real biological problems. Students will repeatedly practise interpreting evidence, comparing competing explanations, connecting processes across scales, and defending conclusions in a respectful scholarly discussion. The assessment structure therefore rewards sustained engagement, critical reading, experimental design, scientific writing, and communication across the term.