ORIGINAL COURSE IMPLEMENTATION DATE: September 2005
REVISED COURSE IMPLEMENTATION DATE: September 2022
COURSE TO BE REVIEWED (six years after UEC approval)**:** January 2028
Course outline form version: 05/18/2018

OFFICIAL UNDERGRADUATE COURSE OUTLINE FORM

Note: The University reserves the right to amend course outlines as needed without notice.

Course Code and Number: BIO 308	**Number of Credits:** 4 Course credit policy (105)

Course Full Title: Plant Physiology
Course Short Title:
(Transcripts only display 30 characters. Departments may recommend a short title if one is needed. If left blank, one will be assigned.)

Faculty: Faculty of Science	**Department (or program if no department):** Biology

Calendar Description:

Principal mechanisms that govern the functioning and biochemistry of plants such as carbon and nitrogen metabolism, photosynthesis, respiration, water relations, mineral nutrition, response to environmental signals, roles of plant hormones, and plant biotechnology.

Prerequisites (or NONE):	BIO 201 and BIO 220.
Corequisites (if applicable, or NONE):	
Pre/corequisites (if applicable, or NONE):	BIO 320 recommended

Antirequisite Courses *(Cannot be taken for additional credit.)*
Former course code/number: **BIO 303**
Cross-listed with:
Dual-listed with:
Equivalent course(s):
(If offered in the previous five years, antirequisite course(s) will be included in the calendar description as a note that students with credit for the antirequisite course(s) cannot take this course for further credit.)

Typical Structure of Instructional Hours

Lecture/seminar hours	45
Tutorials/workshops	
Supervised laboratory hours	45
Experiential (field experience, practicum, internship, etc.)	
Supervised online activities	
Other contact hours:	
Total hours	**90**

Labs to be scheduled independent of lecture hours: ☒ No ☐ Yes

Special Topics *(Double-click on boxes to select.)*
This course is offered with different topics:
☒ No ☐ Yes *(If yes, topic will be recorded when offered.)*

Independent Study
If offered as an Independent Study course, this course may be repeated for further credit: *(If yes, topic will be recorded.)*
☒ No ☐ Yes, repeat(s) ☐ Yes, no limit

Transfer Credit
Transfer credit already exists: *(See **bctransferguide.ca**.)*
☒ No ☐ Yes
Submit outline for (re)articulation:
☒ No ☐ Yes *(If yes, fill in transfer credit form.)*

Grading System
☒ Letter Grades ☐ Credit/No Credit

Maximum enrolment (for information only): 24

Expected Frequency of Course Offerings:
Alternate years *(Every semester, Fall only, annually, etc.)*

Department / Program Head or Director: Gregory Schmaltz	**Date approved:**	September 2021
Faculty Council approval	**Date approved:**	October 8, 2021
Undergraduate Education Committee (UEC) approval	**Date of meeting:**	January 28, 2022

Learning Outcomes:

Upon successful completion of this course, students will be able to:

1. Demonstrate detailed understanding of the fundamental importance of water relations to plant growth, development, and function.
2. Describe the biochemical processes that comprise plant primary and secondary metabolism.
3. Identify the roles of various essential and beneficial plant mineral nutrients and deficiency symptoms.
4. Evaluate the relationship of hormones and environmental factors in the control of plant growth and development.
5. Discuss how the current research of *Arabidopsis thalania* is used to understand physiological phenomena.
6. Apply the scientific method in plant physiology studies by generating hypothesis, designing experiments, analyzing data, and interpreting and presenting research findings.
7. Discuss the role of indigenous scientific knowledge in increasing our understanding of plant science.

Prior Learning Assessment and Recognition (PLAR)

☒ Yes ☐ No, PLAR cannot be awarded for this course because

Typical Instructional Methods *(Guest lecturers, presentations, online instruction, field trips, etc.; may vary at department's discretion.)*

Lectures, in-class discussions, and student presentations; laboratory exercises.

NOTE: The following sections may vary by instructor. Please see course syllabus available from the instructor.

Typical Text(s) and Resource Materials *(If more space is required, download Supplemental Texts and Resource Materials form.)*

	Author (surname, initials)	Title (article, book, journal, etc.)	Current ed.	Publisher	Year
1.	Taiz et al.	Plant Physiology and Development		Sinauer	2018
2.					

Required Additional Supplies and Materials *(Software, hardware, tools, specialized clothing, etc.)*

Typical Evaluation Methods and Weighting

Final exam:	35%	Assignments:	%	Field experience:	%	Portfolio:	%
Midterm exam:	20%	Project:	%	Practicum:	%	Term paper/oral presentation:	20%
Quizzes/tests:	%	Lab work:	25%	Shop work:	%	Total:	100%

Details (if necessary):

Typical Course Content and Topics

Week 1 Review of plant cell structure and function; From the ground up - review of water uptake
Week 2 Introduction to plant nutrition; Mineral availability - uptake of potassium - a model for membrane transport
Week 3 Phosphorus uptake strategies; VAM mediated mineral uptake; Siderophores and nutrient uptake; Nitrogen availability
Week 4 Nitrogen assimilation; Plant response to nitrogen; Introduction to light - properties and responses
Week 5 Photosynthesis and photorespiration - Review of C3, C4 and CAM photosynthesis; Stomatal mechanics and mechanisms; Advantage to inefficient C3 photosynthesis C3/C4 hybrids, Facultative C4 photosynthesis
Week 6 Canopy response to light; Leaf area index, planophiles vs erectophiles; Canopy closure and yield potential
Class will go in the woodlot area on campus and measure leaf area index of several different plant species.
Week 7 Red and far red light – photomorphorgeneis; Phytochrome responses; Blue light responses; Tropic and nastic responses; Gravitropism, touch response
Week 8 Plants and clocks; Circadian rhythms; Photoperiodism; Temperature responses; Vernalization and dormancy
Weeks 9-10 Phytohormones; Roles of auxins, cytokinins, gibberillins, abscisic acid, ethylene, jasmonates; Signal transduction in plants
Week 11 Abiotic stress; Cold, drought, salt, anoxia, and heat; Acclimation and cross adaptation
Week 12 Biotic stress - plant response to pathogens and herbivores; Gene for gene hypothesis
Week 13 Student presentations

Laboratory:

Week 2 Measuring photosynthesis and respiration using *Arabidopsis*
Week 3 Composition of Root nodules
Students will locate plants on campus with nitrogen fixing root nodules, and conduct experiments on the nodules.
Week 4 Pigments and plants, determination of light absorption
Week 5 Measuring photosynthesis in atrazine resistant plants
Week 6 Red and blue light studies
Week 7 No lab – mid-term break
Week 8 Germination and dormancy lab
Week 9 Growth regulator lab (multi week lab)
Week 10 Abiotic stress lab #1 – Students will design their own experiment on abiotic stress effects on *A. thaliana.*
Week 11 Abiotic stress lab part 2
Week 12 Completion of growth regulator lab