BIOL 3B03
Plant Physiology
Winter 2021 Course Outline

Course Details

Instructor: **Instructor: Elizabeth Weretilnyk, weretil@mcmaster.ca, Ext. 24573**

Office hours: LSB 536 (office) or by Microsoft Teams.
Thursdays 1:30 – 2:30 pm (or by appointment)

Lab/TA's: TBD

Lectures: Monday 12:30 – 13:20 pm and Tuesday 13:30 – 14:20 pm
Asynchronous (pre-recorded content) will be posted on Avenue-to-Learn following the proposed schedule of lectures.

Lab: Weekly time and location TBD.

Course Description

- Principles of physiology and plant cell metabolism. Topics include: photosynthesis, photorespiration, mineral nutrition, water relations and transpiration.
  Two lectures, one lab (three hours); one term
  Prerequisite(s): BIOLOGY 2B03 or ISCI 2A18 A/B; and BIOLOGY 2D03 or registration in a Biophysics program
- Lectures are asynchronous/pre-recorded with closed captions while labs are synchronous.
- Prescheduled synchronous class meetings to review material and provide instruction on labs will take place during the term. Synchronous class meetings will be done for weeks with lab exercises during the Monday, 12:30 to 13:20 lecture slot using Microsoft Teams. Labs are attended by the Instructor along with the TAs.

Course Learning Objectives

- To develop an understanding of mechanisms underlying plant management of water, nutrients and the production and allocation of photosynthate and the impact of stresses like climate change on plant productivity.
- To practise and master laboratory skills including those used for the study of plants.
- To introduce students to experiments using plants at the biochemical, sub-cellular and whole plant level.

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

- Measure and dispense liquids with high precision, perform spectrophotometric measurements, isolate chloroplasts and perform enzyme/electron transfer activity measurements.
- Set testable hypotheses, produce and analyse data, and present and discuss results in the context of a formal lab write-up.
- Interpret data and draw inferences/conclusions related to plant performance under optimum and stressed conditions and draw connections between plant productivity and food security.
- Explore the primary literature for insights on interpreting the empirical data students generate.
- Creatively modify a lab protocol to enhance the scope of an experiment.

Course Schedule

The following is a tentative schedule for BIOL 3BO3. Prior to the start of the Winter Term a course schedule will be uploaded to Avenue to Learn.

LECTURE #	DATES	TOPIC	LAB
1.	January 11	Introduction/Water movement	Skills lab (Bonus marks) 1. Set up nutrition lab (Greenhouse)
2.	January 12	Measuring water status	
3.	January 18	Soil properties and water movement	2. Root membrane properties
4.	January 19	Root structure and water uptake	
5.	January 25	Water movement to leaves/ Transpiration	3. Water potential
6.	January 26	Mineral nutrition	
7.	February 1	Solute movement	4. Nitrate reductase
8.	February 2	Nitrogen assimilation I	
9.	February 8	Nitrogen assimilation II & S assimilation	Complete mineral nutrition experiment
10.	February 9	P and Fe assimilation Environmental stress	
11.	February 22	Photosynthesis: light reactions I	
12.	February 23	Midterm Exam	

13.	March 1	Photosynthesis: light reactions II	5. Chloroplast isolation and electron transport assay
14.	March 2	Photosynthesis: carbon assimilation	
15.	March 8	Photorespiration	6. Photosynthesis lab (Greenhouse)
16.	March 9	CO_2 concentrating mechanisms I	
17.	March 15	CO_2 concentrating mechanisms II	7. Senescence lab: set up
18.	March 16	Photosynthesis: Ecological considerations & measurements	
19.	March 22	Translocation/phyllotaxy	Senescence lab: complete
20.	March 23	Assimilate partitioning	
21.	March 29	Sink development	
22.	March 30	Senescence/Stress responses	
23.	April 5	Post-harvest Physiology/Growth regulators	
24.	April 6	Live review session	

IMPORTANT NOTE

The instructor and university reserve the right to modify elements of the course during the term. The university may change the dates and deadlines for any or all courses in extreme circumstances. If any modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes. It is the responsibility of the student to check their McMaster email and course websites weekly during the term and to note any changes. Changes will be communicated through regular McMaster communication channels, such as McMaster Daily News, Avenue to Learn and/or McMaster email.

Course Materials

- There are no assigned readings from a textbook. However, *Fundamentals of Plant Physiology (First Edition)* by Lincoln Taiz, Eduardo Zeiger, Ian Max Møeller and Angus Murphy (published by Sinauer Associates 2018) is highly recommended to supplement the lecture material. Copies will be requested to have on hand at the Campus Store.
- Papers that will aid in completing the lab reports will be posted on Avenue to Learn.
- Lab coats and safety goggles are recommended.

Course Evaluation

Mark Distribution:

Lab Component:	
Lab Reports (7 over the term at 5% each)	35%
Reflections on the Lab	20%
Midterm: Tuesday, Feb 23, 2020 (online)	20%
Final Exam (scheduled by the Registrar)	25%
Total Mark	**100%**

Details on Assessment:

Lab Exercises and Reports: The lab exercises are an integral component of this course since they provide an opportunity to cover the topics discussed in lectures in greater depth. Material covered in labs will be included in exams (midterm and final). Unless otherwise stated, lab reports are due one week plus a day (the following Friday by midnight) after completion of the exercise. Late reports will be subject to a mark reduction of 10% per day overdue. You will be provided with more information about lab write-up formats during the lab. Labs will be submitted using Avenue to Learn. Lab outlines will be posted on Avenue to Learn one week before the lab exercise is done.

Incentive available for completing all labs & submitting them on time. The incentive entails shifting the grade distribution by 5% between the marks for the MT and Final exam, whichever yields a higher final grade. For example, if you ace the final but had a tough midterm the allocation could be shifted to reduce the midterm to 15% of the final mark with an increased weight on the final exam. No exceptions- no late labs and all 7 labs must be completed to be eligible for the mark redistribution.

Absences from the Lab This course has a compulsory lab component. It is the responsibility of the student to attend all labs as scheduled. A missed lab will result in a grade of zero unless the absence is documented by an on-line MSAF notice or it is supported by the Associate Dean's Office. Unfortunately, due to the preparations needed for the labs there can be no provision for make-up exercises/lab content in the event of illness, so this is not an option for relief. Your prompt attention to an absence will make it easier to determine appropriate relief for missed lab work.

Reflections on the Lab: The formal lab write-up is an academic exercise, one that relates the facts and outcomes of your experiment without much self-reflection about what you have learned from the experience. For each lab write-up, a short (250 to 300 word) reflection is submitted at the end of the formal lab describing a) what you expected from the exercise before doing it, b) how well your expectations were met after completing the lab, and c) in your view, what stood out about the experience (eg. did you learn something new?). More information on this component will be posted on Avenue to Learn as will a rubric on how to complete the formal lab report and expectations.

Midterm and Final Exam: The mid-term exam will be released via Avenue to Learn for completion during the scheduled lecture slot. You will be given the class period (50 min) to write the exam. Calculators and other electronic devices are not permitted. The Final Exam (2 hr) will be administered through Avenue to Learn and will be scheduled by the Registrar. The Midterm and Final exams are not cumulative, but some conceptual overlap between each half-term is unavoidable and some review of

material dealt with before the Midterm is advisable for the Final. There will be an opportunity for a re-take of the midterm in case of illness but absence should be accompanied by a MSAF notice or approval of the Associate Dean's office. The format for both will be similar which is typically short answer questions.

Skills Workshop (Introduction to Laboratory Skills): This workshop is not considered a laboratory exercise but your participation is **highly recommended**. If you complete the 1.5h session and obtain confirmation of completion from your Instructor or TA, you will receive 3 BONUS marks to the laboratory component of the course. You can complete this module after setting up the Mineral Nutrition lab in the Greenhouse (ie, during the same lab period)**.** More details will be given in class and on Avenue to Learn.

This course may use online proctoring software for tests and exams. This software may require students to turn on their video camera, present identification, monitor and record their computer activities, and/or lock/restrict their browser or other applications/software during tests or exams. This software may be required to be installed before the test/exam begins.

Academic Integrity

You are expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity. **It is your responsibility to understand what constitutes academic dishonesty.**

Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: "Grade of F assigned for academic dishonesty"), and/or suspension or expulsion from the university. For information on the various types of academic dishonesty please refer to the *Academic Integrity Policy,* located at https://secretariat.mcmaster.ca/university-policies-procedures- guidelines/

The following illustrates only three forms of academic dishonesty:

- plagiarism, e.g. the submission of work that is not one's own or for which other credit has been obtained.
- improper collaboration in group work.
- copying or using unauthorized aids in tests and examinations.

Authenticity/Plagiarism Detection

Some courses may use a web-based service (Turnitin.com) to reveal authenticity and ownership of student submitted work. For courses using such software, students will be expected to submit their work electronically either directly to Turnitin.com or via an online learning platform (e.g. Avenue to Learn, etc.) using plagiarism detection (a service supported by Turnitin.com) so it can be checked for academic dishonesty.

Students who do not wish their work to be submitted through the plagiarism detection software must inform the Instructor before the assignment is due. No penalty will be assigned to a student who does not submit work to the plagiarism detection software. **All submitted work is subject to normal verification that standards of academic integrity have been upheld** (e.g., on-line search, other software, etc.). For more details about McMaster's use of Turnitin.com please go to www.mcmaster.ca/academicintegrity.

Courses with an On-line Element

Some courses may use on-line elements (e.g. e-mail, Avenue to Learn, LearnLink, web pages, capa, Moodle, Echo360, Microsoft Teams, ThinkingCap, etc.). Students should be aware that, when they access the electronic components of a course using these elements, private information such as first and last names, user names for the McMaster e-mail accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in a course that uses on-line elements will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure please discuss this with the course instructor.

Online Proctoring

Some courses may use online proctoring software for tests and exams. This software may require students to turn on their video camera, present identification, monitor and record their computer activities, and/or lock/restrict their browser or other applications/software during tests or exams. This software may be required to be installed before the test/exam begins.

Conduct Expectations

As a McMaster student, you have the right to experience, and the responsibility to demonstrate, respectful and dignified interactions within all of our living, learning and working communities. These expectations are described in the *Code of Student Rights & Responsibilities* (the "Code"). All students share the responsibility of maintaining a positive environment for the academic and personal growth of all McMaster community members, **whether in person or online.**

It is essential that students be mindful of their interactions online, as the Code remains in effect in virtual learning environments. The Code applies to any interactions that adversely affect, disrupt, or interfere with reasonable participation in University activities. Student disruptions or behaviours that interfere with university functions on online platforms (e.g. use of Avenue 2 Learn, WebEx, Echo360, Microsoft Teams or Zoom for delivery), will be taken very seriously and will be investigated. Outcomes may include restriction or removal of the involved students' access to these platforms.

Academic Accommodation of Students with Disabilities

Students with disabilities who require academic accommodation must contact Student Accessibility Services (SAS) at 905-525-9140 ext. 28652 or sas@mcmaster.ca to make arrangements with a Program Coordinator. For further information, consult McMaster University's *Academic Accommodation of Students with Disabilities* policy.

Requests for Relief for Missed Academic Term Work

McMaster Student Absence Form (MSAF): In the event of an absence for medical or other reasons, students should review and follow the Academic Regulation in the Undergraduate Calendar "Requests for Relief for Missed Academic Term Work".

View the McMaster Student Absence Form (MSAF) for more information.

Academic Accommodation for Religious, Indigenous or Spiritual Observances (RISO)

Students requiring academic accommodation based on religious, indigenous or spiritual observances should follow the procedures set out in the RISO policy. Students should submit their request to their Faculty Office ***normally within 10 working days*** of the beginning of term in which they anticipate a need for accommodation or to the Registrar's Office prior to their examinations. Students should also contact their instructors as soon as possible to make alternative arrangements for classes, assignments, and tests.

Copyright and Recording

Students are advised that lectures, demonstrations, performances, and any other course material provided by an instructor include copyright protected works. The Copyright Act and copyright law protect every original literary, dramatic, musical and artistic work, **including lectures** by University instructors

The recording of lectures, tutorials, or other methods of instruction may occur during a course. Recording may be done by either the instructor for the purpose of authorized distribution, or by a student for the purpose of personal study. Students should be aware that their voice and/or image may be recorded by others during the class. Please speak with the instructor if this is a concern for you.

Extreme Circumstances

The University reserves the right to change the dates and deadlines for any or all courses in extreme circumstances (e.g., severe weather, labour disruptions, etc.). Changes will be communicated through regular McMaster communication channels, such as McMaster Daily News, Avenue to Learn and/or McMaster email.