

Biology 3603A Course Outline

1. Course information

Biology 3603A – *Ecophysiology of Plants*. Fall, 2023

Lectures:

Laboratory:

Prerequisites: Biology 2601A/B.

Unless you have either the requisites for this course or written special permission from your Dean 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 in the event that you are dropped from a course for failing to have the necessary prerequisites.

2. Teaching team

Instructor: **Denis Maxwell**
dmaxwell@uwo.ca

Teaching Assistant: **Alex Niski**
aniski@uwo.ca

Lab Coordinator: **Anica Bjelica**
abjelic@uwo.ca

3. Course Syllabus, Schedule, Delivery Mode

This course will introduce you to the physiological responses of plants to their environment along the continuum from stress through acclimation to adaptation. We will discuss how plants cope with a range of stress factors including: high light, low temperature, changes in [CO₂] and nutrient deficiency. As well, you will begin to understand how plants actually sense changes in their environment that alter gene expression and physiology leading to phenotypic and genotypic changes. The course has a strong laboratory component that will help develop a range of transferable skills including collaboration, problem-solving and communication.

Learning Outcomes

Here are the major learning outcomes from the lecture component of the course.

1. the concepts of stress, acclimation, adaptation, homeostasis, photostasis as well as the core principles of thermodynamics
2. the structure and function of the photosynthetic apparatus: physics of light absorption, photosystems, linear electron transport, Calvin Cycle, photorespiration
3. environmental impacts (changes in temperature, light, nutrients) on different components of photosynthesis
4. experimental data (tables, graphs, protein, RNA, DNA blots).
5. the utility of model genetic systems (e.g. *Chlamydomonas*, *Arabidopsis*) and the technique of mutagenesis for elucidating the molecular basis of acclimation & adaptation
6. the evolutionary processes that result in adaptation and factors that constrain adaptation (e.g. rubisco active site).
7. the mechanisms photoautotrophs use to adapt to low temperature (enzyme properties, fatty acid biosynthesis)
8. the global nitrogen cycle, redox states of N, nitrogen metabolism, biological nitrogen fixation
9. plant water relations, including concepts of diffusion, osmosis, water potential-adaptation (halophytes)
10. climate change, particularly elevations in CO₂, on plant growth and physiology - CO₂ limitations.....FACE experiments, evapotranspiration
11. plant phenology and the interplay between photoperiod and temperature. The impact of climate change on phenological timing (e.g. effects of temperature)

- 12. photoperiod: from development (flowering time) to molecular aspects (e.g. phytochrome structure/function) to the importance of biological clocks
- 13. interpretation of graphical data.

These outcomes will be evaluated using the formats of short answer (i.e., 3 sentences) and long answer (i.e. 3 paragraphs). This may be done by providing definitions, compare and contrast, analysis of presented data, addressing novel and/or hypothetical situations.

The laboratory component of the course will develop:

- your teamwork skills.
- your ability to analyze and interpret data and provide reasonable biologically based explanations for your findings.
- your writing and presentation skills.

4. Course Materials

We will be using OWL extensively. This is where you will find: class notes, readings, testable class outcomes, announcements, grades, useful URLs, laboratory handouts.

There is a textbook for the course that is freely available on the OWL site. It's usefulness is in providing clarification when possible.

5. Methods of Evaluation

| Component | Worth (%) | Details |
|----------------------|------------------|--|
| Pre-midterm quiz | 1 | In class, practice |
| Participation | 5 | For being engaged in class discussions |
| Group article review | 4 | Due November 19 |
| Term paper | 14 | Due October 16 |
| Midterm Test | 20 | Monday, October 23 (in class using laptop) |
| Laboratory | 26 | See details below |
| Final Exam | 30 | Final exam period |

Term paper

Every student will write a 1500-word essay. We will discuss the scope of this essay in class. This will be due early! Monday October 16th.

Laboratory

The laboratory is a substantial component of the course. It will require you to work in groups of 3 students. All information pertinent to labs will be posted to OWL. Labs start the week of September 25th.

| Date (week of) | Details | Points |
|---------------------------|--|---------------|
| Sep 25 | Lab overview, designing your experiment. | 1 |
| Oct 2 | Experiment session I | 1 |
| Oct 9 | Thanksgiving (no lab this week) | |
| Oct 16 | Experiment session II | |
| Oct 23 | Experiment session III | 1 |
| Oct 30 | Fall Break (no labs) | |
| Nov 6 | Analyze and plot data | 1 |
| Nov 13 | Review data (prepare for presentation) | |
| Nov 27 | Group lab presentations | 7 |
| Dec 8 | Peer evaluation due | 3 |
| Dec 8 | Final group lab report | 12 |
| | Total marks | 26 |

Participation

I want to put some points towards participation—because I think it's important. In a caring respectful way I will encourage all students to engage during lectures. I want class to be much more about discussing stuff than about me talking and you writing. A lot of this will be done in a group format and I hope that those who are anxious about speaking will find the environment welcoming and that by the end of the course will feel more comfortable with it.

6. Student Absences

If you are unable to meet any course requirement due to illness or other serious circumstances, let me know! In the vast majority of circumstances we can arrive at a suitable, fair and equitable accommodation.

For work totalling 10% or more of the final course grade, I will ask that you 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://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_medical.pdf.

The Student Medical Certificate is available at

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

Absences from Final Examinations

If you miss the Final Exam, please contact the Academic Counselling office of your Faculty of Registration as soon as you are able to do so. They will assess your eligibility to write the Special Examination (the name given by the University to a makeup Final Exam).

You may also be eligible to write the Special Exam if you are in a "Multiple Exam Situation" (e.g., more than 2 exams in 23-hour period, more than 3 exams in a 47-hour period).

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 accommodation for their absence in writing at least two weeks prior to the holiday to the course instructor and/or the Academic Counselling office of their Faculty of Registration. Please consult University's list of recognized religious holidays (updated annually) at

<https://multiculturalcalendar.com/ecal/index.php?s=c-univwo>.

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.

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.

Your term papers and lab reports 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>).

9. Support Services

Please visit the Science & Basic Medical Sciences Academic Counselling 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 me 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.