



# BOT\*2100 Life Strategies of Plants

Winter 2023

Section(s): C01

Department of Molecular and Cellular Biology

Credit Weight: 0.50

Version 1.00 - January 10, 2023

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## 1 Course Details

### 1.1 Calendar Description

This course introduces the structures and processes used by plants in the greening of our planet, and how and why plants are basic to the functioning of the biosphere. This course includes hands-on experience in examining the cells, tissues and architectures of plants as well as selected processes of plant function.

**Pre-Requisites:** 2 of BIOL\*1050, BIOL\*1070, BIOL\*1080, BIOL\*1090

### 1.2 Course Description

This course introduces the structures and processes used by plants in the greening of our planet, and how and why plants are basic to the functioning of the biosphere. This course includes hands-on experience in examining the cells, tissues and architectures of plants as well as selected processes of plant function.

### 1.3 Timetable

Lectures: In person (F2F) depending upon Univ guidance: 8:30-9:20 Monday, Wednesday & Friday, MACS 209

Look through the posted lectures **ahead** of time to get the most out of this course. You can print out the PDFs provided on Courselink and bring them to class. Any questions that you have pertaining to the lecture material can be answered during that time.

Labs: The laboratory component will be conducted in person. Labs will start in the week of Jan 11-12. Contact Dr. Chris Meyer for more details (cmeyer02@uoguelph.ca).

Make sure that you have read the pertinent lab exercises **ahead** of time. Consider any questions posed in each exercise; they can help you in completing the LAB REPORTS.

You are welcome to ask any questions during lectures, the laboratories or at any other times. We welcome contact via email and are happy to set up office meetings.

## 1.4 Final Exam

Mid-Term Exam: February 17th, 2023. During scheduled class time. 8:30AM - 9:20AM

Final Exam: April 18th, 2023. 8:30AM - 10:30AM

Location: TBD

Exam time, location AND mode of examining (F2F or online) are subject to change. Please see WebAdvisor and courseLink notifications for the latest information.

## 2 Instructional Support

### 2.1 Instructional Support Team

**Instructor:** Tariq Akhtar  
**Email:** takhtar@uoguelph.ca  
**Telephone:** +1-519-824-4120 x54794  
**Office:** SC1 4461

Dr. Tariq Akhtar is an Associate Professor in the Molecular & Cellular Biology Department at UofG. He obtained his MSc. in environmental toxicology from the University of Waterloo, PhD. in plant molecular biology from the University of Florida and completed his postdoctoral work in plant biochemistry at the University of Michigan. Dr. Akhtar runs a research laboratory that focuses on the splendid array of compounds that are made by plants and the underlying molecular and biochemical basis for their synthesis.

**Instructor:** Yang Xu  
**Email:** yangxu@uoguelph.ca  
**Telephone:** +1-519-824-4120 x54788  
**Office:** SSC 4453

Dr. Yang Xu is an Assistant Professor in the Department of Molecular and Cellular Biology. Dr. Xu received her Ph.D. degree in Plant Science from the University of Alberta with a research focus on plant lipid biotechnology. She worked as a Postdoctoral Fellow in microalgal lipid biotechnology at the University of Alberta and later as a Postdoctoral Research Associate in plant lipid biochemistry at Michigan State University. Her research laboratory focuses on studying lipid metabolism in plants and microalgae and developing biotechnology strategies to produce designer oils for food, fuel and renewable materials.

**Lab Co-ordinator:** Chris Meyer  
**Email:** cmeyer02@uoguelph.ca  
**Telephone:** +1-519-824-4120 x53955  
**Office:** SC1 3507

Dr. Chris Meyer obtained B.Sc. and Ph.D. degrees in Plant Biology from the University of Waterloo. He has contributed to research and teaching in the plant sciences at the

Universities of Waterloo, Wilfrid Laurier and Brock. Dr. Meyer continues to explore new approaches in plant science education at Guelph. As the BOT\*2100 Lab Coordinator, he manages all aspects of the teaching laboratory. See the Lab Manual for further details.

## 2.2 Teaching Assistants

The TAs are responsible for dealing with your laboratory-based questions and making sure that you understand the procedures. In addition, they will be able to give you help in getting all the experiments to work.

They will grade the LAB REPORTS (see Grades).

- Laura Currie [lcurri03@uoguelph.ca]
  - Marijke Murray [mmurra18@uoguelph.ca]
  - Nicholas Prudhomme [nprudhom@uoguelph.ca]
  - Caroline Reisinger [creisige@uoguelph.ca]
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## 3 Learning Resources

### 3.1 Required Resources

#### Lab Manual (Lab Manual)

BOT\*2100 Life Strategies of Plants, C.J. Meyer, Department of Molecular and Cellular Biology, College of Biological Science, University of Guelph, © Winter 2023.

The laboratory manual and all lab related documents will be available to download from CourseLink. You do not need to purchase anything extra for the lab.

#### Courselink (Website)

<https://courselink.uoguelph.ca>

This course will make use of the University of Guelph's course website (via Courselink). Consequently, you are responsible for all information posted on the Courselink page for BOT\*2100. Please check it regularly.

### 3.2 Recommended Resources

#### Undergraduate Calendar (Website)

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/>

The source of information about the University of Guelph's procedures, policies and regulations, which apply to undergraduate programs.

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## 4 Learning Outcomes

## 4.1 Course Learning Outcomes

By the end of this course, you should be able to:

1. Critically evaluate ideas and arguments by gathering and integrating relevant qualitative and quantitative information, assessing its credibility, and synthesizing evidence to formulate a position.
  2. Accurately and effectively communicate ideas, arguments and analyses in graphic, oral and written form.
  3. Collaborate effectively as part of a team by demonstrating mutual respect, and an ability to set goals and manage tasks and time lines.
  4. Apply scientific methods and processes to generate and interpret scientific data using quantitative, qualitative and analytical methodologies and techniques.
  5. Demonstrate knowledge in the molecular and chemical composition of plants and their relationships to structure and function.
  6. Demonstrate knowledge in the fundamental vegetative and reproductive attributes of plants.
  7. Demonstrate knowledge in the interaction of plants with biotic and abiotic factors.
  8. Demonstrate knowledge in plant diversity and genetic variability and their relationship to evolution, speciation and adaptation.
  9. Demonstrate the use of modern techniques in plant research.
  10. Demonstrate skills to study plants in field or laboratory settings.
  11. Interpret the evolutionary history of plants through an examination of phylogenetic trees.
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## 5 Teaching and Learning Activities

### 5.1 Course Content

#### Lectures

Lecture notes will be posted on courselink and then reviewed during the scheduled lecture time.

Lectures are on:

Monday at 8:30 AM - 9:20 AM

Wednesday at 8:30 AM - 9:20 AM

Friday at 8:30 AM - 9:20 AM

The first lecture is on January 9th, 2023. You are most welcome to ask any questions during lectures, the laboratories, or at any other times.

### **Laboratories**

Laboratories will be held in SSC 3304

Laboratories are on:

Wednesdays at 2:30 – 5:20 PM

Thursdays at 2:30 – 5:20 PM

Laboratories start on **Wednesday - January 11** and **Thursday - January 12**.

Make sure that you read the pertinent lab exercises **ahead** of time. Consider any questions posed in each exercise; they can help you in completing the LAB REPORTS. **Remember that you will be examined on laboratory-based material in the mid-term and final examinations.**

## **5.2 Important Dates**

January 9th, 2023, Monday: First lecture

February 17th, 2023, Friday: Midterm examination will be held during scheduled class time

April 18th, 2023: Final examination 8:30AM - 10:30AM

## **5.3 Note**

You will require a minimum of 6 hours of **independent study** per week (reading, checking your notes, preparing for the lab) to really get the most out of this course. You will be asked to complete a **Course/Instruction and Teaching Assistant Evaluations** using **Courselink**. The evaluation surveys and comments will be given to the instructors after final grades have been submitted.

## **5.4 Lectures**

**Dr. Tariq Akhtar (lectures 1-18 and mid-term)**

**Dr. Yang Xu (lectures 19-36 and final exam)**

<b>Week</b>	<b>Date</b>	<b>Topic</b>	<b>Lecture</b>
1	Jan 9, 11, 13	Introduction to the course; Evolution of Plants	1,2,3
2	Jan 16, 18, 20	Evolution of Plants continued; Classification, Life Cycles (seedless plants)	4,5,6
3	Jan 23, 25, 27	Reproductive strategies continued, Gymnosperms	7,8,9
4	Jan 30, Feb 1, 3	Angiosperms and flowers	10,11,12
5	Feb 6, 8, 10	Pollination, Embryogenesis - fruits. Seeds - Germination & early growth	13,14,15
6	Feb 13, 15	Cell types and tissues, Meristems, Organ types - roots and shoots  Leaves - structure and function, Secondary growth - how plants get bigger.	16,17
	<b>Feb 17</b>	<b>Mid-term Examination in class</b>	18
7	<b>Feb 20-24</b>	<b>FALL STUDY BREAK - NO CLASSES</b>	
8	Feb 27  Mar 1, 3	Photosynthesis - evolution	19, 20, 21

<b>Week</b>	<b>Date</b>	<b>Topic</b>	<b>Lecture</b>
9	Mar 6, 8, 10	Photosynthesis - mechanism	22, 23, 24
10	Mar 13, 15, 17	Photosynthesis - Carbon acquisition, C3, C4, CAM metabolism	25, 26, 27
11	Mar 20, 22, 24	Respiration	28, 29, 30
12	Mar 27, 29, 31	Water - potential and uptake;  Moving water and sugars around the plant;  Water loss	31, 32, 33
13	Apr 3, 5, 7	Inorganic nutrients in soils - N symbiosis;  The Fungi (including mycorrhizae);  Review	34, 35, 36

**Final examination: April 18th, 2023, 8:30AM - 10:30AM**

**Venue TBD**

**Note:** Reduced versions of the lecture slides will be available on Courselink – it is suggested that you print them out and bring them with you to the lecture so you can take additional notes.

<b>Week</b>	<b>Date</b>	<b>Topic</b>	<b>Lecture</b>
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## 5.5 Laboratories

<b>Week</b>	<b>Date</b>	<b>Module</b>	<b>Lab Title</b>
1	Jan 11 -12	0	Introduction
2-3	Jan 18-26	1	Plant evolution 1. Plant phylogeny & life cycles 2. Floral structures & double fertilization
4-6	Feb 1- 16	2	Plant organs: structure and function 1. Seed structure & germination 2. Seedling growth & morphology 3. Meristems 4. Identifying different cell types 5. Root & stem anatomy
7	Feb 22-23		Reading week - no labs this week!
8-10	Mar 1- 16	3	Photosynthesis 1. Leaf anatomy 2. Epidermis & stomatal complexes 3. Photosynthesis in C3 & C4 plants 4. Starch detection in leaves 5. Hill Reaction
11-12	Mar 22-30	4	Water transport 1. Long distance water transport 2. Osmosis, cell turgor & plasmolysis

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## 6 Assessments

Your grade for the course will be determined from the total results of one midterm examination, laboratory work and a final examination.

### 6.1 Midterm Examination



The **MIDTERM EXAMINATION** will be held during class time **8:30 AM – 9:20 PM on Friday Feb 17th 2023**. It will contribute **30%** towards your final grade. Since the midterm examination occurs during a lecture period no alternative time will be scheduled. If you miss the midterm examination due to illness please notify us immediately or bring documentation as soon as possible.

## 6.2 Final Examination

The **FINAL EXAMINATION** - April 18th 2023, 8:30AM - 10:30AM. This examination will contribute **35%** towards your final grade. The final examination will cover primarily materials not covered in the midterm examination but will include related topics dealt with in the labs.

## 6.3 The Examinations

**The examinations will cover the lecture AND laboratory materials.** The examinations will consist of an array of multiple choice questions, some questions that require concise written answers, and analysis of visual materials. The answers to the midterm examination will be posted in the laboratory. The midterm examination will be returned to you. Any problems with examinations or questions arising from them must be resolved immediately.

## 6.4 Labs

**LABORATORY WORK** contributes **35%** towards your final grade.

**There are 4 modules which include 10 scheduled laboratories.** There is a lab report associated with each of the four lab modules. It is strongly recommended that you work on the report questions over the duration of the module and not leave it to the last minute. Similar to the lab modules, each lab report covers a great deal of content that cannot be properly completed in one brief sitting. Lab report templates with questions will be available to download from CourseLink. Due dates for each report are listed above and on CourseLink. You must prepare and submit your own report; all the text, graphs and original content must be your own otherwise it will be treated as plagiarism. Reports must be submitted for grading as a PDF file to the CourseLink dropbox, where they will be scanned through the Turnitin plagiarism-detection software. The TAs will grade your reports and provide feedback. If you are unable to submit a report by the advertised due date, please contact Dr. Meyer at the earliest. Inability to inform within two days of the due date will result in a mark of zero for that specific report. Following academic consideration and consultation with Dr. Meyer, alternative arrangements may be granted on a case-by-case basis.

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# 7 Course Statements

## 7.1 Illness & other authorized absences

If you are absent during laboratory periods, the midterm or final examination, for legitimate medical or other authorized reasons, please make sure you contact us. Provide supporting documentation as soon as you are able.

# 8 Department of Molecular and Cellular Biology

## Statements

### 8.1 Academic Advisors

If you are concerned about any aspect of your academic program:

- Make an appointment with a program counsellor in your degree program. [B.Sc. Academic Advising](#) or [Program Counsellors](#)

### 8.2 Academic Support

If you are struggling to succeed academically:

- Learning Commons: There are numerous academic resources offered by the Learning Commons including, Supported Learning Groups for a variety of courses, workshops related to time management, taking multiple choice exams, and general study skills. You can also set up individualized appointments with a learning specialist.  
<http://www.learningcommons.uoguelph.ca/>
- Science Commons: Located in the library, the Science Commons provides support for physics, mathematic/statistics, and chemistry. Details on their hours of operations can be found at: <http://www.lib.uoguelph.ca/get-assistance/studying/chemistry-physics-help> and <http://www.lib.uoguelph.ca/get-assistance/studying/math-stats-help>

### 8.3 Wellness

If you are struggling with personal or health issues:

- Counselling services offers individualized appointments to help students work through personal struggles that may be impacting their academic performance.  
<https://www.uoguelph.ca/counselling/>
- Student Health Services is located on campus and is available to provide medical attention. <https://www.uoguelph.ca/studenthealthservices/clinic>
- For support related to stress and anxiety, besides Health Services and Counselling Services, Kathy Somers runs training workshops and one-on-one sessions related to stress management and high performance situations.  
<http://www.selfregulationskills.ca/>

### 8.4 Personal information

Personal information is collected under the authority of the University of Guelph Act (1964), and in accordance with Ontario's Freedom of Information and Protection of Privacy Act (FIPPA) <http://www.e-laws.gov.on.ca/index.html>. This information is used by University officials in order to carry out their authorized academic and administrative responsibilities

and also to establish a relationship for alumni and development purposes.

For more information regarding the Collection, Use and Disclosure of Personal Information policies please see the Undergraduate Calendar.

(<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/intro/index.shtml>)

## 8.5 Course Offering Information Disclaimer

Please note that course delivery format (face-to-face vs online) is subject to change up to the first-class day depending on requirements placed on the University and its employees by public health bodies, and local, provincial and federal governments. Any changes to course format prior to the first class will be posted on WebAdvisor/Student Planning as they become available.

# 9 University Statements

## 9.1 Email Communication

As per university regulations, all students are required to check their e-mail account regularly: e-mail is the official route of communication between the University and its students.

## 9.2 When You Cannot Meet a Course Requirement

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons please advise the course instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact. The grounds for Academic Consideration are detailed in the Undergraduate and Graduate Calendars.

Undergraduate Calendar - Academic Consideration and Appeals

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml>

Graduate Calendar - Grounds for Academic Consideration

<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml>

Associate Diploma Calendar - Academic Consideration, Appeals and Petitions

<https://www.uoguelph.ca/registrar/calendars/diploma/current/index.shtml>

## 9.3 Drop Date

Students will have until the last day of classes to drop courses without academic penalty. The deadline to drop two-semester courses will be the last day of classes in the second semester. This applies to all students (undergraduate, graduate and diploma) except for Doctor of Veterinary Medicine and Associate Diploma in Veterinary Technology (conventional and alternative delivery) students. The regulations and procedures for course registration are available in their respective Academic Calendars.

Undergraduate Calendar - Dropping Courses

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-drop.shtml>

Graduate Calendar - Registration Changes

<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/genreg-reg-regchg.shtml>

Associate Diploma Calendar - Dropping Courses

<https://www.uoguelph.ca/registrar/calendars/diploma/current/c08/c08-drop.shtml>

## 9.4 Copies of Out-of-class Assignments

Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time.

## 9.5 Accessibility

The University promotes the full participation of students who experience disabilities in their academic programs. To that end, the provision of academic accommodation is a shared responsibility between the University and the student.

When accommodations are needed, the student is required to first register with Student Accessibility Services (SAS). Documentation to substantiate the existence of a disability is required; however, interim accommodations may be possible while that process is underway.

Accommodations are available for both permanent and temporary disabilities. It should be noted that common illnesses such as a cold or the flu do not constitute a disability.

Use of the SAS Exam Centre requires students to make a booking at least 14 days in advance, and no later than November 1 (fall), March 1 (winter) or July 1 (summer). Similarly, new or changed accommodations for online quizzes, tests and exams must be approved at least a week ahead of time.

For Guelph students, information can be found on the SAS website  
<https://www.uoguelph.ca/sas>

For Ridgetown students, information can be found on the Ridgetown SAS website  
<https://www.ridgetownc.com/services/accessibilityservices.cfm>

## 9.6 Academic Integrity

The University of Guelph is committed to upholding the highest standards of academic integrity, and it is the responsibility of all members of the University community—faculty, staff, and students—to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff, and students have the responsibility of supporting an environment that encourages academic integrity. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse

students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

Undergraduate Calendar - Academic Misconduct

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml>

Graduate Calendar - Academic Misconduct

<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml>

## 9.7 Recording of Materials

Presentations that are made in relation to course work - including lectures - cannot be recorded or copied without the permission of the presenter, whether the instructor, a student, or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

## 9.8 Resources

The Academic Calendars are the source of information about the University of Guelph's procedures, policies, and regulations that apply to undergraduate, graduate, and diploma programs.

Academic Calendars

<https://www.uoguelph.ca/academics/calendars>

## 9.9 Disclaimer

Please note that the ongoing COVID-19 pandemic may necessitate a revision of the format of course offerings, changes in classroom protocols, and academic schedules. Any such changes will be announced via CourseLink and/or class email.

This includes on-campus scheduling during the semester, mid-terms and final examination schedules. All University-wide decisions will be posted on the COVID-19 website (<https://news.uoguelph.ca/2019-novel-coronavirus-information/>) and circulated by email.

## 9.10 Illness

Medical notes will not normally be required for singular instances of academic consideration, although students may be required to provide supporting documentation for multiple missed assessments or when involving a large part of a course (e.g.. final exam or major assignment).

## 9.11 Covid-19 Safety Protocols

For information on current safety protocols, follow these links:

- <https://news.uoguelph.ca/return-to-campus/how-u-of-g-is-preparing-for-your-safe-return/>
- <https://news.uoguelph.ca/return-to-campus/spaces/#ClassroomSpaces>

Please note, these guidelines may be updated as required in response to evolving University, Public Health or government directives.

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