

# BOT\*3310 ~Plant Growth and Development~

## Winter 2017

### Course Description:

This course explores the basic foundations of plant growth and development. Emphasis will be on unique aspects of plants, ranging from the single cell to the whole organism, and integration of events at the cellular level with whole plant development. Topics include basic plant structure and morphology, growth regulators, hormones and signaling, photomorphogenesis, vegetative and reproductive development, flower formation, cellular and sub-cellular components and their connection to plant form, and plant/environment interactions. Molecular and genetic mechanisms underlying plant physiology will be a central theme of this course. The laboratory component offers students hands on experience in modern methods of plant analysis using the model plant *Arabidopsis thaliana*.

### Instructor:

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### Laboratory Coordinator:

Dr. Chris Meyer  
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### Teaching Assistants:

Kiah Barton  
Mark Minow

### Recommended Reading Sources:

The assigned textbook for this course, "**Plant Physiology, 6th edition (2015) by L. Taiz, E. Zeiger, I.M. Møller and A. Murphy**" is available in the bookstore. In addition to the text, sources of information and accessory information, usually scientific papers and web site URLs, will be provided in class and subsequently posted on *CourseLink*. A basic understanding of Genetics and Molecular Biology is required for understanding important aspects of this course. A recommended textbook is "Principle of Genetics", by Snustad and Simmons (any edition).

### Lectures and Laboratories:

Lectures: 12:30-1:20 Monday, Wednesday, Friday in **MacKinnon, Rm. 121**  
Laboratories: 2:30-5:20 Monday or Tuesday, **SSC 3304**

**Note:** Labs begin on **Jan. 16 or Jan. 17**, depending on your section.

**Course Structure:** The course will consist of lectures by the instructor and evaluation of student performance in the labs, which includes poster presentations by student groups, evaluations of each other's posters, and description of scientific procedures and experiments in formal laboratory reports. Evaluation will be based on the following:

	<u>% of Final Mark</u>
<b>Midterm Exam:</b> (in class)	25%
<b>Final Exam:</b> (4/19/2017 @ 8:30-10:30)	35%
<b>Laboratory work:</b>	40%
- Components for lab evaluation:	
1) Lab Reports	20%
2) Poster Presentations	20%
(posterior quality, defense: 15 %)	
(peer evaluation: 5%)	

## **LECTURE SCHEDULE (tentative)**

Week 1: Jan. 9 - 13

Overview of course

- Unique and important features of plants, plant structures and organs (shoot, root, flower)
- Embryogenesis and meristems, molecular mechanisms of organ formation

Week 2: Jan. 16 -20

- Genetic feedback loops and organ specification, meristem function, SAM and RAM maintenance
- Leaf initiation, patterning and phyllotaxy, position vs lineage, periclinal chimeras

Week 3: Jan. 23 - 27

- Photoreceptors, light signalling and development
- Phototropism and gravitropism

Week 4: Jan. 30 – Feb. 3

- Auxin gradients and organ specificity
- Gene reporter constructs, methods of gene expression visualization

Week 5: Feb 6 - 10

- Phytohormones and development:
- Auxin and polar growth, organ movement
- Molecular signal transduction and development

Week 6: Feb. 13 - 17

- Phytohormones and development:
- Gibberellins and cell expansion, seed germination
- Cytokinins and cell division

***MID-TERM EXAM: Friday, February 17, 2017 (TENTATIVE)***

~~~~~**W I N T E R   B R E A K** ~~~~ February 20 - 24 ~~~~~

Week 7: Feb. 27 – Mar. 3

- Phytohormones and development:
- Ethylene and senescence

Week 8: Mar. 6 - 10

- Abscisic acid and stress response
- Abiotic stress signaling and development
- Cold tolerance

Week 9: Mar. 13 - 17

- Newly discovered phytohormones
- Jasmonic acid and plant defense

Week 10: Mar. 20 - 24

- Water movement and plant vasculature
- Photosynthesis and carbon assimilation, sink/source relations and transport

Week 11: Mar. 27 – 31

- How plants tell time
- Photoperiod response and circadian rhythms

Week 12: Apr. 3 – April 7

- Flowering and floral induction, vernalization and plant memory
- REVIEW

**Week 12: POSTER PRESENTATIONS – Apr. 3 & 4, 2017**

~~~~~**FINAL EXAM: April 19, 2017** ~~~~~

**Learning Outcomes for BOT3310.** By the end of this course, students should be able to:

1. Understand structure and function of tissue and organs of higher plants.
2. Demonstrate knowledge of phytohormones and their role in plant growth.
3. Decipher molecular signal transduction pathways based on genetic makeup.
4. Understand the role of environmental interactions in plant growth.
5. Design experimental protocols to identify mutant phenotypes.
6. Collaborate effectively with fellow students in performing lab experiments.
7. Carry out lab experiments with minimal supervision.
8. Interpret data and findings in the context of primary scientific literature.
9. Design a scientific poster describing qualitative and quantitative data.
10. Explain data on poster to colleagues and defend conclusions.

## **Course and University Policies**

### 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 in writing, with your name, id#, and e-mail contact, and be prepared to provide supporting documentation. See the academic calendar for information on regulations and procedures for Academic Consideration:

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

### Accessibility

The University of Guelph is committed to creating a barrier-free environment. Providing services for students is a shared responsibility among students, faculty and administrators. This relationship is based on respect of individual rights, the dignity of the individual and the University community's shared commitment to an open and supportive learning environment. Students requiring service or accommodation, whether due to an identified, ongoing disability or a short-term disability should contact the Student Accessibility Services (SAS) as soon as possible.

For more information, contact SAS at 519-824-4120 ext. 56208 or email [csd@uoguelph.ca](mailto:csd@uoguelph.ca) or see the SAS website (<https://www.uoguelph.ca/csd/>).

### Academic Misconduct

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 discourages misconduct. 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 submission.

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.

The [Academic Misconduct Policy](#) is detailed in the Undergraduate Calendar:

<http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08>.

### E-mail communication

As per university regulations, all students are required to check their <uoguelph.ca> email account regularly: email is the official route of communication between the University and its students. Also please note, email questions that can be easily answered by looking at the course outline information or material posted on CourseLink, will not be answered.

### Drop date

The last date to drop one-semester Winter 2017 courses, without academic penalty, is Friday March 10. For regulations and procedures for Dropping Courses, see the Academic Calendar: <https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c03/c03-wintersem.shtml>

### 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.

### Recording of Materials

Electronic recording of classes is expressly forbidden without consent of the instructor. When recordings are permitted they are solely for the use of the authorized student and may not be reproduced, or transmitted to others, without the express written consent of the instructor.

## **CAMPUS RESOURCES**

The [Undergraduate Calendar](#) is the source of information about the University of Guelph's procedures, policies and regulations which apply to undergraduate, graduate and diploma programs:

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

Make an appointment with a [Program Counsellor](#) in your degree program.

### **If you are struggling to succeed academically:**

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.

### **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.

[Student Health Services](#) is located on campus and is available to provide medical attention.

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.

### **If you have a documented disability or think you may have a disability:**

The [Student Accessibility Services](#) (SAS) can provide services and support for students with a documented learning or physical disability. They can also provide information about how to be tested for a learning disability.