

A Course Guide To

# Life Strategies of Plants

## BOT\*2100

Dr. I. Tetlow

Department of Molecular and Cellular  
Biology  
University of Guelph

Winter 2016

## Course objectives

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.

## Instructor

### Dr. Ian Tetlow (Instructor)

Dr. Ian Tetlow was awarded a B.Sc. (Hons) in Plant Science from the Faculty of Agriculture at the University of Newcastle-upon-Tyne, U.K. in 1986. His Ph.D. project, undertaken at University College of North Wales (Bangor), U.K., focused on the physiological responses of plants to attack by biotrophic fungi with an emphasis on the effects of pathogens on plant carbon metabolism. Following his Ph.D. Dr. Tetlow began post-doctoral work at the University of Manchester, U.K. studying the regulation of carbon metabolism in non-photosynthetic plastids. Following post-doctoral studies Dr. Tetlow continued to work in the area of non-photosynthetic carbon metabolism and was awarded a Leverhulme Special Research Fellowship, followed by an Industrial Fellowship, both of which were held at the University of Manchester. In 2002 Dr. Tetlow moved to the University of Guelph and is currently an Associate Professor in MCB. Current research interests involve understanding the role of protein-protein interactions and protein phosphorylation in regulating starch metabolism in crop plants and carbon partitioning in oilseed crops. Dr. Tetlow also teaches Metabolism in the Whole Life of Plants (BOT\*4380).

Dr. Tetlow can be contacted by email at [itetlow@uoguelph.ca](mailto:itetlow@uoguelph.ca) or at extension 52735. His office is in the Science Complex, Room 4471 (laboratory 4409).

### Dr. Chris J. Meyer (Lab Coordinator)

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. Dr. Meyer can be contacted in SCIE 3507 – Ext. 53955 or E-mail: [cmeyer02@uoguelph.ca](mailto:cmeyer02@uoguelph.ca)

### Teaching Assistants

Your teaching assistants in the laboratories will be Cole Anderson, Alison Edge, Jessica White and Jenelle Patterson.

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

They will grade the LAB REPORTS that are handed in at the end of laboratories (see Grades).

**Please note: Electronic Recording of Classes by Students**

“Electronic recording of classes is expressly forbidden without prior 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.”

**Course Schedule**

Lectures        10:00-11:20 Tuesday & Thursday, **MACS 209 (MacDonald Stewart Hall)**

Look through the readings listed in the lecture schedule (to follow below) **ahead** of time to get the most out of this course. You can print out the notes on Courselink but these are NOT complete so you are expected to **take notes during lecture**.

Labs            2:30-5:20 Wednesday (section 1) OR Thursday (section 2), **SCIE3304**

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.

You are welcome to ask any questions during lectures, the laboratories or at any other times.

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

- a) critically evaluate ideas and arguments by gathering and integrating relevant qualitative and quantitative information, assessing its credibility, and synthesizing evidence to formulate a position.
- b) accurately and effectively communicate ideas, arguments and analyses in graphic, oral and written form.
- c) collaborate effectively as part of a team by demonstrating mutual respect, and an ability to set goals and manage tasks and time lines.
- d) apply scientific methods and processes to generate and interpret scientific data using quantitative, qualitative and analytical methodologies and techniques.
- e) demonstrate knowledge in the molecular and chemical composition of plants and their relationships to structure and function.
- f) demonstrate knowledge in the fundamental vegetative and reproductive attributes of plants.
- g) demonstrate knowledge in the interaction of plants with biotic and abiotic factors
- h) demonstrate knowledge in plant diversity and genetic variability and their relationship to evolution, speciation and adaptation.
- i) demonstrate the use of modern techniques in plant research.
- j) demonstrate skills to study plants in field or laboratory settings.
- k) interpret the evolutionary history of plants through an examination of phylogenetic trees.

## Course resources

### **Textbook:**

The required text, available from the bookstore and on 2-hour reserve in the Library is: Raven Biology of Plants, 8th Edition, 2013 by R.F. Evert and S.E. Eichhorn

### **Laboratory manual:**

The required laboratory manual is: BOT\*2100 Life Strategies of Plants, C.J. Meyer, Department of Molecular and Cellular Biology, College of Biological Science, University of Guelph, © Fall 2015. You are responsible for bringing this manual to every laboratory. The charge also covers the cost of your project handout and other additional handouts that you will receive later in the semester.

### **Courselink:**

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.

### **Undergraduate Calendar:**

Is the source of information about the University of Guelph's procedures, policies and regulations, which apply to undergraduate programs. It can be found at:

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

## Course Structure

### **Important dates**

January 12 <sup>th</sup> :	first lecture
January 20 <sup>th</sup> and 21 <sup>st</sup> :	first lab for section 1 and section 2 students respectively
February 11 <sup>th</sup> :	midterm examination
April 15 <sup>th</sup> :	final examination

## Accessibility

The University of Guelph is committed to creating and maintaining a barrier-free University community and to eliminating discrimination against individuals with disabilities. To help provide the best possible service to students, the University has established an accessibility website at [www.uoguelph.ca/accessibility](http://www.uoguelph.ca/accessibility). This site brings together the services, groups and committees at the University devoted to promoting accessibility and to ensuring that individuals have equitable access to services and facilities. The University welcomes feedback on any accessibility issues at this website.

## Illness and 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.

## Where and When

### Lectures

Lectures will be in **MACS (MacDonald Stewart Hall) Room 209**

Lectures are on:

Tuesdays at 10:00 - 11:20 AM

Thursdays at 10:00 - 11:20 AM

The first lecture is on **Tuesday January 12<sup>th</sup>**. You are most welcome to ask any questions during lectures, the laboratories, or at any other times.

### Laboratories

Laboratories will take place in Room 3304 in the Science Complex.

Laboratories are on:

Wednesdays at 2:30 – 5:20 PM

Thursdays at 2:30 – 5:20 PM

Laboratories start on **Wednesday January 20<sup>th</sup>** and **Thursday January 21<sup>st</sup>**.

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.**

## Grades

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

The **MIDTERM EXAMINATION** will be held in class at **10:00 – 11:20 a.m. on Thursday February 11<sup>th</sup>**. 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.

The **FINAL EXAMINATION** will be on **Friday April 15<sup>th</sup>** (2:30-4:30 p.m., room to be announced). 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.

**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.

**LABORATORY WORK** contributes **35%** towards your final grade. The grades come from:

**10 scheduled laboratories** that each require a lab report to be handed in either before you

leave the lab, or the following week. Labs 1 and 8 are each worth 2% of your final grade, Labs 2 – 7 are each worth 3%, and the Group Project is worth 13%, for a total of 35% of your final grade.

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.

# Lectures

## Dr. I. Tetlow

			<b>Readings</b> (Evert & Eichhorn, 8 <sup>th</sup> edition)
1	Jan 12 <sup>th</sup>	Introduction to the course; Evolution of Plants	3-10, 246-248, 253-254, 348-358, 366-390
2	Jan 14 <sup>th</sup>	Evolution of Plants continued; Life Cycles (seedless plants)	391-456 <b>but focus on</b> 406-407, 410-411, 422-423, 442-443
3	Jan 19 <sup>th</sup>	Classification, Reproductive strategies	234-243, 457-465, 155-162, 169-171
4	Jan 21 <sup>st</sup>	Angiosperm flowers, Flowering genes	465-476, 477-492, 604-609, 668-670
5	Jan 26 <sup>th</sup>	Pollination, Embryogenesis - fruits	465-476, 526-532, 492-496
6	Jan 28 <sup>th</sup>	Seeds - Germination & early growth	472-473, 532-537, 675-676
7	Feb 2 <sup>nd</sup>	Meristems, cells differentiating into tissues	42-62, 63-71, 538-541, 560-564, 579-583
8	Feb 4 <sup>th</sup>	Cell types and tissues	541-555
9		Organ types - roots and shoots	558-569, 571-577, 579-588, 607-613
10	Feb 9 <sup>th</sup>	Secondary growth - how plants get bigger	614-635, 569-571
11	<b>Feb 11<sup>th</sup> Feb 15<sup>th</sup>- 19<sup>th</sup></b>	<b>Mid-term Examination in class WINTER BREAK</b>	
12	Feb 23 <sup>rd</sup>	Leaves - structure and function	588-602, 607-613
13	Feb 25 <sup>th</sup>	Photosynthesis - evolution	94-106, 122-124
14	March 1 <sup>st</sup>	Photosynthesis - mechanism	125-135
15	Mar 3 <sup>rd</sup>	Photosynthesis - C acquisition, C3, C4, CAM	135-148
16	Mar 8 <sup>th</sup>	Respiration	94-95, 107-121
17	Mar 10 <sup>th</sup>	Inorganic nutrients in soils - N symbiosis	683-700, 718
18	Mar 15 <sup>th</sup>	The Fungi (including mycorrhizae)	Chapter 14, and 700-701, 280-281, 312-315
19	Mar 17 <sup>th</sup>	Water - potential and uptake	78-85, 657-658
20	Mar 22 <sup>nd</sup>	Water loss	519-520, 703, 711-712, 720
21	Mar 24 <sup>th</sup>	Moving water and sugars around the plant	708-727
22	Mar 29 <sup>th</sup>	Moving water and sugars around the plant	

23 Mar 31<sup>st</sup> Review

### Final examination Friday April 15<sup>th</sup>

**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.

## Laboratories

Week	Date	Lab #	Title
1	Jan 20-21	1	Plant evolution & life cycles Flower morphology
2	Jan 27-28	2	Seeds to seedlings Seedling morphology
3	Feb 3-4	3	Seeds to seedlings (continued) Meristems Identifying different cell types
4	Feb 10-11	4	Photomorphogenesis Root & stem anatomy
5	Feb 17-18		Reading week - no lab scheduled
6	Feb 24-25	5	Leaf anatomy Epidermis & stomatal complexes
7	Mar 2-3	6	Photosynthesis in C3 and C4 plants Hill Reaction Starch detection in leaves
8	Mar 9-10	7	Visualizing water transport Measuring osmosis Observing cell turgor & plasmolysis
9	Mar 16-17	8	Fungal diversity Introduction to the group projects
10	Mar 23-24		Group project work
11	Mar 30-31		Group project work
12	Apr 6-7		No lab scheduled