BIOL 352 (2009)
Plant Physiology II: Plant Development
COURSE OUTLINE AND INTRODUCTION

Lecture/lab times

3 credits (2 hours lecture/wk, 3 hours lab/wk, optional 1 hour tutorial/wk)
Lectures: Mondays and Wednesdays 10:00 to 11:00 a.m., Rm 303, Frank Forward
Labs: 2:00 to 5:00 pm, Monday to Thursday (starts week of September 14)
Tutorial: Fridays 10:00 to 11:00 a.m., Rm 1, Woodward Instructional Resources Centre

Instructors:

Lectures: Geoffrey Wasteneys and Santokh Singh
Labs: Santokh Singh

Geoffrey Wasteneys
Department of Botany
Telephone: 604-822-4662
Email: geoffwas@interchange.ubc.ca
Office hours: Wednesday 2:00 to 4:00pm, or by appointment

Santokh Singh
Department of Botany
Lab: Biol Sci. Bldg. 2509/2511
Telephone: 604-822-3330 (lab 604-822-5036)
Email: santokh@interchange.ubc.ca
Office hours: during lab sessions, if time permits (Monday - Thursday: 2:00 to 5:00pm), or by appointment.

Co-requisites:

One of BIOL 334, FRST 302. (CHEM 233 is recommended.)

Appropriate reading assignments from the text will be given regularly.

Supplementary reference material: Selected articles, book chapters, and other material will be given.

Web site: http://www.vista.ubc.ca (need your CWL ID and password to access the course website)
Evaluation:

35% lab: based on written lab reports and attendance (evaluated by Dr. Santokh Singh and TAs)
15% Exam #1 covering lectures 1-7 (Oct 7): 40 min
15% Exam #2 covering lectures 8-16 (Nov 18): 40 min
35% Final exam - cumulative

If you have a valid excuse (e.g. illness, verified by a medical practitioner’s certificate) for missing a quiz, the points will be assigned to the final exam. Any other reason for missing a quiz, such as a religious holiday, must be discussed with one of the Instructors at least 3 weeks prior to the planned absence.

- Final exam will be cumulative.
- In order to pass the course, you must pass both the lab and the lecture components separately.

Learning objectives

1. to obtain an understanding of concepts, processes, and experimental approaches related to the physiology of plant growth and development.
2. to understand how the scientific process can be used to answer questions concerning the control of plant development. You will be asked to
   - use specific experimental approaches to answer questions and test hypotheses.
   - interpret new data in light of your understanding of concepts and processes.
3. to appreciate the practical importance of plant development.

Thus, in addition to learning what is known about plant development, you will be asked to learn how this is known and to use this information to solve problems.

We will use clickers in our classes. Please ensure that you register your PRS number on Vista so that it is synchronized with your student number.
Lecture/Tutorial Outline

1. Plant Growth and Development Part I (7 lectures, 4 tutorials)
   - Lecture 1 (Sept. 9): Introduction to Plant Development
   - Tutorial 1 (Sept. 11): Plant Anatomy Refresher
   - Lecture 3 (Sept 16): Plant Cell Wall Synthesis and Secretion
   - Tutorial 2 (Sept 18): Problem Solving: Cell Wall Synthesis
   - Lecture 4 (Sept. 21): Auxin Transport and Action
   - Lecture 5 (Sept 23): Cell Expansion Mechanisms
   - Tutorial 3 (Sept 25): Problem Solving: Cell Expansion
   - Lecture 6 (Sept 28): Directional Cell Expansion-1
   - Lecture 7 (Sept 30): Directional Cell Expansion-2
   - Tutorial 4 (Oct 2): Directional Cell Expansion

2. Signal Transduction and Plant hormones Part I (4 lectures, 3 tutorials)
   - Lecture 8 (Oct 5): Gene Expression and Signal Transduction
     - Exam 1 (Oct 7): 40 minutes, covering materials in Lectures 1 to 7
   - Thanksgiving Day (Oct 12)
   - Lecture 9 (Oct 14): Introduction to Hormones/Auxin (Part I)
   - Tutorial 6 (Oct 16): Problem Solving: Auxin
   - Lecture 10 (Oct 19): Auxin (Part II)
   - Lecture 11 (Oct 21): Cytokinins
   - Tutorial 7 (Oct 23): Problem Solving: Cytokinins

3. Plant Growth and Development Part II (4 lectures, 2 tutorials)
   - Lecture 12 (Oct 26): Meristem Identity
   - Lecture 13 (Oct 28): Meristem Maintenance
   - Tutorial 8 (Oct 30): Problem Solving: Meristems
   - Lecture 14 (Nov 2): Tissue Pattern Formation
   - Lecture 15 (Nov 4): Cell Fate Determination
   - Tutorial 9 (Nov 6): Pattern Formation

4. Signal Transduction and Plant hormones Part II (6 lectures, 4 tutorials)
   - Lecture 16 (Nov 9): Ethylene
     - Remembrance Day Holiday (Nov 11)
   - Tutorial 10 (Nov 13): Problem Solving: Ethylene
   - Lecture 17 (Nov 16): brassinosteroids
• **Exam 2 (Nov 18): 40 minutes, covering materials in Lectures 8 to 16**
  • *Tutorial 11 (Nov 20): Problem Solving: Brassinosteroids*
  • Lecture 18 (Nov 23): Gibberellins (Part I)
  • Lecture 19 (Nov 25): Gibberellins (Part II)
  • *Tutorial 12 (Nov 27): Problem Solving: Gibberellins*
  • Lecture 20 (Nov 30): Abscisic Acid
  • Course review (Dec 2)
  • *Tutorial 14 (Dec 4): Problem Solving: Abscisic Acid*

**Tutorials**

*Tutorials will be focused on solving problems relevant to lecture materials. Attendance at tutorials is optional but recommended.*
<table>
<thead>
<tr>
<th>Date</th>
<th>Monday-Lecture</th>
<th>Wednesday-Lecture</th>
<th>Friday-Tutorial</th>
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<tr>
<td>Sept 9</td>
<td>L1-Introduction to Plant Development</td>
<td>Sept 11 T1-Anatomy review-online reading</td>
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<td>Wasteneys, Singh, Chen</td>
<td>Wasteneys</td>
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<td>Sept 14</td>
<td>L2- The Plant Cell – transcription, translation, endomembrane trafficking and cell-cell communication</td>
<td>Sept 16 L3-Cell Walls – polysaccharide synthesis and secretion</td>
<td>Sept 18 T2- Problem solving: Cell walls</td>
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<td>Oct 5</td>
<td>L8- Gene expression &amp; signal transduction</td>
<td>Oct 7 Exam #1 (L1-7)</td>
<td>Oct 9 T5-Terminology/Techniques</td>
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<td>Oct 19</td>
<td>L10- Auxin (Part II)</td>
<td>Oct 21 L11- Cytokins</td>
<td>Oct 23 T7- Problem solving: Cytokinins</td>
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<td>Nov 2</td>
<td>L14- Tissue Specification</td>
<td>Nov 4 L15- Cell Fate Determination</td>
<td>Nov 6 T9- Problem solving: cell fate determination</td>
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<tr>
<td>Nov 9</td>
<td>L16- Ethylene</td>
<td>Nov 11 Remembrance Day Holiday</td>
<td>Nov 13 T10- Problem solving: Ethylene</td>
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<td>Singh</td>
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<td>Nov 16</td>
<td>L17- Brassinosteroids</td>
<td>Nov 18 Exam #2 (L8-16)</td>
<td>Nov 20 T11- Problem Solving: BR</td>
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<td>Nov 30</td>
<td>L20- ABA</td>
<td>Dec 2 Course Review</td>
<td>Dec 4 Last day of class</td>
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<td>Singh, Wasteneys</td>
<td>T13- Problem Solving: ABA</td>
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**FINAL EXAM: TBA (exam period: 12/08—12/22)**
L: Lecture, 10:00-11:00am, Monday and Wednesday: Rm 303, Frank Forward
T: Tutorial, 10:00-11:00am, Friday, Rm 303, Frank Forward
PLANT PHYSIOLOGY II. Plant Development (BIOL 352)

Introduction to the Plant Physiology II Laboratory

There are four laboratory sections in this course, and each section has the capacity to accommodate a maximum of about 14 students.

Learning objectives:

- to understand key experimental approaches and biological methods related to the physiology of plant growth and development.
- to understand how to conduct an independent lab research project.
- to be able to analyze experimental data and write scientific, journal-style research papers.

List of Laboratory Exercises:

<table>
<thead>
<tr>
<th>No.</th>
<th>Laboratory Exercise</th>
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| 1   | LAB UNIT 1: PLANT ANATOMY  
Lab 1A: Structure of Stems and Roots  
Lab 1B: Structure of Stems and Leaves |
| 2   | LAB UNIT 2: TISSUE CULTURE OF TOBACCO AND GENERATION OF TRANSGENIC PLANTS |
| 3   | LAB UNIT 3: SENESCENCE AND REGENERATION OF CUCUMBER COTYLEDONS: LIGHT AND HORMONAL REGULATION OF PROTEINS AND CHLOROPHYLL |
| 4   | LAB UNIT 4: PHYSIOLOGY OF SEED GERMINATION AND HYPOCOTYL CELL GROWTH  
Lab 4A: Phytochrome and hormonal control of lettuce seed germination  
Lab 4B: Cell growth in lettuce hypocotyls: interaction between gibberellic acid and colchicine |
| 5   | LAB UNIT 5 (DEMONSTRATION LAB): ROOT CELL GROWTH IN WILD-TYPE, MOR1-1 AND RSW1-1 MUTANTS OF ARABIDOPSIS THALIANA |
| 6   | INDEPENDENT RESEARCH PROJECT |
Timetable of Lab Experiments and Research Projects:

<table>
<thead>
<tr>
<th>WEEK OF</th>
<th>Group ‘A’</th>
<th>Group ‘B’</th>
<th>Group ‘C’</th>
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<tr>
<td>September 7</td>
<td>NO LABS THIS WEEK</td>
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<td>September 14</td>
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<td>INTRODUCTION (All Groups)</td>
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<td>September 21</td>
<td>Lab Unit 2</td>
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<td>September 28</td>
<td>Lab Unit 4 + Demo</td>
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<td>Lab Unit 5</td>
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<td>October 5</td>
<td>Lab Unit 4</td>
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<td>October 12*</td>
<td>Lab Unit 3</td>
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<td>October 19*</td>
<td>Lab Unit 3</td>
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<td>October 26</td>
<td>WRITE GROUP PROJECT PROPOSAL [Submit by October 29th]</td>
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<td>November 2</td>
<td>INDEPENDENT RESEARCH PROJECT EXPERIMENTS</td>
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<td>November 9</td>
<td>INDEPENDENT RESEARCH PROJECT EXPERIMENTS</td>
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<td>November 16</td>
<td>INDEPENDENT RESEARCH PROJECT EXPERIMENTS</td>
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<td>November 23</td>
<td>WRITE INDEPENDENT RESEARCH PROJECT REPORT [NOTE: PROJECT REPORT SUBMISSION DATE IS NOVEMBER 30th]</td>
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Follow-up Schedule of Experiments

Lab Unit 1 (Experiment 1A, 1B) (optional labs): can be carried out sometime before September 25th. Please make arrangements with Dr. Santokh Singh.

Lab Unit 2: Check every week for 6 weeks

Last date for submission of project proposal and lab reports:

Lab Unit (short) Reports: First short report: November 5th by 4 PM.
                        Second short report: November 19th by 4 PM.

Project proposal: October 29th, 2009 by 4 PM.

Project (Long) report: November 30th, 2009 by 4 PM.

*Students of Monday section are required to do their experiment scheduled for October 12th on October 19th to compensate for the Thanksgiving day holiday on October 12th
Lab Faculty, Technician and TAs:

Instructor:

**Santokh Singh**
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