

**BSC 420/520: PLANT PHYSIOLOGY  
SPRING 2011**

Plant Physiology. 4 hrs. Experimental study of plant life processes to include applicable biophysical and biochemical principles, water relations, molecular biology, stress physiology, and growth and development. 3 lec-3 lab. (PR: BSC 302 or 320 or 322 or 324) *Writing Intensive*

INSTRUCTOR: Dr. Marcia Harrison-Pitaniello, BBSC241J (office), S107 (lab), 696-4867; [harrison@marshall.edu](mailto:harrison@marshall.edu)

LECTURE: 11:00 am - 12:15 pm Tuesday and Thursday in S376

LAB: 1:00 pm - 3:50 pm Monday in S108

COURSE MATERIALS:

Plant Physiology, 2010, Taiz and Zeiger, 5<sup>th</sup> edition [required]

Lab notebook; 3-ring binder [required]

Additional course materials will be available on MUOnline and at <http://www.marshall.edu/cellcentral/bsc420.htm>

OFFICE HOURS: Tuesdays 10-11 am and 3-4 pm; Thursdays 9-11 am and 4-5 pm; or by appointment.

COURSE LEARNING OUTCOMES:

1. Review the basic processes involved in plant physiology at the whole plant, biochemical, and molecular levels.
2. Read, interpret, and evaluate current research papers in plant physiology.
3. Organize a course laboratory notebook to accurately report procedures, data, and analysis.
4. Analyze data collected from class laboratory projects.
5. Design and conduct independent experiments to study plant physiology incorporating methods from the laboratory projects.
6. Present independent research at Sigma Xi Research Day in April.
7. Improve students' scientific writing and presentation.

GRADING:

Exams – 3 lecture exams [100 pts each]	300 points
Readings and class participation	40 points
Lab work	90 points
Independent Projects	70 points
<b>Total</b>	<b>500 points</b>

Exams will consist of a combination of short essays, short answers questions, and problems. A study guide will be provided at least one week prior to the exam. Students are welcome to work on the study guide and show part to the instructor for review. ***Make-up exams will be given for excused absences reported before the scheduled exam.***

Exam 1 - Feb 10

Exam 2 – March 17

Exam 3 - 10:15 May 5 (according to the Spring 2011 exam schedule)

Readings and class participation grade will be based on lecture and lab attendance and overall class contribution according to the following system: -2 points per unexcused lecture absence; -5 points per unexcused absence when the student is required to present a figure from a research article; -5 points per unexcused lab absence; -5 points for missing a class commitment. If needed, labs can be made up by arrangement with the instructor.

Lab work grade will be based on work presented in your laboratory notebook. Criteria for the graded portion of the assignment will be presented with each lab exercise. Each lab project will be worth 15 points, and the lab notebook entries for your independent project will be worth 30 points.

Student's independent projects. Each student will design and perform an experiment as an independent project. The project will be a component of a team or class project to be presented at the Marshall University Sigma Xi Research Day in late April. Each student will present their portion of the project in a short PowerPoint presentation in class. The project grade will be comprised of the proposal [10 pts], abstract [15 pts], and poster contribution [35 pts] and in-class presentation [10 pts]. Late assignments will result in a deduction of 1 point for each day late.

Graduate student additional requirements. Graduate students will have one additional take-home essay associated with each exam and are required to propose one additional experiment for their independent projects.

Grade Scale. A: 500-450 points (90% of total points); B: 449-400 points (80% of total points); C: 399-350 points (70% of total points); etc.\_

#### WRITING ASSIGNMENTS:

1. Exams will be composed of short answer, essay questions and data analysis.
2. Lab information will be maintained in a laboratory notebook. Each lab will require data analysis (written summary, calculations, tables, graphs, etc). The data analysis will be completed by the next week for discussion and grade. **Lab notebook will be collected and graded at intervals throughout the course.** In addition to the lab notebook, you should keep a three-ring binder for protocols and references.
3. Independent Project Report: A formal report and class presentation of your independent research projects is required. Written guidelines for all aspects of the project will be distributed on MUOnline. Drafts of the abstract and poster will be reviewed by the instructor prior to the submission of the final document.
  - **Independent Project Proposal:** draft - March 1; due date - March 15
  - **Independent Project Presentation:** last week of classes and at Sigma Xi Research Day in April (TBA)
4. Informal writing: Other forms of writing will include notes on research articles, pre-lecture and pre-lab questions, in-class work. These are not graded but serve to assist students in learning the material.

#### COURSE POLICIES:

See Marshall University Undergraduate Catalogue - Academic Information for complete guidelines ([http://www.marshall.edu/catalog/undergraduate/ug\\_10-11\\_published.pdf](http://www.marshall.edu/catalog/undergraduate/ug_10-11_published.pdf)).

1. **Attendance policy:** Attendance in lectures and laboratory exercises is integrated into your grade. You are responsible for any material missed by being absent. Absences from exams or quizzes due to illness, death in the family, or institutional activities will be excused with the appropriate notification from Marshall University Student Affairs Office (MSC2W38, 696-6422). Class and/or lab will be cancelled due to inclement weather according to the policy described on pages 64 of the 2010-11 undergraduate catalog.
2. **Academic dishonesty in any form will not be tolerated.** All written assignments, quizzes, and exams are to be independent efforts of each student. Refer to the undergraduate catalog for definitions of cheating, fabrication/falsification, plagiarism; bribes/favors/treats; and complicity. Sanctions will include a lower or failing project/paper/test grade, and a lower final grade for the course. Individuals found to engage in academic dishonesty will be reported to the Dept. of Biological Sciences.
3. **Students are required to stay on task** during the lecture and laboratory exercises. Students may be asked to work in groups during class time, and following protocols in lab. Please concentrate on the material presented. Discussion of the problems in a group is encouraged. If you have completed the assigned task, please help someone else. If you are lost, review the book material, formulate a question, and show the instructor your work.
4. **Records:** All exams and graded material will be returned to the student. Material that is not picked up will be kept for one semester or summer term following completion of the course. After that period, the material will be discarded and an Excel grade spreadsheet will be the official record. Grades cannot be e-mailed or given over the phone. You must be present during lecture or lab to collect graded exams and material. Also, grades will periodically be loaded onto the MUOnline Grade Book for your review.
5. **Academic accommodation:** Marshall University is committed to making all programs, services, and activities fully accessible to students with disabilities. For more information, contact the Disabled Student Services or the H.E.L.P. Program.
6. **Electronic Devices:** All electronic devices (laptop and handheld computers, instant messaging devices, PDAs, cell phones, pagers, data-bank watches, etc.) must be turned off during class- unless permitted by the instructor.
7. **Computing Services Acceptable Use Policy:** [http://www.marshall.edu/ucs/CS/acceptable\\_use.pdf](http://www.marshall.edu/ucs/CS/acceptable_use.pdf) describes general principles and guidelines for responsible and acceptable use of Marshall University information technology environment.

#### LABORATORY POLICIES:

1. **Safety:** All students must complete a safety tutorial during the first lab session.
2. Living organisms used in this course may include microbes, cell cultures, excised tissues, and plants. Proper handling of living material and microbes will be discussed in the appropriate labs.
3. Data analyses include calculations, graphing, and statistical analyses (regression equations and t-test) will be evaluated as part of your lab grade. You need to complete ALL portions of each lab exercise. Make sure you have a personal copy of data and graphs for each laboratory exercise.

## LECTURE AND LAB SCHEDULE

Week	Dates	Lecture and Lab Topics
1	1/10-14	Lab 1. <i>LP1 - Arabidopsis growth and seedling morphology</i> (pt 1) Lab notebooks Lab safety tutorial; Basic lab management Lecture: Course syllabus discussion and development, Course overview, plant tissue structures and adaptations
2	1/17-21	Lectures: <i>Arabidopsis</i> morphology Transport and Translocation of Water and Solutes <b>NO LAB- Martin Luther King, Jr. Holiday</b>
3	1/24-28	Lab 2: Lab Tutorial <i>LP1 - Arabidopsis growth and seedling morphology</i> : plant morphology; time-lapse imaging of plant growth. <i>LP2 - Analysis of Gene Expression</i> : Plant seeds for reporter gene analysis (and future labs); collect information on assigned genes. Computer work: Literature review; selection of papers for lecture and projects (HH 444). Lectures: Water Balance in Plants; Mineral nutrition (plant tissue culture and hydroponics)
4	1/31-2/4	Lab 3: Lab Tutorial; <i>LP2 - Analysis of Gene Expression</i> : gene expression analysis of GUS and GFP. Lecture: Heavy metal accumulation (essay 5.2); Research article 1 (heavy metal accumulation)
5	2/7-2/11	Lab 4: Lab Tutorial; LP1 and 2: Data analysis; prep for next labs Lecture: Lipid metabolism (biofuel) <b>Exam 1: Thursday, Feb. 10</b>
6	2/14-2/18	Lab 5: Lab Tutorial; <i>LP3 - Analysis of plant growth and gravitropic curvature</i> : Time-lapse imaging; Introduction to Python and MATLAB. Lecture: Photosynthesis
7	2/21-2/25	Lab 6: Lab Tutorial; <i>LP3 - Analysis of plant growth and gravitropic curvature</i> : Analysis using Python/MATLAB. Lecture: Secondary Metabolism and Plant Defense
8	2/28-3/4	Lab 7: Lab Tutorial; LP4 - Analysis of T-DNA mutants: Extract genomic DNA from leaf tissue of T-DNA mutants Lecture: Research article 2 (secondary metabolism)
9	3/7-3/11	Lab 8: Lab Tutorial; <i>LP4 - Analysis of T-DNA mutants</i> : Set up PCR Lecture: Cell wall and cellular growth (biofuel)
10	3/14-3/18	Lab 9: Lab Tutorial; <i>LP4 - Analysis of T-DNA mutants</i> : Separate PCR products by agarose electrophoresis; Present research proposals Lecture: Assimilation of Mineral Nutrients <b>Exam 2: Thursday, March 17</b>
	3/18	Last Day to Drop an Individual Course
	3/21-3/25	Spring Break-no class
11	3/30-4/3	Lecture: Abiotic stress and Plant Hormone Review Lab 10: Independent projects
12	4/4-4/8	Lecture: Abiotic stress and signal transduction Lab 11: Independent projects
13	4/11-4/15	Lecture: Research article 3 (abiotic stress-manuscript draft) Lab 12: Independent projects
14	4/18-4/22	Lecture: The Control of Flowering Lab 13: Independent projects- poster preparation
15	4/25-4/29	Lecture: Research article 4 (flowering/evolution) Lab 14: Final poster preparation; Presentations of independent work; lab clean-up <b>Sigma Xi Research Day</b>
	5/5	<b>Exam 3: 10:15 May 5</b>