

Course Title/Number	BSC 420: PLANT PHYSIOLOGY
Semester/Year	Spring 2016
Instructor	Marcia Harrison-Pitaniello
Days/Time	Lecture: TR 9:30 am - 10:45 pm; Laboratory: Monday 1:00 p.m. - 3:50 p.m.
Location	Lecture and Lab: Science 108
Office	Office: Science 200A; Lab: Science 107
Phone	(304) 696-4867
E-Mail	harrison@marshall.edu
Office/Hours	M/W/F 10:00-11:00 am; T/R 10:50-11:50 am; by appointment.
University Policies	By enrolling in this course, you agree to the University Policies listed below. Please read the full text of each policy by going to www.marshall.edu/academic-affairs and clicking on "Marshall University Policies." Or, you can access the policies directly by going to http://www.marshall.edu/academic-affairs/?page_id=802 for Academic Dishonesty/ Excused Absence Policy for Undergraduates/ Computing Services Acceptable Use/ Inclement Weather/ Dead Week/ Students with Disabilities/ Academic Forgiveness/ Academic Probation and Suspension/ Academic Rights and Responsibilities of Students/ Affirmative Action/ Sexual Harassment. Class operation under delays: A two-hour delay means that classes that begin at 9:30 a.m. meet at 10:00 a.m. and continue for the remaining period of that class. If the university is open, but the student feels that the conditions are too dangerous for them to attend, they will not be penalized for missing class; please do not exploit this policy. Contact your professor as soon as reasonably possible on such days.

Course Description: From Catalog

<p>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) <i>Writing Intensive. Service Learning.</i></p>

Course Student Learning Outcomes	How students will practice each outcome in this Course	How student achievement of each outcome will be assessed in this Course
Students will analyze problems that integrate basic processes involved in plant physiology at the whole plant, biochemical, and molecular levels.	Students will receive assigned textbook readings and lecture preparation assignments. In-class exercises will review chapter content.	Student discussion during lectures will be a component of the participation grade. Exam questions will include problems associated with basic plant physiology processes.
Students will read, interpret, and evaluate current research papers on plant physiology.	Students will read and discuss articles as part of the lecture work.	Exam questions will include problems associated with the publications reviewed in class. Background reading will be a component of the independent projects.
Students will evaluate current online and laboratory resources through weekly laboratory exercises.	Laboratory exercises will provide an overview of basic skills and hands-on use of equipment used in plant physiology research.	Graded lab work will include laboratory preparation, data analysis, and summary in a graded laboratory notebook.
Students will design, conduct, analyze, and present independent experiments in plant physiology.	Students will use the laboratory skills to design laboratory experiments, including an independent project.	Graded project proposal, data analysis, and presentation will be components of the lab grade.
Students will use plant biology concepts to develop educational materials for effective teaching of plant biology principles for the service learning partner.	Teams of students will develop display materials, games, activities, videos, or web-based materials as part of the laboratory and service learning work.	The final educational materials will be assessed as a component of the student's independent research project as a component of the lab grade.
Students will enhance their appreciation of civic engagement	Students will work in the Marshall Greenhouse and in the community with	The work will be assessed through reflective pieces and the development of

with the Huntington community that uses scientific knowledge and disseminates this knowledge to the general public or to K-12 students.	the Junior SCRATCH -Master Gardener Program.	appropriate plant physiology educational materials for young gardeners.
Students will enhance their writing skills and strategies, especially as they apply to scientific writing.	Writing is included in the laboratory notebook entries, exams, and project outreach and research presentations.	Writing will be assessed in every aspect of the course. The final projects will have a draft and revision process. Written assignments, laboratory work, and written portions of the exams will comprise over 50% of the graded course material.

Required Texts, Additional Reading, and Other Materials

1. Plant Physiology, 2015, Taiz and Zeiger, 6th edition [required]
2. Bound notebook and 3-ring binder [for protocols and references]
3. Additional material will be available on MUOnline and at <http://science.marshall.edu/harrison/bsc420.htm>

Course Requirements / Due Dates

- 1) **Exams:** Exams will include written responses in the form of short answer, essay questions and data analysis.
Exam 1: Thursday. Feb. 18
Exam 2: Thursday. March 17
Exam 3: Tuesday 5/3 at 8:00 am (according to the Spring 2016 exam schedule)
- 2) **Laboratory evaluation:** The lab grade requires completion of the laboratory prep, in-lab work, data analysis, and data summary as entered in the students' laboratory notebook. Notebooks will be evaluated and graded throughout the semester. Each lab exercise will be worth 10 points.
- 3) **Independent projects:** *Each student will participate in an outreach and research independent projects. The projects will include scientific experiments and the development of educational materials appropriate for the Junior Master Gardener Program. **Written guidelines for all aspects of the project will be distributed on MUOnline.** Drafts of the materials will be peer-reviewed and reviewed by the instructor prior to the submission of the final document. The proposal, and presentation will require submission of at least one draft each prior to the deadlines listed below.*
*Reflection I and Outreach Proposal [20 pts]: To MUOnline by midnight **Feb. 8***
*Reflection II and Outreach/Scientific Proposal [20 pts]: To MUOnline by midnight **March 11***
Outreach Activities at the WV Academy of Science meeting [20 pts]: April 9
Research presentation [60 pts]: In class or lab during the last week of classes.
Outreach project [60 pts]: In class or lab during the last week of classes.
Note: All WI and Service Learning courses are being asked to add assignments from your WI designated courses to the General Education Assessment Repository (GEAR; www.marshall.edu/gear) for the purpose of assessing the university's Communication Fluency outcome and preparing for the accreditation. The final poster presentation will be used as part of this assessment. Students will be instructed how to submit your poster to GEAR at the end of the semester.
- 4) **Class participation and service learning:** Students will be asked to prepare for lecture content, participate in class discussion, write, and work on problems and case-studies during class time. The participation grade will depend on attendance and contribution to the class discussion and work with the service learning partner.

Grading Policy

<u>Graded material:</u>	<u>Grading scale:</u>
Lecture exams 300 points	A = 100–90% (500-450 points)
Laboratory work 90 points	B = 89–80% (449-400 points)
Class participation 30 pts	C = 79–70% (399-350 points)
<u>Independent project</u> 180 points	D = 69–60% (349-300 points)
Total points 600	F = <60% (less than 299 points)

Lecture exams (300 pts; 100 pts each): Exams will consist of a combination of short essays, short answers questions, and problems. Coverage will include the lecture and lab material for the dates prior to the exam and after the previous exam (for exams 2 and 3). A study guide will be posted on MUOnline at least one week prior to the exam. Students are welcome to work on the study guide and submit part for review. ***Make-up exams will be given for excused absences reported before the scheduled exam.***

Laboratory evaluation (90 pts; 10 points per entry): Lab work grade will be based on lab work presented in your laboratory notebook entries. The contents for the lab entries will be provided for each lab.

Independent project (180 pts): Each student will design and perform an independent project. The project will be a component of a larger team project. The project grade will be comprised of the reflection/proposal 1 [20 pts], reflection/proposal 2 [20 pts], Assessment of outreach activities in BSC classes and at the WV Academy of Sciences [20 pts], outreach project [60 pts], and research project [60 pts].

Class participation (30 points): Readings, class preparation, 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 lab absence. If needed, labs can be made up by arrangement with the instructor. Note: The lecture schedule is meant as a guide to the basic textbook coverage. The amount of lecture time on each topic will vary (i.e., Topics, which include discussion of a research article will require more class time). *Lecture preparation and coverage will be posted on the preceding Friday by 5:00 pm on MUOnline.* The class participation also includes 10 hours contributed time to the SCRATCH Program by assisting with 1) JMG training, 2) garden development, and/or 3) propagation and growth plants in the Marshall University Greenhouse.

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 at http://www.marshall.edu/academic-affairs/?page_id=802.

Laboratory Policies

1. Safety: All students must complete a safety tutorial during the first lab session.
2. Living organisms: 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. Make-up labs are possible beyond the week the lab is normally scheduled as long as you inform the instructor ahead of time. Otherwise, absences will result in loss of credit for that lab.
4. Completion of the laboratory analysis will be part of your laboratory grade. Data analyses include calculations, graphing, and statistical analyses will be evaluated as part of your lab grade. Make sure you have a personal copy of data and graphs for each laboratory exercise.

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Office Hours: M/W/F 10:00-11:00 am; T/R 10:50-11:50 am; by appointment.

Week	Dates	Lab Schedule	Lecture topics [specific chapter readings will be assigned for each topic].
1	Jan 11-15	Lab 1: Lab notebooks; Lab safety tutorial; Seed viability testing; <i>Arabidopsis</i> germination protocol; Marshall Greenhouse management.	Chapter 1: Overview of plant structures and adaptations Chapter 2: Ploidy, Tools for studying gene function, and GMOs. Jan. 26: SCRATCH meeting Plant movements Plant mineral nutrition Abiotic Stress responses Exam 1: Thursday, Feb. 18
2	Jan 18-22	No Lab: Service Learning seed viability testing.	
3	Jan 25-29	Lab 2: Collect time-lapse images of plant growth ImageJ – working with image series, making movies, measuring plant growth or movement.	
4	Feb 1-5	Lab 3: Plant mineral nutrition; Analysis of plant growth and movement [Lab 2].	
5	Feb 8-12	Lab 4: Abiotic stress responses; <i>Arabidopsis</i> mutants and their analysis. Reflection I and Outreach Proposal to MUOnline by midnight Feb. 8	
6	Feb 15-19	Lab 5: Ethylene analysis – plant responses to abiotic stress.	
7	Feb 22-26	Lab 6: RNA extraction and RT-PCR set-up gene expression changes due to abiotic stress treatments.	Photosynthesis Light Control of Plant Development Regulation of seed dormancy and seed germination. Exam 2: Thursday. March 17
8	Feb 29-Mar 4	Lab 7: RT-PCR Analysis; Microscopic analysis of abiotic stress treatments.	
9	March 7-11	Lab 8: SDS-PAGE Reflection II and Outreach/Scientific Proposal to MUOnline by midnight March 11	
10	March 14-18	Lab 9: SDS-PAGE analysis; Begin Independent Projects.	
	March 18	Last Day to Drop an Individual Course	
	March 21-25	Spring Break-no class	
11	March 28-Apr 1	Lab 10: Independent projects	Biotic interactions Project-related research articles Exam 3: 8:00 May 3
12	April 4-8	Lab 11: Independent projects Outreach activities due by April 8 for presentation at WVAS on April 9	
13	April 11-15	Lab 12: Independent projects.	
14	April 18-22	Lab 13: Independent projects- poster preparation.	
15	April 25-29	Lab 14: Research presentations; Outreach projects.	
	May 3	Exam 3: 8:00 a.m.	