

BIOLOGY 206
GENERAL BOTANY
SEC. 1: CRN – 30057
Credit Hours: 4
Spring 2015

"Botany I rank with the most valuable sciences, whether we consider its subjects as furnishing the principal subsistence of life to man and beast, delicious varieties for our tables, refreshments from our orchards, the adornments of our flower borders, shade and perfume of our groves, materials for our buildings, or medicaments for our bodies."

-Thomas Jefferson

Instructor

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Office hours: MWF 10:00-11:00 AM; W 12:30-3:30 PM and by appointment

Outside of office hours the best way to contact me is via email. I will respond to your email within 24 hours. I do not carry around a smart phone or remain in constant email contact so do not expect an immediate response.

Laboratory Teaching Assistant

Margo N. Paces
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Course information

Meeting time and place: Lecture MWF 11:15-12:10 AM, 440 Berndt Hall; Lab M 1:25-4:30 PM, 440 Berndt Hall

Course Description:

General Botany will focus on understanding the structure, function, and diversity of plants and the importance they play in our world. We will begin with coverage of the functional connections among higher plant anatomy, morphology and physiology exploring how these affect ecological patterns and the basic life processes plants maintain. We will then explore the evolution and diversity of the plant kingdom focusing on the unique features and a comparison of life history traits of Bryophytes, Ferns, Gymnosperms and Angiosperms.

Objectives:

1. Be able to identify the unique cellular structures of plants.
2. Understand plant metabolism, particularly photosynthesis.
3. Demonstrate an understanding of the relationship between plant tissues and plant growth.
4. Make connection between structure and function of different plant organs and tissues.
5. Understand the diversity present within the plant kingdom and be able to discuss evolutionary trends among the various groups.
6. Understand the concept of alternation of generations and how this relates to evolution of major plant groups.
7. Understand life cycles and the concept of homology.
8. Make connections between basic plant science and modern issues of invasive species, global change, biotechnology, biodiversity, etc.
9. Understand basic patterns of plant diversity and the ecosystem services that this diversity serves to maintain.
10. Continue your development of data collection, analysis, and presentation in the biological sciences.
11. Gain an appreciation for the complexity, diversity, and functionality of plants. (i.e. I want you know that plants are really cool!)

Prerequisite: BIO 113, minimum grade of C-

Required text:

Mauseth, J. D. 2014. Botany: An Introduction to Plant Biology, 5th Ed. Jones & Bartlett Learning: Burlington, MA. ISBN 978-1-4496-6580-7

Course Website:

Canvas via <https://courses.fortlewis.edu/>

This site will maintain all relevant course lecture materials, copies of all labs and homework assignments as well as updates to the schedule. I will also upload at the appropriate time review sheets for all exams approximately one week before the exam.

Course Evaluation

Grades will be determined *roughly* according to the following percentage values:

Exams (2 @ 100 pts each)	24%
Final Exam (145 pts)	15%
Lab Reports	24%
I (Rough Draft 50 pts – Final draft 50 pts)	
II (100 pts)	
Other lab activities	12%
Quizzes (8 @ 10 pts each)	10%
Chapter review question homework (10 @ 10 pts each)	13%
Other	2%

Your grade will mostly be a sum of the earned points you have accrued throughout the semester. Make-up lecture exams may be scheduled within 5 days of the original exam date ONLY in the case of a legitimate absence. If you miss an exam for a legitimate reason and are unable to make up the exam within 5 days the percentage score on the final exam will be substituted for the missed exam score. Legitimate absences will include any absence with a letter documenting that absence from the appropriate college official, be a documented medical excuse, or be a documented religious observance. If you miss for an illegitimate reason then you will receive a zero for that particular exam. Missed quizzes and homeworks cannot be made up; however, your lowest quiz and homework scores will be dropped at the end of the term. Late submissions on large assignments (lab reports) will be accepted after the due date however the final grade will be reduced by 10% for each day the assignment is late.

Extra credit will be available on a limited basis and will be any such opportunities will be announced at the appropriate time.

Grading Scale by %

A	94-100	C+	77-79
A-	90-93	C-	70-72
B+	87-89	D+	67-69
B	83-86	D	63-66
B-	80-82	D-	60-62
C	73-76	F	0-59

The above grading scale will be followed however I will round your final percentage depending upon your class attendance.

Course Structure and Specific Requirements

Lecture:

This term we will be meeting for lecture in the laboratory. This will give us the opportunity for lecture to involve hands-on demonstration that is not available in a traditional lecture hall. Lecture time will therefore be a mix of mini-lab-like activities, demonstrations, discussion, and of course, traditional lecture. Many days will involve a mix of activities. I expect that all students will have reviewed the assigned book chapters prior to attending lecture. This will allow for us to better discuss the material for the day.

Quizzes:

We will have weekly quizzes (except on weeks with exams) at the start of class each Monday. These quizzes will be a mix of theoretical and practical questions and will review important concepts drawn from the lecture material from the previous week.

Exams:

We will have a total of three exams, including the final. Exams will mostly include material covered since the last exam. That said it is quite possible that later exams will include some material from earlier sections as we build on more complex topics. All exams will be a mix of multiple choice, short answer, diagrams, and essay questions. The final will be similar in scope to the other exams however it will be slightly longer and have a comprehensive portion (approx. 1/3 of the total).

Lab Information:

The lab in this course will serve to supplement and provide hands-on experience with botanical concepts, experimental procedures, and give you the chance to further develop your skills in data collection and analysis. These labs will vary from descriptive to experimental in nature. Some topics will only be covered in lab while others will be covered in both lecture and lab.

Full Lab reports: You will be required to complete two full lab reports in the form of a scientific manuscript. Both reports will require proper introduction of the project, a description of the methodology, presentation of data, analysis and discussion of that data, and include references supporting the work. I will provide specific instructions on the format and data requirements later. The first report will be completed based on our lab “Leaf morphology as a predictor of climate”. This report will be completed INDIVIDUALLY. You will have the opportunity to turn in a rough draft for review prior to the submission of your final report. This rough draft will be worth 50% of the final draft.

Your second lab report will be completed as a small GROUP project. Your group will design and carry out an original plant-based experiment over a multi-week period of time. For this assignment your group will need to submit a detailed proposal which will be reviewed for feasibility and design. Following approval all members of the group will work together to set up and care for the experiment. You will have some time during laboratories to work on this project but you will also need to work outside of course time so you will need to work with your group to design a project you can attend to and set aside time to complete it. You will work as a group on the experiment and writing of the lab report. Your writing will be organized in Canvas using the “collaboration” tool. This will allow me to monitor contributions from each team member. A portion of your final grade on the report will be based on your contribution to its writing. The multi-authored paper will be due April 10.

Your group project may be observational or experimental in nature. The following is a list of the major equipment which can be made available to you. Other standard laboratory supplies will also be available.

- Infrared gas analyzer (to examine various photosynthetic rates)
- NDVI pens (to measure chlorophyll content of leaves)
- Pressure Bomb (to examine water use efficiency – Note, this can only be used with instructor supervision)
- Quantum sensor (measures direct level of irradiance – this is Dr. M’s personal instrument, but ask nice and he will probably let you use it)
- Refractometer (to determine nectar sugar concentration – also Dr. M’s.)
- Drying oven
- Resources for plant identification
- Greenhouse or plant growth chamber space (this will need to be coordinated with Dr. M)
- Herbarium specimens and related data

The experiment you complete must be feasible. The following are some potential projects. (These are just off the top of my head and in no way are meant to represent the only projects you may pursue.) Your group will need to submit a proposal for review by February 6. Your proposal must be a minimum of one page and include 1) Names of your team members, 2) title of project, 3) brief description of proposed research with general hypothesis and variables explicitly defined, 4) required equipment, 5) rough timeline.

- Variation in chlorophyll content during leaf senescence between native and non-native plants.
- Comparing photosynthetic efficiency of two species.
- Comparing water use efficiency of native and non-native species.
- Variation in seed viability between generic and name brand grass seed.
- Light requirements for de-etiolation of dark-germinated seedlings.
- Differences in xylem cavitation in juvenile and adult individuals.

Lab assignments: Some laboratories will require the completing and turning in of the lab activity. This may be drawings of structures, answers to questions, or an abbreviated lab report. These will vary from week to week.

Chapter Review Questions:

Each week (except weeks with exams) you will be assigned a selection of the end of the chapter review questions in Mauseth to answer on Canvas. You will have one week to complete these questions – late completed questions will not be accepted. The selected questions will be those I deem the most relevant for you to know and will assist in your studying for exams.

Other Course policies

Academic Integrity:

The Biology Department upholds College policy on Academic Integrity. Therefore, students who commit acts of academic dishonesty (a.k.a. cheating, copying, plagiarizing):

1) on homework or other less major assignments, will receive a ZERO on the assignment in question, and will be reported to Academic Affairs.

2) on exams, major papers or reports will earn a ZERO and be automatically removed from the COURSE, and will be reported to Academic Affairs.

Any student who accumulates two reported incidents of dishonesty with the Academic Affairs office will have a formal hearing with the Academic Standards Committee and faces academic dismissal from the College.

Attendance:

While I do not take a daily role, regular attendance is expected – particularly if you want to do well. I will try to post much of our class material on Canvas however this may not always be possible as all course materials may not be easily converted to digital format. If you know you are going to miss class please let me know beforehand. If your absence results in your missing a quiz or exam, and is legitimate, the aforementioned policy stands.

Classroom conduct:

While I hope it goes without saying, please respect the rights of myself and your fellow classmates. If you are late try not to disturb everyone else. Additionally please leave mobile phones, pagers, iPods, etc, at home or turn them off and keep them stowed during class. There is no need for you to keep your phone next to you on your desk during class time. I will not allow texting or checking of messages on any electronic device during class time. If this becomes a problem you will be asked to forfeit your device. Such activity is not only very disrespectful but also interferes with your ability to learn. FLC health and safety policies prohibit any food and beverage in laboratories. As our course is meeting in the laboratory at all times DO NOT bring ANY food or drink (this includes water) to lecture or lab. If you do you will be asked to finish it in the hall before coming back to class.

Biology Laboratory Safety Rules and Procedures:

Everyone in the biology lab must follow these safety rules and procedures.

- It has been said that “common sense isn't very common.” Please use common sense to keep yourself and classmates safe, and the laboratory running smoothly. You are each responsible for maintaining the cleanliness and safety of the lab.

- No food or drinks are allowed during a lab session. The only exception is food or drink provided by the instructor as part of the laboratory.
- Only closed-toe shoes are to be worn in the lab. Open-toe sandals are not permitted.
- Keep hands and other objects away from your face, nose, eyes, ears, and mouth. Do not apply cosmetics while in the lab.
- When working with bacterial cell cultures, work areas/surfaces should be wiped down with disinfectant before and after lab use.
- Hands should be washed after handling bacteria and before leaving the laboratory.
- Laboratory coats are optional. They do protect your clothing from stains and reagents.
- When working around open flames from a Bunsen burner, long hair should be secured behind your head.
- Be careful around Bunsen burners. Flames cannot always be seen.
- All unnecessary books, purses, briefcases, etc., should be kept off the countertops during lab work.
- Never pipette anything by mouth (including water). Use pipetting devices.
- Label all materials with your name or initials, date, and any other applicable information (e.g., type of media, organism, etc.).
- When handling chemicals, note any hazard codes or warnings on the container and take the appropriate precautions indicated.
- Do not pour chemicals down the sink without first checking with your instructor.
- Do not pour culture media fluids with bacteria or agar down the sink.
- Return all chemicals, reagents, cultures, and glassware to their appropriate places.
- Flame transfer loops, wires, or needles (all made of metal) before and immediately after use when transferring biological material.
- Do not walk around the laboratory with transfer loops, wires, needles, or pipettes containing biological material.
- Report any broken equipment immediately to your instructor.
- Immediately report any broken glassware, especially those containing bacteria or biological material.
- Immediately report any chemical or biological fluid spills to your instructor.
- Follow all instructions given by your instructor for cleaning up any spills or broken glass.
- If you are injured in the laboratory, immediately inform your instructor.
- Always wipe and clean the lenses of your microscope before putting it away. Use the appropriate tissue paper and cleaning solution for this purpose.
- Do not remove any materials from the laboratory without permission from your instructor.
- Dispose of wastes in their proper container, there are separate containers for sharps, broken glass, hazardous materials and biohazardous materials.

Waste Disposal

- Dispose of items in special bags or receptacles as indicated. If you have a question regarding the proper disposal of an item, ask your instructor.
- Use a Biohazard (orange/red) bag for agar plates (plastic Petri plates) containing any biological material.
- Use a desktop plastic waste container for used plastic micropipette tips; these containers will be emptied into a Biohazard (orange/red) bag for autoclaving.
- Use a Biohazard “orange/red bag” container for contaminated cotton swabs.
- Use a Sharps container for needles, glass slides, syringes, pipettes, other types of sharps.
- Use a “Glass waste” container for broken glassware and for used microscope slides.
- Any glassware containing liquid culture medium in which bacteria have been grown must be autoclaved before disposal.
- In general, non-contaminated items that pose no threat can be disposed of by placing them in the regular trash. Any sharp object (“sharps”), contaminated or not, should be discarded into the sharps container.

(Biology department lab safety guidelines prepared by SH on August 29, 2014; adapted from:
<http://www.as.ysu.edu/%7Ecrcooper/LabRules.pdf>)

Add/Drop policy:

The last day to add the class is census date, January 27, 2015. Prior to this date you may drop the course at anytime with no grade being recorded. College policy states that not attending the first two class meetings will result in automatic disenrollment.

The last day to withdraw from FLC classes with a grade of "CW" (course withdrawal) is 4 pm Friday, March 6, 2015. This is a college-wide deadline that is not negotiable.

To withdraw from this course, go to the Registrar's Office, Room 160, Miller Student Services Building before the course withdrawal deadline. They will help you through the process. You do not need my signature on the course withdrawal request form.

Starting Fall 2013, students have a life-time limit of three individual course withdrawals from FLC courses. If you have withdrawn from classes before Fall 2013, these will not count towards your lifetime limit. Also, withdrawing entirely from a semester (all classes) does not count against your lifetime "CW" limit. Semester withdrawal is handled under a different policy and procedure. Please refer to the Academic Policies section of the Fort Lewis College Catalog of Courses for more information about course and semester withdrawal policies and procedures.

Accommodations:

Students with disabilities who require reasonable accommodations to fully participate in course activities or meet course requirements must register with the Disability Services Office. If you qualify for services through the Disability office, bring your letter of accommodations to me as soon as possible so I can make the appropriate arrangements. Letters are available through Dian Jenkins, Coordinator of Disability Services, 280 Noble Hall, 247-7459.

Tentative Lecture/Lab Schedule

Wk	Date	Lecture Topics	Reading/Assignment
		Section I: Plant Structure: Anatomy and Morphology	
1	Jan. 12/14/16		
	Lecture	M: Introduction: Why study plants? W: <i>Brassica rapa</i> seed planting; Plant cells F: Plant cell structure and division	Chap. 1, 3, 4 Review Questions
	Lab	Supermarket Botany and Video: Private Life of Plants “It’s a Jungle Out There”	
2	Jan. 19/21/23		
	Lecture	M: Quiz. Stems: external structure and internal organization W: Structure and function of tissue systems F: Growth and differentiation: Primary meristems	Chap. 5 Review Questions
	Lab	Leaf morphology as a predictor of climate	
3	Jan. 26/28/30		
	Lecture	M: Quiz. Woody growth of stems: Secondary Meristems W: Leaves F: Roots	Chap. 6, 7, 8 Review Questions
	Lab	Structure of the woody plant body and dendrochronology I. (Tree coring; experiment: identifying complacent and sensitive ring series)	
4	Feb. 2/4/6		
	Lecture	M: Quiz. Flowers and the plant life cycle – the alternation of generations W/F: Fertilization, double fertilization, and embryology of Angiosperms	Chap. 9 Review Questions F: Initial group research proposal due
	Lab	Structure of the woody plant body and dendrochronology II. (Core preparation and analysis, cross-dating)	Lab Report 1 rough draft due
5	Feb. 9/11/13		
	Lecture	M: Plant breeding systems: Pollination syndromes W: Wrap-up and review F: Exam I	Chap. 9
	Lab	Floral and fruit structure and variation; Video: Private Life of Plants “The Birds & The Bees”	
		Section II: Plant Functions: Physiology, Growth and Development	
6	Feb. 16/18/20		
	Lecture	M: Photosynthesis – overview and light reaction W: Photosynthesis – determining the reaction curve of chlorophyll F: Photosynthesis – Carbon fixation	Chap. 10 Review Questions
	Lab	Photosynthesis I: the light reaction	Lab Report 1 final draft due
7	Feb. 23/25/27		
	Lecture	M: Quiz. Photosynthesis – C ₃ , C ₄ & CAM	Chap. 10, 11

		W: Transport processes: Xylem F: Pressure bomb demonstration – ecophysiology of water movement	(limited parts), 12 Review Questions
	Lab	Photosynthesis II: Comparison of C3 and C4 plants under low and elevated CO ₂	
8	Mar. 2/4/6		
	Lecture	M: Quiz. Transport processes: Phloem W: Plant nutrition: soil, essential elements F: Mycorrhizae and nodulation	Chap. 12, 13 Review Questions
	Lab	Open lab for collaborative projects	
9	Mar. 9/11/13		
	Lecture	M/W: Quiz. Regulation of growth and development – Hormones & Tropisms F: No class - Biology Department Advising	Chap. 14 Review Questions
	Lab	Allelopathy Lab Part I: Leaf collection and chemical extraction	
10	Mar. 16/18/20		
	Lecture	M: Vernalization, phytochrome and flower induction W: Wrap-up and review F: Exam II	Chap. 14
	Lab	Allelopathy Lab Part II: Analysis and Video: “What Plants Talk About	
Spring Break!			
	Section III	Evolution of Plant Diversity	
11	Mar. 30/Apr. 1/3		
	Lecture	M: Classification of the plant kingdom: What makes a plant a plant? Algae W/F: Non-vascular plants: Bryophyta, Hepatophyta, Anthoceroophyta	Chap. 19, 20 Review Questions
	Lab	Introduction to plant diversity	
12	Apr. 6/8/10		
	Lecture	M: Quiz. Seedless vascular plants I: Lycophyta, Arthrophyta, Pteridophyta W: Seedless vascular plants II F: Gymnosperms I: Progymnospermophyta and Pteridospermophyta and the origin of the seed habit	Chap. 21, 22 Review Questions F: Lab Report II Due
	Lab	Bryophytes and Seedless Vascular Plants	
13	Apr. 13/15/17		
	Lecture	M: Quiz. Gymnosperms II: Cycadophyta, Ginkgophyta, Gnetophyta W: Gymnosperms II: Coniferophyta F: Angiosperms I: Video: “First Flower”	Chap. 22, 23 Review Questions
	Lab	Seed Plants and Plant Phylogeny Reconstruction	

14	Apr. 20/22/24		
	Lecture	M: Quiz. Angiosperms II: Diversity W/F: Wrap-up and review	
	Lab	Identifying native woody plant diversity of the FLC Campus	
15	Thurs. Apr. 30	Final Exam 7:30 – 9:30 AM	