

BOT4935/BOT5225C Plant Anatomy

Fall, 2014

Lecture: MWF period 3 (9:35 – 10:25), McCarty Hall A 1142

Lab: MW periods 5 – 7 (11:45 – 2:45), Rolfs 114

Instructor - lecture

Dr. Christine Davis

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Office hours: immediately
after class and by
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Instructor - lab

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Why is learning plant anatomy important? Plant anatomy is situated between the study of plant morphology and cell biology. Studying plant anatomy allows a student to conceptually integrate organismal structure and function. Further, it helps to reveal the relationships between structure, function, taxonomy, ecology, and developmental genetics.

Our course aims to help students understand

- 1) The arrangement of tissue and cells types within the dermal, ground, and vascular tissue systems in vascular plants;
- 2) The characteristics of specialized cells and their components;
- 3) The relationship between internal structure, physiology, and ecology;
- 4) Evolutionary history and taxonomic variation of vascular plant anatomy;
- 5) The genetics and process of vascular plant development.

Further, our course will help you develop skill with

- 1) Experimental design and hypothesis testing;
- 2) Microscope techniques;
- 3) Leading and participating in discussion of scientific literature;
- 3) Oral and written presentation of your own work.

Specific learning outcomes

After you have completed this class, you will be able to:

- 1) Discuss the structural components of plant cell walls and membranes;
- 2) Compare and contrast the characteristics of plastid types;
- 3) List and describe the anatomy and ecological significance of epidermal and secretory structures;
- 4) Compare, contrast, draw, and describe the taxonomic and evolutionary variation in xylem and phloem components;
- 5) Outline and describe current understanding of the components of shoot, root, and floral development, including gene expression, tissue differentiation, and growth;
- 6) Outline and describe the process of woody secondary growth in stems;
- 7) Draw, identify, and describe stelar patterns in stems and roots of vascular plants with and without secondary growth;
- 8) Draw, identify, and describe leaf anatomy and leaf adaptations associated with specific habitats;
- 9) Describe and give examples of the practical use of plant anatomy in wood technology, archaeology, forensics, and paleontology;
- 10) Design, carry out, and present a laboratory study in plant anatomy.

Recommended preparatory courses

Although this course has no explicit prerequisites, it is intended for upper-level undergraduate or graduate students in botany and plant science. It will be assumed that students have a basic understanding of plant morphology, diversity, phylogeny, ecology, and physiology.

Texts

Esau, Katherine. *Anatomy of Seed Plants*. 2nd edition. John Wiley and Sons.

Additional readings and primary literature provided on eLearning.

Laboratory exercises printed from eLearning.

Course grades will be determined as follows:

Undergraduate registrants (BOT4935)

5 exams @ 100 pts each	= 500 pts	~59%
Leading a class discussion/synopsis	= 40 pts	~ 5%
3 discussion participations @ 4 points each	= 12 pts	~ 1%
10 lab quizzes @ 20 pts each	= 200 pts	~23%
1 lab project/symposium	= 100 pts	~12%
Total course points	= 852	

Grading scale:

90 – 100% = A

80 – <90% = B

70 – <80% = C

60 – <70% = D

below 60% = E

Graduate registrants (BOT5225C)

5 exams @ 100 pts each	= 500 pts	~52%
Leading a class discussion/synopsis	= 40 pts	~ 4%
3 discussion participations @ 4 points each	= 12 pts	~ 1%
10 lab quizzes @ 20 pts each	= 200 pts	~21%
1 lab project/symposium	= 100 pts	~11%
Formal write up of project	= 100 pts	~11%
Total course points	= 952	

Exams

Five exams will be given according to the schedule at the end of the syllabus. The exams will require drawing, labeling, and short and long written answers. Exams may include concepts from class discussion or primary literature. The exams are not cumulative.

Leading discussions, synopses, and participation in discussion

Each student will work within a small group to lead a class discussion of a research paper. Each small group will be required to prepare a discussion synopsis to facilitate the discussion. All students are responsible for reading the paper and contributing to discussion. Please see the attached document at the end of the syllabus for more details on preparing the synopsis, leading the discussion, how your grade for the synopsis and leading the discussion will be determined, and how you can earn points for contributing to the class discussion.

Laboratory

Your laboratory grade will be based upon 10 lab quizzes, your lab project and its presentation in a course symposium, and a formal write up of your project (BOT5225C only). Twelve lab quizzes will be given, but only the 10 top scores will be counted toward your grade. Please see you lab instructor for details concerning preparation for the lab quizzes. Details regarding the lab project, symposium, and formal write-up will be provided as the time approaches.

Course attendance, curves, and make up policy

Attendance is required and essential for success in this course. I understand that absences happen, but if you make this a habit, you are guaranteed to perform poorly. There will be NO curve applied to grades. If you have a **valid documented excuse and notify us in advance**, you may be able to make up missed graded assignments, quizzes, or exams. We will determine this on an as-needed basis.

Policy on electronic devices

Use them if you want, but if they become distracting to your classmates, you will be asked to leave. Also, please note that the use of devices for socializing during class is very obvious to your classmates and your instructors. We'll make a mental note of it as disrespectful, and it leaves a negative impression.

UF counseling services

Resources are available on campus for students having personal problems or lacking clear career and academic goals. The resources include:

UF Counseling & Wellness Center, 3190 Radio Rd, 392-1575, psychological and psychiatric services.

Career Resource Center, Reitz Union, 392-1601, career and job search services.

Many students experience test anxiety and other stress – related problems. “A Self Help Guide for Students” is available through the Counseling Center (301 Peabody Hall; 392-1575) and at their web site: <http://www.counsel.ufl.edu/>.

Academic Honesty Policy

All students registered at the University of Florida have agreed to comply with the following statement:

“I understand that the University of Florida expects its students to be honest in all their academic work. I agree to adhere to this commitment to academic honesty and understand that my failure to comply with this commitment may result in disciplinary action up to and including expulsion from the University.”

In addition, on all work submitted for credit the following pledge is either required or implied:

“On my honor I have neither given nor received unauthorized aid in doing this assignment.”

If you witness any instances of academic dishonesty in this class, please notify the instructor or contact the Student Honor Court (392-1631) or Cheating Hotline (392-6999). For additional information on Academic Honesty, please refer to the University of Florida Academic Honesty Guidelines at: <https://catalog.ufl.edu/ugrad/current/advising/info/student-honor-code.aspx#honesty>.

Important – Plagiarism

Plagiarism is a serious violation of the Student Honor Code. It includes:

- Submitting all or part of someone else's work as if it is your own
- "Borrowing" without crediting the source
- Submitting duplicate assignments
- Collaborating or receiving substantive help in writing your assignment unless we require such collaboration as part of the work
- Failing to cite sources, or citing them improperly

Consequences of plagiarism:

- Failing grade on assignment AND
- Course grade penalty of one letter grade AND
- Report to the Office of the Dean of Students.

Please review plagiarism and how to avoid it: <http://web.uflib.ufl.edu/msl/07b/studentplagiarism.html>

Accommodations for students with disabilities

Students who will require a classroom accommodation for a disability must contact the Dean of Students Office of Disability Resources, in Peabody 202 (phone: 352-392-1261). Please see the University of Florida Disability Resources website for more information at: <http://www.dso.ufl.edu/drc/>. Note that the student should provide documentation of a requirement for accommodation by the second week of classes. No accommodations are available to students who lack this documentation. It is the policy of the University of Florida that the student, not the instructor, is responsible for arranging accommodations when needed. Once notification is complete, the Dean of Students Office of Disability Resources will work with the instructor to accommodate the student.

Lecture schedule (tentative, always subject to change)

Month	Day	Date	Topic	Notes
Aug.	M	25	Intro	
	W	27	Plant cells, plastids	Assign and schedule discussion leaders
	F	29	Cell walls, primary simple tissues	
Sept.	M	1	No lecture – Labor Day	
	W	3	Complex primary tissues	
	F	5	Primary growth /development of the shoot	
	M	8	SEM tour - ICBR (tentative)	
	W	10	Paper discussion 1	Kurawa et al., 2007. <i>Nature</i> 445, 652-655.
	F	12	Exam 1	
	M	15	Stem, vascular bundle types, stelar patterns	
	W	17	Secondary vascular tissue/growth of shoot	
	F	19	Secondary protective tissue/growth	
	M	22	Anomalous secondary growth	
	W	24	Secretory structures of the stem	
	F	26	Ecological specializations of stem/wood	
	M	29	Practical applications of stem/wood anatomy	
Oct.	W	1	Paper discussion 2	Poorter et al. 2014. <i>Functional Ecology</i> 28, 232–242.
	F	3	Exam 2	
	M	6	Leaf anatomy	
	W	8	Leaf anatomy	
	F	10	Leaf specialization and secretion	
	M	13	Root anatomy, cell elongation, primary growth	
	W	15	Root anatomy, primary/secondary growth	
	F	17	No lecture - homecoming	
	M	20	Root specialization	
	W	22	Practical applications of leaf anatomy	
	F	24	Paper discussion 3	Brundrett and Kendrick. 1988. <i>Canadian Journal of Botany</i> 66: 1153-1173.
	M	27	Exam 3	
	W	29	Reproductive and floral anatomy	
	F	31	Flower anatomy	
Nov.	M	3	Flower specializations	
	W	5	Pollen anatomy	
	F	7	Fruit anatomy	
	M	10	Seed anatomy	
	W	12	Paper discussion 4	Park et al. 2004. <i>Proc. R. Soc. Lond. B</i> 271, 311–316.
	F	14	Exam 4	
	M	17	Evolution of development	Guest lecturers – Drs. Pam and Doug Soltis
	W	19	Evolution of development	Guest lecturers – Drs. Pam and Doug Soltis
	F	21	Gametogenesis and fertilization	Guest lecturer – Dr. Stuart McDaniel
	M	24	Embryogenesis, seed development, seedling growth	Guest lecturer – Dr. Bernard Hauser
	W	26	No lecture - Thanksgiving	
	F	28	No lecture - Thanksgiving	
Dec.	M	1	Review/catch up	
	W	3	Exam 5	
	F	5	No lecture - Prepare for symposium	Use class meeting time for office hours with Dr. Davis
	M	8	Project symposium setup	Formal written paper due (BOT5225C students)
	W	10	Project symposium setup	

Laboratory schedule (tentative, always subject to change)

Month	Day	Date	Topic	Notes
Aug.	M	25	Welcome back!	NO LAB
	W	27	1. Intro, Safety, Microscopes	Review plant morphology handout on your own
Sept.	M	1	Labor Day Holiday	NO LAB
	W	3	2. Hand sectioning and staining, microtome demo	Lab Quiz 1 ; Guest Dr. Kurt Neubig
	M	8	3. Cells	
	W	10	4. Simple Tissues	Lab Quiz 2 Lecture: Paper discussion, synopsis due; Exam 1 on FRIDAY
	M	15	5. Complex Tissues: xylem and phloem	
	W	17	6. Apical meristems	Lab Quiz 3
	M	22	7. Secondary growth and vascular cambium	
	W	24	Catch up session if needed; introduce project, initial brainstorm	Lab Quiz 4
	M	29	8. Stems, stelar patterns, and vascular bundles of the stem	Lab project proposal with references due Lecture: Paper discussion, synopsis due
Oct.	W	1	9. Wood and pits	Lab Quiz 5 Lecture: Paper discussion, synopsis due; Exam 2 on FRIDAY
	M	6	Project time	
	W	8	Project time	Lab Quiz 6
	M	13	10. Leaf Anatomy	Lab project outline due
	W	15	Leaf Anatomy	Lab Quiz 7
	M	20	11. Root anatomy, secondary meristems, and stelar patterns	
	W	22	Root anatomy and meristem	Lab Quiz 8 ; Lecture: Paper discussion, synopsis due on FRIDAY
	M	27	Project time	Lecture: Exam 3
	W	29	Project time	Lab Quiz 9
Nov.	M	3	12. Flower Anatomy	Lab project one paragraph update and timeline due
	W	5	13. Pollen, spores, and gametogenesis	Lab Quiz 10
	M	10	Project time	
	W	12	14. Seed Anatomy and embryogenesis	Lab Quiz 11 Lecture: Paper discussion, synopsis due; Exam 4 on FRIDAY
	M	17	15. Fruit Anatomy	
	W	19	Project time	Lab Quiz 12
	M	24	Project time	
	W	26	Thanksgiving	NO LAB
Dec.	M	1	Project time	
	W	3	Project time	
	M	8	Project symposium	Formal written paper due (BOT5225C students)
	W	10	Project symposium	

Paper discussions

Each student will work within a small group to lead one class discussion of a research paper. Each leader group is required to prepare a discussion synopsis to facilitate the discussion. All students are responsible for reading the paper and contributing to discussion.

When you lead the discussion, you are the “expert” on the readings. It is your job to help the class meet the following goals:

- Clarify the main points of the readings.
- Clarify the basics of the methods used (if applicable).
- Reveal interesting topics and questions for further discussion or debate.
- Apply the readings to the anatomy topics in the preceding portion of the course.
- Involve contributions from all classmates.
- Avoid domination by any one speaker (including you, the discussion leader).

Guidelines for writing the discussion synopsis

The discussion synopsis is a two-page document that will be handed out to all participants at the beginning of your discussion.

- 1) The first page of the discussion synopsis is a list of defined terms and/or clarification of methods crucial for understanding the reading. This should be covered as part of the discussion, too.
- 2) The second page of the synopsis should contain a series of discussion questions you'll pose.

Before you write the discussion synopsis, start by thinking about 3 or 4 key concepts everyone should come away with from the discussion. Design 3 or 4 key questions that will assess understanding of these concepts.

- List and number your key questions in bold.
- Under the key question, indent and list questions that will “lead up” to your key question (3 – 4).
- Leave adequate space under each question for note-taking.

Guidelines for leading and facilitating discussion

- Start the discussion by discussing crucial terms, then, ask one of your “key questions.” (see Guidelines for writing the discussion synopsis.)
- Try not to answer your own questions.
- Minimize or eliminate rhetorical questions or “yes/no” and “agree/disagree” questions.
- It's okay to wait a while in silence after you ask a question. Sometimes it takes a little while for people to think before answering – be patient.
- It's okay to stray from the planned list of questions in your synopsis. Just steer the discussion back when you can.
- After the initial discussion about terms, minimize “recitation” type questions; that is, questions that ask your classmates to recall facts or knowledge about the subject matter.
- When possible, summarize portions of the discussion (for example, summarize what the class has learned about the methods used in a study, or the key components of the experiment in the paper).
- When appropriate, paraphrase your classmates' comments, responses, and questions in order to clarify their meanings to the class. (This is called active listening.)
- Use eye contact, clear confident speaking, and positive body language. Avoid actions such as crossing your arms, looking at the clock, or deep sighs.

Rubric for discussion leading:

Grading Criteria	Descriptors	Points
Preparation	Demonstrates: Good preparation and familiarity with readings Cooperation and collaboration among leaders	___/4
Discussion Techniques	Discussion techniques: Engage students—motivating Encourage all students to contribute Guide but do not dominate discussion Promote discussion of different viewpoints	___/4
Content & Discussion Questions	Questions asked: Lead the class toward discussion goals Are clear Refer to readings	___/4
Facilitation Skills	Leaders demonstrate good facilitation skills: Active listening Summarizing	___/4
Communication skills	Facilitators engage class through their: Eye contact Clear and confident voice Gestures	___/4
	Total points	___/20

Rubric for discussion synopsis:

Descriptors	Points
Key questions match with major points of readings	___/4
Other questions adequately “lead up” to key questions	___/4
Crucial terms and methods described correctly and clearly	___/4
Format of synopsis follows guidelines	___/4
Writing free of spelling and grammatical errors	___/4
Total points	___/20

Rubric for participation points:

0 points = Absent
1 point = Present but does not contribute
2 points = Participates in discussion by adding an opinion or asking a question
3 points = Participates in discussion by adding an opinion, posing a thoughtful question, and answering questions
4 points = Makes exemplary contributions to discussion by integrating concepts, introducing novel perspectives, and drawing out additional contributions from classmates