

**EEB 414 - Plant Anatomy and Development – Spring 2018**  
**3 credits (1 extra lab credit available)**

**Meeting location:** Hesler 202

Tuesdays and Thursdays 3:40 p.m. to 5:25 p.m. (note that this is beyond the 4:55 pm time on UTK timetable)

**Instructor: Dr. Joe Williams**

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**Textbook – these are provided in lab (you may want to buy one to take home):**

**1) Esau, K. 1977.** *Anatomy of Seed Plants, 2nd Ed.* New York, NY: Wiley.

This is the required text, about \$50 used if you buy it online (out of print). Provided in lab.

**A more expensive alternative (c. \$140):**

**2) Evert, RF 2006.** *Esau's Plant Anatomy. Meristems, cells, and tissues of the plant body: their structure, function, and development* Hoboken, NJ: Wiley-Interscience.

This is an up-to-date alternative, but it does not cover the material as broadly.

**Course Description:** We will explore the internal *anatomy* of cells, tissues, and organs. We will also study *development* of vegetative and reproductive structures of vascular plants. Emphasis on seed plants. Hand-sectioned and stained material and prepared slides will be visualized each weeks via light microscopy. Students will also develop skills in microphotography.

**Plant anatomy learning objectives** – After taking this class, you will understand: 1) the internal organization of the plant body; 2) basic aspects of plant development; and 3) anatomical aspects of plant functional biology.

**Biology Degree Learning Objectives** - You should be able to explain the *five big ideas* in biology as they relate to topics you have learned throughout your degree program

1. **Evolution:** Populations of organisms and their cellular components have changed over time through both selective and non-selective evolutionary processes.
2. **Structure and Function:** All living systems (organisms, ecosystems, etc.) are made of structural components whose arrangement determines the function of the systems.
3. **Information Flow and Storage:** Information (DNA, for example) and signals are used and exchanged within and among organisms to direct their functioning.
4. **Transformations of Energy and Matter:** All living things acquire, use, and release and cycle matter and energy for cellular / organismal functioning.
5. **Systems:** Living systems are interconnected, and they interact and influence each other on multiple levels.

You should also be proficient in the following **scientific practices**:

- Formulate empirically-testable hypotheses
- Interpret visual representations (figures and diagrams)
- Evaluate data and come to a conclusion (with evidence) (formulate an argument)

## Syllabus

Week	Date	Day	Subject
1	Jan. 11	Th	Introduction – course organization – using the microscopes, sizes of cells
2	Jan. 16	T	Lecture: Plant body plans, growth and development (embryos, gametophytes)
	Jan. 18	Th	Using the microscopes and cameras continued, making hand sections
3	Jan. 23	T	Lecture: Plant tissue systems and cell types - <i>paper discussion #1 (instructor)</i>
	Jan. 25	Th	Plant tissue systems, cell types, cell contents (hand-sections continued)
4	Jan. 30	T	Lecture Plant cell contents and cell walls - <i>First photos are due by 5pm by email</i>
	Feb. 1	Th	Plant cell walls and cell contents continued
5	Feb. 6	T	Lecture: Plant tissues – epidermis and secretory structures
	Feb. 8	Th	Epidermis and secretory structures
6	Feb. 13	T	<i>Exam 1</i>
	Feb. 15	Th	Shoots - Xylem and secondary growth
7	Feb. 20	T	Lecture: Plant vascular systems - Xylem and vascular cambium
	Feb. 22	Th	Shoots - Xylem continued
8	Feb. 27	T	Lecture: Plant vascular systems – Phloem, cork cambium, “bark” – <i>2nd photos due by 5pm by email</i>
	Mar. 1	Th	Shoots – phloem and Cork cambium
9	Mar. 6	T	Lecture: Shoot apical meristems and branching - <i>paper discussion #2</i>
	Mar. 8	Th	Shoots and branching
<b>Mar. 12-16</b>			<b>Spring break</b>
10	Mar. 20	T	Lecture: Root apical meristems and roots
	Mar. 22	Th	Roots
11	Mar. 27	T	<i>Exam 2</i>
	Mar. 29	Th	Lecture: Leaves
12	Apr. 3	T	Leaves
	Apr. 5	Th	Leaves and other appendages, flowers

Week	Date	Day	Subject
13	Apr. 10	T	Lecture: Flowers, male and female gametophytes, fertilization - <i>paper discussion #3</i>
	Apr. 12	Th	Floral organs, ovules, male and female gametophytes, fertilization
14	Apr. 17	T	<i>Lab</i> : Embryos, seeds, fruits
	Apr. 19	Th	<i>Lecture</i> : Embryos and seeds
15	Apr. 24	T	Last Lecture
	Apr. 26	Th	<b>Exam 3</b>
	<b>May 8</b>	<b>M</b>	<b>Final projects are due by 2:30 p.m. – Tuesday, May 8<sup>th</sup>, 2018</b> <b>NO EXCEPTIONS!</b>

\*Note: syllabus is subject to change!

If you need course adaptations or accommodations because of a documented disability or if you have emergency information to share, please contact the Office of Disability Services at 191 Hoskins Library at 974-6087. This will ensure that you are properly registered for services.

Please use *Canvas* to download class materials and to monitor your progress. <http://online.utk.edu/>

### Grading system

<b>Exams (450)</b>	<b>45 %</b>
Exam 1 = 150	
Exam 2 = 150	
Exam 3 = 150	
<b>Paper summaries = 100</b>	<b>10 %</b>
<b>Photo journal = 350</b>	<b>35 %</b>
First photos = 50	
2nd photos = 50	
Final project = 250	
<b>Class participation = 100</b>	<b>10 %</b>
<b>Total</b>	<b>100 %</b>

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#### Grade distribution

A ≥ 93%	C ≥ 73%
A- ≥ 90%	C- ≥ 70%
B+ ≥ 87%	D+ ≥ 67%
B ≥ 83%	D ≥ 62%
B- ≥ 80%	D- ≥ 59%
C+ ≥ 77%	F ≤ 58%

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**Exams.** Practical exams will focus on the most recent material covered, but you will be expected to have retained and be able to use material from past exam(s). Exams are designed to test your ability to recognize structures and to apply concepts learned in lecture.

**Laboratory notebooks.** It is really helpful to *draw what you see* and to keep notes in a notebook. You can buy a 1” ring binder at the bookstore – paper will be provided for you in the lab.

**Read two published papers and summarize findings.** We will read and discuss three articles from the plant anatomy primary literature. I will lead the discussion of paper #1 and graduate students will lead the 2<sup>nd</sup> and 3<sup>rd</sup> discussions. Discussion leaders will provide images from the paper and some background material in a Powerpoint format. The leader will give a presentation allowing questions and discussion

(20 minutes). In the following week, each of you will write a one page summary of the paper, to be turned in by the next Lecture class. The written summary should highlight the main findings of the paper *and* the discussion we had in class. You will copy and paste at least one image from the .pdf of the paper into your Word text file, as part of your summary. Your grade (50 points) will be based on the quality of your individual written summary and your discussion of what you see as the central figure (pasted in).

**Photo journal (you may share photographs with 1-2 partners or go solo).** Individually, *or with partner*, you will build up a series of photos of the internal anatomy of the plant body from material prepared in class and photographed on various cameras. These images will be copied into a Powerpoint file and then labeled and captioned, so that any viewer can appreciate what parts of the plant are being described. *To make a good journal, you will have to make time to work in the lab outside of the normal class hours.* If you shared photographs, the Powerpoint journal *must* attribute the photos that were taken by your partner *on your title page or within the presentation.* I expect all labeling and captions to be done individually. In other words, you can share photos, scale bars and interpretations of structures, but each person must process these photos and design their own unique presentation. Past practice has indicated that successful journals result from working on the journal throughout the semester. Many poorly done journals were put together in the last two or less weeks of class!

**Extra credit:** Do you want to add an extra credit hour for this class? Some of you may want to do a more detailed plant anatomy project – if so, *you can register for EEB 400, section 009, for one credit hour.* Please discuss this option with me if you have a project in mind, or I can help you choose one.

### The fine print section:

**Make-up exams will only be given when a student has a valid excuse** recognized by the University. Such excuses are:

- a. A death in the family
- b. A medical illness of a severity that prevents a student from attending class (includes accidents)
- c. A University-sponsored activity or event that requires that a student miss class (requires letter)
- d. In order to take a make-up exam, a student must notify the Instructor as soon as possible and provide written documentation of one of the legitimate excuses listed above where possible. Students missing an exam due to a University-sponsored event should provide the Instructor with documentation of the event *prior to* the scheduled exam so that a make-up can be scheduled. **Make up exams for this type of course, which involve practical set ups, are time consuming for the instructor to give. Make up exams should be a last resort only. If you fail to come to a scheduled makeup exam, you will lose the opportunity.**

**Communication:** You can reach me by email or phone. Generally, I will make announcements about class matters only during lecture. I will post announcements in *Canvas* occasionally, and in unusual circumstances (such as an emergency), e-mails will be sent. It is your responsibility to attend class and check Blackboard regularly!

**Citizenship:** Please arrive on time and do not leave early unless for emergency. Please keep socializing in class to a minimum and cell phones off. We have very little lab time!

### **YOUR RIGHT TO KNOW:**

Tennessee law requires that you are provided notice that some of the laboratory exercises involve contact with chemicals which have been identified with potential health hazards. These include, but are not limited to: ethyl alcohol and stains. While every effort has been made to make the materials as safe as possible, these chemicals are toxic or dangerous and you must be responsible for their safe handling. If you feel you are at a higher risk than normal because of some medical condition, we recommend that you consult your physician before taking this course.