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### BIOO 433.01: Plant Physiology

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## **BIOO 433 - PLANT PHYSIOLOGY – SPRING 2016 - LECTURE SYLLABUS (3 Credits)**

**Instructor:** Dr. Anna Sala, NS 117 A; 243 6009; sala@mso.umt.edu

**Meeting time and room:** Tuesdays, Thursdays 11:00-12:20 LA 338

### **Recommended Texts:**

1. Taiz and Zeiger 5<sup>th</sup> Ed. Plant Physiology. Sinauer. ([Online Supplements](#))
2. Taiz, Zeiger, Møller, Murphy. 6<sup>th</sup> ed. Plant Physiology and Development. Sinauer

**Office Hours:** Thursday 2-4 PM or by appointment via email (write BIOO433 in subject)

**Electronic Resources:** Moodle

**Course Description:** This course is an introduction to the physiological processes underlying plant growth and development and plant responses to the environment.

### **Learning Outcomes:**

At the end of this course you should be able to:

1. Explain how plant growth (adding biomass) differs from that of animals
2. Explain the unique features of plant cells
3. Explain in general terms why plants need water and what they do to remain hydrated
4. Explain in general terms why plants need nutrients and how they manage to get them
5. Explain in general terms the process of photosynthesis and the goal of alternative photosynthetic pathways
6. Provide examples of how plants manage to integrate function at the whole plant level despite the lack of a coordinating system like a brain.
7. Provide examples of how plants sense their environment
8. Appreciate the relevance of the physiology of plants in ecology and agriculture
9. Integrate and synthesize scientific information on the physiology of plants

### **Course Structure:**

The course consists of two 1 h 20 min lectures per week. Depending on student demand, additional discussion sessions may be scheduled. From past experience, students benefit a lot from discussion sessions. Because we do not follow any particular textbook (I only recommend one), class attendance is fundamental and mandatory for this course.

### **Teaching style:**

**This is an intense course** that covers the most fundamental, core concepts in plant physiology. Realistically, there is much more material than we can cover in one semester. My philosophy is to cover some topics in depth and just brush over other topics. **My emphasis is on understanding, critical thinking and integration of core concepts** rather than on details and memorization. In some cases, however, memorization helps people register facts that eventually become relevant for understanding of core concepts. **My lectures rely strongly on interaction with students.** Therefore, student participation in class is very important. Students are strongly encouraged to ask questions at any time during class. Questions may be to either clarify concepts covered in class or to discuss any

other issues related to Plant Physiology (fun discussions often arise this way). Although class discussions are very good, they also compromise our ability to move forward with the material and we invariably get behind schedule. This is acceptable to a point and I try to find a happy medium where we can have discussions but at the same time cover most of the material. This is why the class schedule is only tentative. I will post earlier lectures so it is easy for you to take notes. I also post study guides and, when necessary, new material used in class before each exam on Moodle.

### **What to expect:**

Students generally like this course, but they invariably say that it is hard. Two main reasons make it hard: 1) there is an incredible amount of basic, core material to cover in an introductory plant physiology course; and 2) the material is inherently difficult and complex because it deals with thermodynamics, organic chemistry, cellular biology, molecular biology and a long array of disciplines that are not necessarily intuitive. My point is not to discourage students, but simply to alert students that **this is a course that requires commitment**. Studying the day before the exam will most likely not be enough. However, if you prepare correctly, you have a high chance to do well.

### **Some recommendations:**

- Take good notes in class.
- After each lecture or at the end of each main topic rewrite your notes (with an emphasis on understanding) according to your own style of learning. Prevent the accumulation of material to study.
- After rewriting the notes for each main topic, go over the review questions (there may be up to 100 or so per topic!) and have a sense of how easily you could answer them. If you are having a hard time for most of the questions, then you may need to revise your notes and study more. If you can answer most of the questions you are well prepared.
- To help nail down the most important core concepts, try to summarize all your notes before a given exam into a 1 or 2 page condensed summary. This really forces you to focus and extract the core concepts. Again, keep in mind that understanding rather than memorization is the emphasis.
- If, after studying, there are questions which you still do not know how to answer, then come and see me during office hours or make an appointment.
- Going over study questions in groups can be very fun (sort of an academic trivia) and productive. Students have benefitted a lot from this in the past.

Depending on student demand, we may dedicate some office hours to discussing questions as a group.

### **Exam Format:**

I write exams trying to emphasize understanding. This should not be misleading, however. Generally, if you do not know the facts, then there is little to understand. Therefore, knowing the facts precedes understanding. Exam answers should give evidence of both knowledge and understanding. Students must include the most important points in their answers and they must provide a clear and succinct explanation of why important points are important. As in real life, 'good enough' is not enough. If you aim for an A, your work needs to be excellent on all accounts (content, evidence of understanding *and* writing). I often write some open-ended questions in exams. Students do not like these because they have to use their own criteria for how to approach the question, justify their choice of approach and provide enough information to address it based on their approach.

**Special accommodation:**

Make-up exams will be permitted only with compelling and supported reasons and necessary arrangements **prior** to the scheduled exam. No early final exams will be given, so make any travel plans accordingly. The University of Montana assures equal access to instruction through collaboration between students with disabilities, instructors, and [Disability Services for Students](#). If you think you may have a disability adversely affecting your academic performance, and you have not already registered with Disability Services, please contact Disability Services in Lommasson Center 154 or call 406.243.2243. I will work with you and Disability Services to provide an appropriate modification. Please contact me **one week before** each exam if you require any service through DSS

**Grading:**

There will be five homework assignments (20 points each). These generally consist on reading papers and/or interpreting data. Tentative dates are in the schedule at the end. Homework will be due one week after it is handed out. Students will lose 10% of the grade per day late. We will have two regular session exams and a final exam. The final exam is partially comprehensive. Exams consist of a few very short questions and relatively short essay questions. Short essay questions are to explain certain processes, interpret some results or make predictions based on information given. Graduate students are also required to write a paper (5 pages maximum on how plant physiology can enrich their graduate research. These papers must be turned in the last day of class.

- Exam 1: 100
- Exam 2: 100
- Final Exam: 150
- Homework: 100
- **Total: 450**

**Students taking the lecture (450 points) and the lab (180 points)** should view them as a single 4-credit course and **may opt to receive the same combined grade for both** courses where the lab is ca. 30% of the grade.

Letter grade assignments are as usual: A = 90-100%, B = 80-89%, C = 70-79%, D = 60-69 and F < 60%.

**Communication.** *I will use your UM email address* to give updates about the class. So make sure to check it often and/or link it to the email address you commonly use. Feel free to write me via email, but please write BIOO433 in the subject so I do not erase it.

**Ads, drops and changes of grade:** I will follow university policies on drops, ads, and changes of grade. Please check the Registrar's Office Calendar for important deadlines and dates after which course changes are not automatically approved. Requests to drop or change the grade basis to benefit a student's grade point average will not be approved.

**Tentative schedule:** The table below provides a tentative schedule. Note the homework dates may change depending on where we are (I will let you know if so) but **exam dates will not change**. Also note that chapters marked with an asterisk will not be covered in detail during lecture. Reference to these chapters will be made when discussing the corresponding lecture topics.

## Tentative lecture & homework schedule

Week	Dates	Topic	Chapter (5th ed.)
1	Jan. 24	Introduction, Characteristics of plants	
	Jan. 26	Overview plant cells	1
2	Jan. 31	Overview plant cells	1
	Feb. 2	Cell walls	15
3	Feb. 7	Water relations <b>Homework</b>	3, 4, 26*
	Feb. 9	Water relations	3, 4, 26*
4	Feb. 14	Water relations	3, 4, 26*
	Feb. 16	Mineral nutrition	5, 26*
5	Feb. 21	<b>EXAM 1</b>	
	Feb. 23	Mineral nutrition <b>Homework</b>	5, 26*
6	Feb. 28	Mineral Nutrition	5, 26*
	Mar. 2	Solute Transport	6
7	Mar. 7	Photosynthesis: light reactions.	7
	Mar. 9	Photosynthesis: light reactions	7
8	Mar. 14	Photosynthesis: dark reactions. <b>Homework</b>	8
	Mar. 16	Photosynthesis: dark reactions	8
9	Mar. 21-23	SPRING BREAK	
10	Mar. 28	Photosynthesis: Ecology	9
	Mar. 30	<b>EXAM 2</b>	
11	Apr. 4	Phloem transport. <b>Homework</b>	10
	Apr. 6	Respiration	11
12	Apr. 11	Nitrogen Assimilation	12
	Apr. 13	Secondary Metabolism.	13
13	Apr. 18	Phytochrome. <b>Homework</b>	17
	Apr. 20	Blue light Responses	18
14	Apr. 25	Flowering	25
	Apr. 27	Hormones	19-24
15	2-May	Hormones	19-24
	4-May	Hormones	19-24
16	9-May	<b>FINAL EXAM (8:10-10:10)</b>	