

PLNT SCI 4315/7315 Crop Physiology- Spring Semester

Course Description:

To introduce students to the concepts of crop growth and development and provide a basic understanding of the principles and practices involved in modern agroecosystems. Emphasis will be placed on physiological processes and morphology of crop plants, and their application to crop breeding and management decisions. Prerequisites: Plant Science 2110 or equivalent.

This course consists of lectures, discussions, and laboratory sessions that will provide an overview of how plants function. We will examine fundamental processes such as photosynthesis, respiration, nutrition, and hormones and bring them into perspective with regard to crop management, production, and yield formation.

Class Time:

Monday 1:00 – 2:50 Agriculture Lab 39; we may also meet at the greenhouses
Tuesday and Thursday 10:00 – 10:50 Agriculture Building 3-24

Text:

Required:

Taiz & Zeiger, 2006. *Plant Physiology* 4th edition, Sinauer Associates, Inc. Publishers, Sunderland, MA. ISBN 10: 0-87893-856-7 (hardcover).

A companion website to this book can be found at www.plantphys.net

Other:

Additional materials from sources other than Taiz & Zeiger, will originate from other textbooks, including *Plant Physiological Ecology* (Lambers, Chapin, III, and Pons, 2006), *Introduction to Plant Physiology* 3rd edition (Hopkins and Hüner, 2004), *The Physiology of Flowering Plants*, 4th edition (Öpik and Rolfe, 2005), *Biochemistry and Molecular Biology of Plants* (Buchanan, Gruissem, and Jones, 2000), and *Physiology of Crop Plants* (Gardner, Pearce, Mitchell, 1985), as well as a number of other sources such as primary literature.

Instructor:

Dr. Felix B. Fritsch, Assistant Professor, Division of Plant Sciences, Univ. of Missouri

Office / Contact Information:

Ag Lab 27A (inside Ag Lab 27)

Phone 882-3023

Email: fritschif@missouri.edu

Office Hours:

By appointment

You are encouraged to come by my office, call or e-mail to resolve any questions or discuss the material presented during this course.

University of Missouri-Columbia Notice of Nondiscrimination

The University of Missouri System is an Equal Opportunity/ Affirmative Action institution and is nondiscriminatory relative to race, religion, color, national origin, sex, sexual orientation, age, disability or status as a Vietnam-era veteran. Any person having inquiries concerning the University of Missouri-Columbia's compliance with implementing Title VI of the Civil Rights Act of 1964, Title IX of the Education Amendments of 1972, Section 504 of the Rehabilitation Act of 1973, the Americans With Disabilities Act of 1990, or other civil rights laws should contact the Assistant Vice Chancellor, Human Resource Services, University of Missouri-Columbia, 130 Heinkel Building, Columbia, Mo. 65211, (573) 882-4256, or the Assistant Secretary for Civil Rights, U.S. Department of Education.

Americans with Disabilities Act (ADA) Statement

If you need accommodations because of a disability, if you have emergency medical information to share with me, or if you need special arrangements in case the building must be evacuated, please inform me immediately. Please see me privately after class, or at my office.

Office location: 27 Ag Lab Building

Office hours: Tues and Thurs. 11:00 – 12:00

To request academic accommodations (for example, a notetaker), students must also register with the [Office of Disability Services](http://disabilityservices.missouri.edu), (<http://disabilityservices.missouri.edu>), S5 Memorial Union, 882-4696. It is the campus office responsible for reviewing documentation provided by students requesting academic accommodations, and for accommodations planning in cooperation with students and instructors, as needed and consistent with course requirements. For other MU resources for students with disabilities, click on "Disability Resources" on the MU homepage.

Civility Statement

Because this class needs to be a participatory community if students are to fulfill their potential for learning, people who disrupt the community by their words or actions (rude, sarcastic, obscene or disrespectful speech or disruptive behavior) will be removed from class. In order to achieve our educational goals and to encourage the expression, testing, understanding and creation of a variety of ideas and opinions, respect must be shown to everyone.

Intellectual Pluralism

The University community welcomes intellectual diversity and respects student rights. Students who have questions concerning the quality of instruction in this class may address concerns to either the Departmental Chair or Divisional leader or Director of the [Office of Students Rights and Responsibilities](http://osrr.missouri.edu) (<http://osrr.missouri.edu>). All students will have the opportunity to submit an anonymous evaluation of the instructor(s) at the end of the course.

Academic Dishonesty

Academic integrity is fundamental to the activities and principles of a university. All members of the academic community must be confident that each person's work has been responsibly and honorably acquired, developed, and presented. Any effort to gain an advantage not given to all students is dishonest whether or not the effort is successful. The academic community regards breaches of the academic integrity rules as extremely serious matters. Sanctions for such a

breach may include academic sanctions from the instructor, including failing the course for any violation, to disciplinary sanctions ranging from probation to expulsion. When in doubt about plagiarism, paraphrasing, quoting, collaboration, or any other form of cheating, consult the course instructor.

Academic Dishonesty includes but is not necessarily limited to the following:

- A. Cheating or knowingly assisting another student in committing an act of cheating or other academic dishonesty.
- B. Plagiarism which includes but is not necessarily limited to submitting examinations, themes, reports, drawings, laboratory notes, or other material as one's own work when such work has been prepared by another person or copied from another person.
- C. Unauthorized possession of examinations or reserve library materials, or laboratory materials or experiments, or any other similar actions.
- D. Unauthorized changing of grades or markings on an examination or in an instructor's grade book or such change of any grade report.

Academic Integrity Pledge: Students are expected to adhere to this pledge on all graded work whether or not they are explicitly asked in advance to do so.

"I strive to uphold the University values of respect, responsibility, discovery, and excellence. On my honor, I pledge that I have neither given nor received unauthorized assistance on this work."

The University has specific academic dishonesty administrative procedures. Although policy states that cases of academic dishonesty must be reported to the Office of the Provost for possible action, the instructor may assign a failing grade for the assignment or a failing grade for the course, or may adjust the grade as deemed appropriate. The instructor also may require the student to repeat the assignment or to perform additional assignments. In instances where academic integrity is in question, faculty, staff and students should refer to Article VI of the Faculty Handbook. Article VI is also available in the M-Book. Article VI provides further information regarding the process by which violations are handled and sets forth a standard of excellence in our community.

GRADE DETERMINATION:

Since this is a course cross-listed as an upper level undergraduate course and an introductory graduate level course different requirements apply for undergraduate and graduate students.

For undergraduate students, the final grade for this course will be derived from quizzes, exams, lab reports, and seminar summaries.

For graduate students, one 5-8 page paper and a class presentation on the topic as well as additional seminar summaries will be part of the grade in addition to the requirements for undergraduate students.

Exam and quiz questions will be based solely on material covered during lecture and laboratory sessions. Information presented in the required text but not covered in class will not be included in the exams and quizzes. However, questions conceptual in nature will be asked and will likely

require integration of material presented in class and not represent a simple recitation of specifics presented in class.

Quizzes: Six quizzes will be given at random, unannounced times over the course of the Semester. Quizzes will consist of short answer, multiple-choice, and/or mix and match questions. Each quiz is worth 10 points. You may not make up any missed quizzes. A missed quiz is worth zero points. The lowest quiz grade (or missed quiz) will be dropped prior to calculation of the final grade.

Exams: Four exams will be given during scheduled lab times and may consist of short answer, multiple choice, true/false and matching questions. Each exam will cover any material from lecture and labs prior to it. In-term exams will not be comprehensive (i.e. only material covered since the last exam). The final exam will emphasize information presented after the fourth in-term exam and the remainder of the questions will cover any material presented prior to the fourth in-term exam. The three highest scores of the four in-term exams and the final exam will be used to calculate the exam portion of the final grade.

Make-up exams and quizzes: Generally speaking, make-up exams are not allowed. Make-up exams will only be given under exceptional circumstances to students that provide proof of a valid conflict. If you know you will have to miss an exam and have a justifiable reason, contact Dr. Fritschi before the exam. Determination of whether a reason is justifiable is at the discretion of the instructor. For example, interviews with post-graduation employer or graduate school are valid while work related conflicts are not valid justifications.

Lab Reports:

After a particular lab project (may cover multiple lab sessions) is completed, reports will be turned in during lab the following week. For every day of the week a report is late, 1 pt will be deducted from the final score. Due to the nature of the lab, it is impossible to make up a missed lab. If a lab is missed the report may be turned in on the due date minus 3 pts from the final score. Hand written reports are acceptable as long as handwriting is legible, but, typed reports are preferred.

Seminar Evaluations:

Seminar evaluations are required for all students (2 for undergraduate; 4 for graduate) and will be a component of the final grade. A schedule of seminars will be provided with reminders during lecture days. There are several pertinent seminar series offered at MU:

Plant Science: Wednesdays, 3:30 Monsanto Auditorium (LSC)

Interdisciplinary Plant Group: Mondays, 3:30 Monsanto Auditorium (LSC)

Biochemistry: Fridays, 1:00 Monsanto Auditorium (LSC)

Any of these seminar series will be adequate for summary requirements as long as they are plant-oriented. Seminars of particular applicability will be announced in class. Each summary will consist of filling out the form provided. Short paragraphs on the second page should be addressed carefully and responses should be submitted in typewritten format. Electronic submissions are accepted. Each report is due within 7 days of the seminar date. At least half of the seminar summaries have to be submitted before the third in-term exam and the other half

may be submitted anytime but before the last day of class. Failure to submit summaries by these deadlines will result in zero points for every late submission.

Graduate Student Project:

Graduate students are expected to write at 5-8 page paper. The paper may be in the form of a review similar to an introduction to a peer-reviewed journal article or a thesis or dissertation proposal. The paper is to be written in 12 point type on 8 1/2 x 11 paper with 1 inch margins. Complete citations are to be included (pick a format common to a plant science journal) but do not count toward the page requirement. The topic of the review has to be plant physiology-oriented and is to be selected in consultation with the instructor. Submission deadline for the review is April 23 (2 weeks prior to the last lecture).

Each graduate student will prepare a 15 min PowerPoint presentation on his/her literature review or proposal for presentation during the last lab section (May 4). The written report will be weighted 75% and the oral presentation 25% of the graduate student project.

Grading:	Undergraduate	Graduate
Exams* 5 @ 100 pts each.....	500	500
Quizzes 5 @ 10 pts each.....	50	50
Lab reports 7 [†] @ 10 pts each.....	70	70
Seminar summaries 2/4 @ 25 pts each.....	50	100
Graduate student project 1 @ 200pts.....	<u> </u>	<u>200</u>
Total.....	670	920

* Includes Final

† The number of lab reports will depend on lab project progress and whether a field trip will be possible.

Tentative Grading Scale:

Final grades will be determined by dividing the points a student receives by the total possible points to determine a percentage. Grading will be based on the following scale.

95.0 to 100.0%	A+
90.0 to <95.0%	A
88.0 to <90.0%	A-
86.0 to <88.0%	B+
80.0 to <86.0%	B
78.0 to <80.0%	B-
76.0 to <78.0%	C+
70.0 to <76.0%	C
68.0 to <70.0%	C-
66.0 to <68.0%	D+
60.0 to <66.0%	D
58.0.0 to <60.0 %	D-
less than 58.0%	F

Tentative Class Schedule:

Week	Date	Class	Topic
1	Jan. 20	Lecture	Course Introduction
	Jan. 22	Lecture	Plant Cells, Tissues, Meristems and Organs
2	Jan. 26	Lab	Setup of experiments
	Jan. 27	Lecture	The Plant Cell; Organelles, and Membranes
	Jan. 29	Lecture	Energy and Carbon Flow – Introduction; Photosynthesis
3	Feb. 2	Lab	Plant Morphology and Anatomy
	Feb. 3	Lecture	Photosynthesis
	Feb. 5	Lecture	Photosynthesis
4	Feb. 9	Lab	Exam 1
	Feb. 10	Lecture	Photosynthesis
	Feb. 12	Lecture	Respiration
5	Feb. 16	Lab	Seedling growth / Light
	Feb. 17	Lecture	Leaf/Plant Energy Budget – Scaling up to the canopy level
	Feb. 19	Lecture	Water relations
6	Feb. 23	Lab	Photosynthesis
	Feb. 24	Lecture	Water relations
	Feb. 26	Lecture	Water relations
7	Mar. 2	Lab	Exam 2
	Mar. 3	Lecture	Mineral nutrition
	Mar. 5	Lecture	Mineral nutrition
8	Mar. 9	Lab	Mineral nutrition experiment
	Mar. 10	Lecture	Mineral nutrition
	Mar. 12	Lecture	Phloem translocation; Seminar summaries due
9	Mar. 16	Lab	Exam 3
	Mar. 17	Lecture	Symbiosis
	Mar. 19	Lecture	Allelopathy
10	Mar. 23	No class	Spring Break
	Mar. 24	No class	Spring Break
	Mar. 26	No class	Spring Break
11	Mar. 30	Lab	Flex / Field trip
	Mar. 31	Lecture	Growth and development – Introduction
	Apr. 2	Lecture	Plant growth – a quantitative process; Quiz 4
12	Apr. 6	Lab	Water relations
	Apr. 7	Lecture	Growth and Allocation
	Apr. 9	Lecture	Cell walls, cell growth and differentiation
13	Apr. 13	Lab	Hormones / Allelopathy
	Apr. 14	Lecture	Hormones
	Apr. 16	Lecture	Hormones
14	Apr. 20	Lab	Exam 4
	Apr. 21	Lecture	Hormones
	Apr. 23	Lecture	Graduate student literature review due
15	Apr. 27	Lab	Flex / Field trip
	Apr. 28	Lecture	Light control of plant development
	Apr. 30	Lecture	Control of flowering
16	May 4	Lab	Graduate student presentations
	May 5	Lecture	Course evaluation
	May 7	Lecture	Review; Seminar Summaries due
17	May 15	Final Exam	10:30 am – 12:30 pm, 3-24 Ag Bldg

Field trip:

Every effort will be made to organize a field trip to Monsanto's facility in Chesterfield, MO. Whether this field trip will be possible will depend on the willingness of Monsanto to host our group and scheduling that permits all students to participate. If it can be accommodated, the field trip will be counted as two lab sessions and a field trip report instead of a lab report will be required.