COURSE OUTLINE: BIOL 3400/5400 Plant Physiology (Fall, 2010)

Lecture: **TR: 9:30 – 10:45 a.m. (BC 1025)**
Laboratory: **W: 12:00 - 2:50 p.m. (BC 2042)**

Instructor: Dr. Russ Goddard, 2090 Biology/Chemistry Bldg., 249-2642
Research Lab Location: 2079 Biology/Chemistry Bldg. or 1075 (Microscopy Lab)
email: rgoddard@valdosta.edu **Course Web Page**: http://www.valdosta.edu/~rgoddard/
Office Hours: TR 3:30 – 4:30 p.m.

Course Catalog Description: BIOL 3400, Plant Physiology, 3-3-4. Prerequisite: BIOL 2230, 2270 and CHEM 1211/1211L. An introduction to basic principles of plant function including physical processes occurring in plants, water relations in whole plants and plant tissues, cell physiology and biochemistry, and growth and development.

Text: Taiz, L., and E. Zeiger. 2010. Plant Physiology. 5th ed. Sinauer Associates, Inc. Publishers, Sunderland, MA ISBN: 978-0-87893-866-7 (casebound). Available at bookstore or online.

General Course Objectives: The instructor's goal in teaching this course is to give students a greater appreciation of the plant world we depend on and to stimulate student learning of basic concepts in plant and biological science. Specific course learning objectives aligned with Department and University learning objectives are listed at the end of this syllabus.

This course provides an introduction to basic principles of plant function, primarily covering physical processes in plants, metabolism, secondary products, cell physiology, and introducing principles of growth and development.

Grading: There are two parts to this course, the lecture and the laboratory. The lecture will provide an opportunity to discuss conceptual information in the text, and current topics in the subject. The laboratory will provide hands-on opportunities in structured labs and in independent investigations. Both will count toward your final grade.

Lecture Exams (300 pts): There will be 3 one-hour exams in this course. Each exam will cover approximately 1/3 of the lecture and reading material. All exams will cover material presented since the last lecture exam but could integrate cumulative information garnered from the entire semester. Each of the three exams will be worth 100 pts.

Labs, Lab Projects (100 pts.): There will be a formal weekly lab in BC 2042. Complete handouts generally will not be given for these labs (but you will receive instructions and background). Lab grading will be by attendance and participation (15% of lab grade), and an online lab notebook. After each lab study is completed, students (each lab group) should write up their results and analysis and send this to Dr. Goddard to place on the web page. Lab write-ups should be in the format of a scientific paper and should include any pictures that help others in understanding the lab. At least six completed write-ups are required during the semester for maximum credit (60 % of lab grade); at least half must be turned in before spring break. Each write-up can be prepared by groups of four students (maximum!) or less and should be emailed in Word, Rich text, text, or html format to rgoddard@valdosta.edu. Occasional pop quizzes may be given and will count also to your lab grade. Finally, each student must present at least one group lab in a PowerPoint format during the midterm or final lab symposium session (15% of grade)

Independent lab project (at least 10% of lab grade): During the course of the lab, students (minimum group of 2; max.= 4) will design a research project, conduct the experiment, record the results and then present it as a Web Poster. This project can be small or large as long as a testable question is asked and answered by results from specific experimentation. Progress reports may be necessary throughout the semester for independent projects.

FINAL SUBMISSIONS OF ALL ASSIGNMENTS ARE DUE BY Tuesday, Nov. 23, 2010 before the end of the University business day (5:30 p.m.). Note that the only assignment excepted from this deadline is a lab write-up for the last labs of the class.

BIOL 5400 requirement: (100 pts.) A written research paper discussing the current knowledge and questions regarding a topic in plant physiology will be required and due by Nov. 18, 2010. A complete paper would be one approximately 15 pages, double-spaced, 12 pt font. Alternatively, a complete 30 – 40 min PowerPoint presentation can be made to the class at a time to be arranged in lieu of the paper assignment. The PowerPoint presentation must also be accompanied by a complete reference list. The independent laboratory assignment will also be graded more rigorously and exceptional work is expected for this assignment.

Attendance: Students who miss class (lecture or laboratory) will lose points toward their final grade. Don't miss class.

The final grades will be based on a percentage of your cumulative points relative to the total points possible:

Guaranteed grade distribution is as follows (Max. pts = 400; for BIOL 3400 only):

A = 90-100%	(360 - 400 points)	D = 60-69%	(240 - 279 ")
B = 80-89%	(320 - 359 ")	F = ≤ 59%	(≤ 239 points)
C = 70-79%	(280 - 319 ")		

MAKE-UP EXAMS: I generally do NOT allow make-ups because the exams are given during the normally scheduled class times. If you know that you will miss an exam and believe that you have a justifiable reason for missing it, you must talk to me **BEFORE** the scheduled exam time, either in person or by phone to seek my approval and to arrange a suitable time to retake the exam. I determine whether you have a justifiable reason to arrange a make-up exam. Approved make-ups must be completed within 3 days of the scheduled exam date.

Tentative **EXAM SCHEDULE (dates to be announced during lecture):**

Approx. 1/3rd schedule:

Exam 1: Thursday, 16 Sept. 2010
Exam 2: Tuesday, 26 Oct. 2010
Exam 3: Thursday, 2 Dec. 2010

Final Exam Period: **Thursday, December 9, 2010** 10:15am-12:15pm
There is no comprehensive final exam but this time may be used for a presentation symposium of the lab projects and posters.

FERPA: The Family Educational Rights and Privacy Act (FERPA) prohibits the posting of grades by social security number or in any manner personally identifiable to the individual student. Grades will not be posted by social security number or by name. No grades can be given over the telephone, as positive identification can not be made by this manner.

Students with Disabilities: Students requesting classroom accommodations or modifications because of a documented disability should contact the Access Office for Students with Disabilities located in room 1115 Nevins Hall. The phone numbers are 245-2498 (voice) and 219-1348 (tty).

Tentative Lecture Schedule:

The textbook in this course was chosen for a number of reasons. One of these is that the organization of content in the book best follows the order that I teach the course.

Tentative Lecture and Laboratory Schedules: Mid-term is March 4, 2010

Lecture:		**Laboratory:**	Tentative Schedule
Week of / Date:	***Topics covered: Assigned Reading:(Chapter:pages)***	**Date:**	**Laboratory Exercise:**
Aug. 16	**What is Plant Physiology?** Botany Review	Aug. 18	Lab Introduction; Plant Propagation
Aug. 23	Plant and Cell Architecture (Chapt. 1)	Aug. 25	Plant Water Potential Plant Pressure Bomb; Transpiration
Aug. 30	Water Potential (Chapt. 3) Water Balance and Transport in Plants (Chapt. 4)	Sept. 1	Start Mineral Nutrition; discuss and design independent projects
Sept. 6	Membrane Potential and Solute Transport (Chapt. 6)	Sept. 8	Mineral Nutrition (cont'd)
Sept. 13 **Sept. 16**	Mineral Nutrition (Chapt. 5) **EXAM 1**	Sept. 15	Amylase induction during Seed Germination
Sept. 20	Mineral Assimilation (Chapt. 12)	Sept. 22	Analysis of α-amylase by glucose accumulation
Sept. 27	Phloem Transport (Chapt. 10)	Sept. 29	Analysis of α-amylase by starch hydrolysis
Oct. 4	**Biochemistry and Metabolism** Respiration and Lipid Metabolism (Chapt. 11)	Oct. 6	Analysis of Mineral Nutrition and Hormonal induction during seed germination or independent lab
Oct. 11	Photosynthesis: The light reactions (Chapt. 7) Photosynthesis: Carbon reactions (Chapt. 8)	Oct. 13	Student Oral Presentations I:
Oct. 18	Fall Break Holiday, Oct. 19; No class; Ps con't on Thursday	Oct. 20	Measurement and characterization of Photosynthesis
Oct. 25 **Oct. 26**	Photosythesis: Physiological and Ecological considerations (Chapt. 9) **EXAM 2**	Oct. 27	Measurement of the CO2 dependence of photosynthesis
Nov. 1	**Cellular Communication (Chapt. 14)**	Nov. 3	Measurement of Photorespiration in C3 and C4 plants.
Nov. 8	Plant Defenses: Surface protection and secondary metabolites (Chapt. 13)	Nov. 10	SDS-PAGE
Nov. 15	Plant Defense (cont'd)	Nov. 17	SDS-PAGE and Electroblotting of proteins
Nov. 22	**Growth and Development (Chapt. 16)** Growth, development, and differentiation	Nov. 24	Immunoblot-localization of cytoskeletal proteins in plant cells.
Nov. 29	Hormones Auxins, Gibberellins,Cytokinins, Ethylene, Abscisic Acid, Phytochrome	Dec. 1	Student Oral Presentations II: **Lab Clean-Up (Required!)**
Dec. 2	**EXAM 3**		

VSU administration has required that certain elements be included in all class syllabi. One of these requirements is that relevant course learning outcomes must be linked to the VSU General Educational Outcomes at http://www.valdosta.edu/academic/VSUGeneralEducationOutcomes.shtml and to the Biology Department educational outcomes listed on page 108 of the current undergraduate catolog. Students should be aware that the Biology department learning outcomes are extremely general and a more appropriate detailed outline of the learning outcomes we expect are represented by the ETS Biology Major Fields Test that we require seniors to complete and pass with a minimally acceptable score before graduating (see: http://www.ets.org/Media/Tests/MFT/pdf/mft_testdesc_biology_4bmf.pdf)

Course learning outcomes

Each Student will

- demonstrate understanding of the organization of plants from the level of cells through tissues, tissue systems, and organs. [BIOL 3; VSU 5]
- demonstrate understanding of developmental patterns and processes of plants. [BIOL 4; VSU 5]
- demonstrate understanding of organellar function at the cellular level of architecture. [BIOL 3; VSU 5]
- demonstrate understanding water potential and its effect on cellular function. [BIOL 3; VSU 5]
- demonstrate detailed understanding of the physiological mechanisms involved in the uptake and transport of water and the translocation of food by plants. [BIOL 3, 4; VSU 5]
- demonstrate understanding of the cellular establishment of membrane potential and its role in solute transport. [BIOL 3; VSU 5]
- demonstrate understanding of the mechanisms for procurement of mineral ions by plants and mineral nutrition and the role these minerals play in organic molecule synthesis and use. [BIOL 3; VSU 5]
- demonstrate understanding of the interrelationships among plants and micro-organisms symbiosis in nitrogen and phosphorous acquistion by plants. [BIOL 3, 5; VSU 5]
- demonstrate understanding of the assimilation of mimeral ions by plants particularly with respect to nitrogen and sulfur [BIOL 3,5; VSU 5].
- demonstrate understanding of the relationship of complementary metabolic pathways such as photosynthesis and respiration in energy acquistion and use during plant development [BIOL 3; VSU 5]
- demonstrate understanding of the environmental influences upon carbon metabolism in plants (e.g. with respect to alternative fixation pathways, photoinhibition, and photorespiration) [BIOL 3,5; VSU 5].
- demonstrate understanding of plant natural products with respect to their role in plant defense mechanisms [BIOL 3,5; VSU 5].
- demonstrate understanding of some of the complex cellular communication mechanisms in plant cells [BIOL 3,4; VSU 5].
- demonstrate understanding of the major effects and physiological mechanisms of growth regulators (hormones) in plants. [BIOL 4; VSU 5]
- formulate hypotheses, collect and analyze data, and present results in the standard format of a scientific paper. [BIOL 1; VSU 5]
- demonstrate the ability to work and use basic equipment effectively in the laboratory. [BIOL 1, VSU 5]
- demonstrate the ability to handle materials safely and analyze data in the laboratory. [BIOL 1, VSU 5, 7]
- demonstrate the ability use proper methods and procedures for insuring safety in the laboratory. [VSU 5]
- demonstrate comprehension of basic concepts and the ability to use scientific terminology accurately through effective oral and written communication. [BIOL 1, VSU 4, 5, 7]
- demonstrate the ability to follow oral and written instructions effectively. [VSU 7]
- demonstrate the ability to complete assignments and examinations ethically. [VSU 8]

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BIOL = Biology Department Educational Outcomes
VSU = VSU General Education Outcomes