

COURSE OUTLINE: BIOL 3400/5400 Plant Physiology (Fall, 2014)

CRN 81767 and 81794

Lecture: MWF: 8:00 – 8:50 a.m. (BC 1202)

Laboratory: M: 12:00 noon - 2:50 p.m. (BC 2040)

Instructor: Dr. Russ Goddard, 2090 Biology/Chemistry Bldg., 249-2642

email: rgoddard@valdosta.edu

Office Hours: MW: 10:15 – 11:50 a.m.

Course Catalog Description: BIOL 3400, Plant Physiology, 3-3-4. Prerequisite: BIOL 1107K, BIOL 1108K, BIOL 3200, CHEM 1211/1211L, CHEM 1212/1212L. 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: Jones, R., H. Ougham, H. Thomas, S. Waaland. 2012. The Molecular Life of Plants, Wiley-Blackwell ISBN: 978-0-470-87012-9

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 2040. Due to a lack of expensive equipment that is not duplicated, the formal lab period will often provide a demonstration of techniques and student groups will perform experiments independently using these techniques and apparatus. 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), quizzes, and an electronic lab notebook. Each group write-up can be prepared by groups of four students (maximum!) or less and each group is required to submit four lab write-ups during the semester. Each student of a group is required to serve as the primary author for one of the write-ups. After each lab study is completed, students (one per lab group) should write up their results and analysis in MS Word and send this as an attached document to Dr. Goddard by email (rgoddard@valdosta.edu). Lab write-ups should be in the format of a scientific paper and should include any pictures that help others in understanding the lab (cell phone cameras are allowed in lab). Write-ups will be evaluated as 50% of your lab grade; Lab write-ups should clearly indicate all names of all group members and who is serving as the primary author. It is strongly suggested that the primary author circulate a draft to all members of the group before sending a lab to Dr. Goddard. Group members can then share in editing since the group grade will be for all members. Some adjustment in individual group scores may be made after evaluations are completed by your group members. Additionally, assignments will be made for peers to review different group lab write-ups. Suggested deadlines for the completion of independent labs and turn in dates will be given by Dr. Goddard.

FINAL SUBMISSIONS OF ALL ASSIGNMENTS ARE DUE BY Friday 5 December 2014 before the end of the University business day (3:00 p.m.).

BIOL 5400 requirement: (100 pts.) Graduate students will be required to:

1. Conduct an independent research project using the knowledge and equipment introduced during laboratory. This must include original data and a complete write-up, PowerPoint presentation, or

- Poster presentation.
2. A choice of:
 - a. A written research paper discussing the current knowledge and questions regarding a topic in plant physiology. A complete paper would be one approximately 12 pages, double-spaced, 12 pt font.
 - b. An evaluation of one or more primary source literature articles dealing with current research in Plant Physiology that will be presented in oral and PowerPoint format to the class.

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):

	Undergraduate	Graduate
A = 90-100%	360 - 400 points	450 – 500 points
B = 80-89%	320 - 359 "	400 – 449 “
C = 70-79%	280 - 319 "	350 – 399 “
D = 60-69%	240 - 279 "	300 – 349 “
F = ≤ 59%	≤ 239 points	≤ 299 points

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 (final dates to be announced during lecture):

Approx. 1/3rd schedule:

Exam 1: Monday, 22 September 2014

Exam 2: Friday, 24 or 31 October 2014 (Exact date TBD by Dr. Goddard later)

Exam 3: Monday, 8 December 2014

Final Exam Period: Wednesday, December 10, 2013 8:00 a.m. - 10:00 a.m.

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) prohibit 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:

Tentative Lecture and Laboratory Schedules: **Mid-term is 2 October 2014; Last day to withdraw without penalty is 9 October 2014**

Lecture:		Laboratory:	Tentative Schedule
Week of / Date:	<i>Topics covered: Assigned Reading:(Chapter:pages)</i>	Date:	Laboratory Exercise:
Aug. 18	What is Plant Physiology? Botany Review	Aug. 18	Lab Introduction; Plant Cells and Tissues
Aug. 25	Plant and Cell Architecture	Aug. 25	Continue Plant Cells & Tissues; Start Plant Organ Structure
Sept. 1	Water Potential Water Balance and Transport in Plants	Sept. 1	Plant Structure: Organ Structure & Function; Roots, Stems, Leaves, Growth forms
Sept. 8	Membrane Potential and Solute Transport	Sept. 8	Plant Seeds, Germination, Seedling Dev't
Sept. 15	Mineral Nutrition	Sept. 15	Plant Water Potential Plant Pressure Bomb; Transpiration
Sept. 22	Mineral Assimilation EXAM 1 (9/22/14)	Sept. 22	Mineral Nutrition (Molarity, preparation of solutions), Independent Ψ investigations
Sept. 29	Phloem Transport	Sept. 29	Mineral Nutrition (cont'd)
Oct. 6	Biochemistry and Metabolism Respiration and Lipid Metabolism	Oct. 6	Mineral Nutrition (cont'd)
Oct. 13	Photosynthesis: The light reactions Photosynthesis: Carbon reactions	Oct. 13	Amylase induction during Seed Germination
Oct. 15	Photosynthesis: Physiological and Ecological considerations	Oct. 15	Analysis of α -amylase by glucose accumulation
Oct. 20	Cellular Communication EXAM 2 (10/24)?	Oct. 20	Analysis of α -amylase by starch hydrolysis
Oct. 27	Plant Defenses: Surface protection and secondary metabolites EXAM 2 (10/31)?	Oct. 27	Measurement and characterization of Photosynthesis
Nov. 3	Plant Defense (cont'd)	Nov. 3	Measurement of the CO ₂ dependence of photosynthesis
Nov. 10	Growth and Development Growth, development, and differentiation	Nov. 10	Measurement of Photorespiration in C ₃ and C ₄ plants.
Nov. 17	Hormones Auxins, Gibberellins, Cytokinins, Ethylene, Abscisic Acid, Phytochrome	Nov. 17	Measurement and characterization of Photosynthesis
Nov. 24	Thanksgiving Holidays: No Classes		
Dec. 1	Hormones (Con't)	Dec. 1	TBD; Independent investigations
Dec. 8	EXAM 3	Dec. 8	Mandatory Lab Clean-Up

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 catalog. 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: <https://www.ets.org/mft/about/content/biology>).

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 acquisition by plants. [BIOL 3, 5; VSU 5]
- demonstrate understanding of the assimilation of mineral 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 acquisition 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]

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