

Plant Biochemistry, Spring 2013
BOT 6935, section 4264, 4 credits

Meeting time and place

MTWTh, 4th Period, 133 Cancer/Genetics Research Complex

Instructors

Dr. Alice Harmon, 621 Carr Hall, harmon@ufl.edu, 392-9169. Office hours- most mornings

Dr. Charles Guy, 1509 Fifield Hall, clguy@ufl.edu , 273-4528 Available most days; call before coming to be sure I'm there.

Dr. Bala Rathinasabapathi (Dr. Saba), 2247 Fifield Hall, brath@ufl.edu , 352-273-4847. Meetings by appointment.

Dr. Donald McCarty, 2237 Fifield Hall, drm@ufl.edu, 352-273-4846. Meetings by appointment.

Course Description/Goals

The course is intended for students in the plant sciences. All topics are taught in the context of plant biology. Successful completion of this course will provide students with fundamental knowledge of biochemistry and specific knowledge of compounds and biochemical pathways that occur in plants.

Topics include

1. The biochemistry of amino acids and proteins, sugars and carbohydrates, and lipids.
2. Quantitative aspects of biochemistry including enzyme kinetics, protein-ligand binding, analytical techniques, and bioenergetics
3. Intermediary metabolism, discussed in the context of plant cell structure and function.
4. Biochemical processes and metabolic pathways that are specific to plants, including photosynthesis, photorespiration, cell wall biosynthesis, nitrate and sulfate assimilation, and plant secondary metabolism.

Learning Objectives and Outcomes

- Students will learn the structure, function and biosynthetic pathways of essential biochemical molecules including their key chemical and physical properties.
- Students will understand plant cell structure and organization and apply specific biochemical functions to all components of plant cell structure.
- Students will learn how membranes form and function and how the building blocks of membranes are made.
- Students will learn amino acid structures and relate their chemical properties to the synthesis and function of proteins and enzymes.

- Students will understand protein structural hierarchy and relate structure to function. The principles of enzyme kinetics will be learned and applied through hands on problem sets. Students will be shown how enzyme properties contribute to metabolic processes.
- Students will understand how light energy is captured and used to provide chemical forms of energy to power the functions of cells and whole plants. The importance of CO₂ fixation and carbohydrate metabolism will be presented. The nature and composition of plant cell walls will be explored.
- Students will learn about the rich diversity of secondary compounds and metabolism in plants and how such compounds contribute to human health.

Course Prerequisites

Students should have completed a course in introductory biology including plant biology (BSC 2010/11 or equivalent) and a course organic chemistry (CHM 2210/11 or equivalent) with a grade of C or better. Students are expected to be familiar with the chemistry and reactions of functional groups and with "pushing electrons."

Required Textbook

Lehninger Principles of Biochemistry, 4th or 5th edition, print version or e-book, by Nelson and Cox (W.H. Freeman and Company).

Recommended Textbook

Plant Biochemistry, by Bowsher, Steer, and Tobin, Garland Science, 2008

Course Home Page

From e-Learning (Sakai) you will be able to access notes and lecture slides, take quizzes, view the course calendar, view exam scores, access study questions, read course announcements and find information concerning assignments.

Login. Go to <http://lss.at.ufl.edu>, click on the Continue button under Sakai System Entry, and use your **Gatorlink ID and password to login**. If you cannot access e-Learning using this password, contact the computing helpdesk helpdesk@ufl.edu or call 392-HELP or visit them in the Hub to solve the problem.

Each time you log onto e-Learning, it will open the **Sakai Workspace** page. This is your "home E-Learning portal," where all of your courses with an E-Learning component are listed. If you are registered for this section of BOT 6935, then a link for this course will be shown. If you **just** registered for this course, you will need to wait 24 hours before the link to this course appears. If this course is still not listed in your MyE-Learning page, contact your instructor.

Attendance Policy

Regular attendance in class is expected because successful completion of the course is highly unlikely without direct participation in the lecture instructor-student dialog and discussion of the course content. Lecture notes and slide sets serve primarily as an outline to direct the content presented in lectures, and should not be considered a detailed account of all content presented in the lectures. Occasional unavoidable absences will not necessarily impact student performance in the course. However, if extended absences become necessary, the student should contact the course organizer to discuss options and strategies of how to make up missed work.

Quizzes

Quizzes and homework assignments will be scheduled by each instructor.

Exams

There will be five exams, which are each 100 points. Exams are not comprehensive and will cover the lectures specified in the lecture schedule. However, some questions may require knowledge of material covered on previous exams. Exams will consist of questions (multiple-choice, fill in the blank, short and long answer) and problems. The first four exams will be given at 6 pm on the days specified in the lecture schedule. The time and day of the fifth exam will be determined. Exams will cover details of structure, function, and pathways, major concepts, problem solving, data analysis. Each exam will be given two scores, the raw score and the scaled score. The raw score is the number of points answered correctly on the exam. The scaled score is the raw score plus a scaling factor, which weights the exam for difficulty. This system allows use of questions that are challenging for everyone in the class.

Make Up Exams and Course Work

Make Up exams will be given for legitimate excuses such as student illness or death in the immediate family. Make up exams that are requested for any other reason, will be given at the discretion of the instructor. These must be arranged ahead of the student's absence.

Grading scale

500 possible points from exams and up to 100 possible points from quizzes and homework assignments

Letter Grade	Grade Points	%
A	4.0	92-100
A-	3.67	87-91
B+	3.33	83-86

B	3.0	79-82
B-	2.67	73-78
C+	2.33	69-72
C	2.0	65-68
C-	1.67	60-64
D+	1.33	55-59
D	1.0	52-54
D-	0.67	50-53
E	0	0-49

Information on current UF grading policies can be found in the Graduate Catalog at: <http://gradschool.ufl.edu/catalog/current-catalog/catalog-general-regulations.html>

Academic Honesty

The Honor Code for the University of Florida reads, “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity”. You will sign all of your exam papers, which will confirm your pledge that you have neither given nor received unauthorized help in taking the exam.

Software Use Policy

Students are expected to be informed of the University’s policy on use of proprietary software and use of IT resources. These policies can be found at:

<http://www.it.ufl.edu/policies/aupolicy.html>

Accommodations for Students with Disabilities

Students requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student, who must then provide this documentation to the Instructor when requesting accommodation.

University Support Services

Resources are available on campus for students having test anxiety, personal problems or lacking clear career and academic goals that interfere with their academic performance. These resources include:

1. Counseling & Wellness Center, 301 Peabody Hall, 392-1575, personal and career counseling. <http://www.counseling.ufl.edu>
2. Student Health Care Center, 392-1161, personal counseling. <http://shcc.ufl.edu/>

3. Career Resource Center, Reitz Union, 392-1601, career development assistance and counseling. <http://www.crc.ufl.edu/>

Classroom etiquette

You are expected to be courteous to your fellow students and not interfere with their learning. You are expected to be on time, turn off cell phones, and talk only when the instructor asks you to. You may use a Laptop or tablet during class lectures, although using such devices for texting and other forms of personal communication are strongly discouraged.

BOT 6935 Plant Biochemistry				Spring 2013
DATE	DAY	#	TOPIC	Instructor ¹
Jan 7	M	1	Course overview Plants vs. Animals What you should already know What is expected of you	AH
8	T	2	Membranes and plant cell compartments	AH
9	W	3	Amino Acids, Peptides, Proteins I http://jmol.sourceforge.net/demo/aminoacids/	AH
10	Th	4	Amino Acids, Peptides, Proteins II	AH
14	M		Amino Acids, Peptides, Proteins III	
15	T	5	Protein Tertiary and Quaternary Structure (example: Rubisco)	AH
16	W	6	Enzymes I	AH
17	Th	7	Enzymes II	AH
21	M	8	Martin Luther King Day – No class	AH
22	T	9	Enzymes III	AH
23	W	10	Protein-Ligand Interaction I	DM
24	Th	11	Protein-Ligand Interaction II	DM
28	M	12	Protein-Ligand Interaction III	DM
29	T	13	Enzyme Kinetics I	DM
Exam 1 on classes 1-9, time and place TBD				
30	W	14	Enzyme Kinetics II	DM
31	Th	15	Enzyme Kinetics III	DM
Feb 4	M	16	Enzyme Kinetics IV	DM
5	T	17	Enzyme Kinetics V	DM
6	W	18	Enzyme Kinetics VI	DM
7	Th	19	Enzyme Kinetics VII	DM
11	M	20	DNA/RNA Hybridization Kinetics	DM
12	T	21	Oxidation/reduction, bioenergetics, ATP and NAD(P)H	AH
13	W	22	Light-dependent reactions of photosynthesis I	AH
14	Th	23	Light-dependent reactions of photosynthesis II	AH
18	M	24	Light-dependent reactions of photosynthesis III	AH
19	T	25	Carbohydrates I	AH
Exam 2 on classes 10-20, time and place TBD				
20	W	26	Carbohydrates II	AH
21	Th	27	Calvin Cycle	AH
25	M	28	Rubisco; photorespiration	AH
26	T	29	C4 Metabolism, CAM Metabolism	AH

Plant Biochemistry Syllabus

	27	W	30	Regulation of Metabolism	AH
	28	Th	31	Glycolysis	CG
Mar4-8				Spring Break	
	11	M	32	Oxidative Pentose Phosphate Pathway	CG
	12	T	33	Citric Acid Cycle	CG
Exam 3 on classes 21-30, time and place TBD					
DATE	DAY	#	TOPIC	Instructor [†]	
	13	W	34	Oxidative phosphorylation	CG
	14	Th	35	Plant mitochondrial function	CG
	18	M	36	Sucrose synthesis and breakdown	CG
	19	T	37	Starch structure and metabolism	CG
	20	W	38	Cell wall polysaccharides	CG
	22	Th	39	Phosphate uptake systems and role in cells	CG
	25	M	40	Nitrogen fixation	CG
	26	T	41	Nitrate assimilation	CG
	27	W	42	GS/GOGAT	CG
	28	Th	43	Sulfate assimilation	CG
Apr 1	M	44	Amino acid synthesis I	CG	
	2	T	45	Amino acid synthesis II	CG
	3	W	46	Fatty acid desaturation	BR
	4	Th	47	Fatty acid synthesis I	BR
	8	M	48	Fatty acid synthesis II	BR
	9	T	49	Fatty acid oxidation I	BR
Exam 4 on classes 31-45, time and place TBD					
	10	W	50	Fatty acid oxidation II	BR
	11	Th	51	Health promoting secondary products	BR
	15	M	52	Flavonoids I	BR
	16	T	53	Flavonoids II	BR
	17	W	54	Phenolics and ESPS synthase	BR
	18	Th	55	Terpene synthesis	BR
	22	M	56	Terpenoid synthesis	BR
	23	T	57	Alkaloids	BR
	24	W	58	Isoquinolone alkaloids	BR
TBA	W			Exam 5 on classes 46-58, date, time and place TBD	

[†]AH, Dr. Alice Harmon; CG, Dr. Charles Guy, BR, Dr. Bala Rathinasabapathi