

**Plant Biochemistry, Spring 2014**  
**BOT 6935, section 4264, 4 credits**

***Meeting time and place***

MTWTh, 4<sup>th</sup> Period, 133 Cancer/Genetics Research Complex

***Instructors***

Dr. Alice Harmon, 621 Carr Hall, [harmon@ufl.edu](mailto:harmon@ufl.edu), 392-9169. Office hours- most mornings

Dr. Charles Guy, 1535 Fifield Hall, [clguy@ufl.edu](mailto: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](mailto:brath@ufl.edu) , 352-273-4847. Meetings by appointment.

Dr. Donald McCarty, 2237 Fifield Hall, [drm@ufl.edu](mailto: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 CO<sub>2</sub> 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*, 5<sup>th</sup> or 6<sup>th</sup> 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](mailto: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.

### ***Lecture Schedule***

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

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17	M	24	Light-dependent reactions of photosynthesis III	AH
18	T	25	Carbohydrates I	AH
18	T	<b>Exam 2</b> on classes 10-20, time and place TBD		
19	W	26	Carbohydrates II	AH
20	Th	27	Calvin Cycle	AH
DATE	DAY	#	TOPIC	Instructor <sup>1</sup>
24	M	28	Rubisco; photorespiration	AH
25	T	29	C4 Metabolism, CAM Metabolism	AH
26	W	30	Regulation of Metabolism	AH
27	Th	31	Glycolysis	CG
Mar3-7			<b>Spring Break</b>	
10	M	32	Glycolysis continued	CG
11	T	33	Oxidative Pentose Phosphate Pathway	CG
11	T	<b>Exam 3</b> on classes 21-30, time and place TBD		
12	W	34	Citric Acid Cycle	CG
13	Th	35	Oxidative phosphorylation	CG
17	M	36	Plant mitochondrial function	CG
18	T	37	Sucrose synthesis and breakdown	CG
19	W	38	Starch structure and metabolism	CG
20	Th	39	Cell wall polysaccharides	CG
24	M	40	Phosphate uptake systems and role in cells	CG
25	T	41	Nitrogen fixation	CG
26	W	42	Nitrate assimilation	CG
27	Th	43	GS/GOGAT	CG
31	M	44	Sulfate assimilation and amino acid synthesis	CG
Apr 1	T	45	Acetylation/ deacetylation regulation of primary metabolism	CG
2	W	46	Fatty acid desaturation	BR
3	Th	47	Fatty acid synthesis I	BR
7	M	48	Fatty acid synthesis II	BR
8	T	49	Fatty acid oxidation I	BR
8	T	<b>Exam 4</b> on classes 31-45, time and place TBD		
9	W	50	Fatty acid oxidation II Oxylipins and Jasmonates	BR
10	Th	51	Health promoting secondary products	BR
14	M	52	Flavonoids I	BR
15	T	53	Flavonoids II	BR
16	W	54	Phenolics and ESPS synthase	BR
18	Th	55	Terpene synthesis	BR
21	M	56	Carotenoids	BR
22	T	57	Alkaloids I	BR
23	W	58	Alkaloids II	BR
TBA		<b>Exam 5</b> on classes 46-58, date, time and place TBD		

<sup>1</sup>AH, Dr. Alice Harmon; CG, Dr. Charles Guy; BR, Dr. Bala Rathinasabapathi