Plant Biochemistry, Spring 2019

HOS 6932 (formerly PCB 6935), **Section 4C66**, Class 22263
Meets: 10:40-11:30, MTWTh, Fifield 1304, 4 graduate credits

Instructors:

Karen E. Koch	2147 Fifield Hall, 352-273-4833. kekoch@ufl.edu
Donald R. McCarty	2237 Fifield Hall, 352-273-4846, drm@ufl.edu
Bala "Saba" Rathinasabapathi	2247 Fifield Hall, 352-273-4847. brath@ufl.edu
Alice Harmon	(Emeritus, course consultant)

Office hours: Meetings by appointment

Topics will include:

--- Biochemical adaptations to biotic and abiotic stresses
--- Biochemical basis for diverse plant responses and phenotypes
--- Metabolic phenotypes and their influence on plant development
--- Metabolic micro-environments and their significance
--- Biochemistry of specialized products (caffeine, cannabinoids, theobromine, etc.)
--- Biosynthesis, storage, and metabolism of key plant products.
--- Structure and function of plant proteins, from enzymes and transporters to motors
--- Mechanisms of enzyme and transporter function, from kinetics to ligand binding
--- Principles of metabolic modeling and flux balance analysis.
--- Fundamental aspects of plant biochemistry and metabolism in an organismal context.

Lecture Schedule:

Date	Day	Title	Presenter	Room
Jan 7	M	Plant cell compartments and metabolic micro-environments	All	1304
Jan 8	Tu	Amino acids: Keys to protein structure and function	DM	*1301
Jan 9	W	Exploiting protein diversity for separation and purification	DM	1304
Jan 10	Th	Fundamentals of protein structure, crystallography, NMR	DM	*1301
Jan 14	M	Building 3D models of proteins by homology	DM	1304
Jan 15	Tu	Clues to protein function: conserved domains & phylogenetics	DM	1304
Jan 16	W	Working class proteins: Enzymes and catalysis	DM	1304
Jan 17	Th	Ruling class proteins: Transcription factors and protein kinases	DM	1304
Jan 21	M	No Class- MLK holiday		
Jan 22	Tu	Movers and shakers: Molecular motors couple ATP to motion	DM	*1301
Jan 23	W	Discussion, integration and review for exam 1	DM	1304
Jan 24	Th	**Exam 1**	DM	1304
Jan 28	M	Light, photo-chemistry, and photoreceptors	KK	1304
Jan 29	Tu	Photosynthesis: Photo-systems, electron transport, ^{+}H gradient	KK	1304
Jan 30	W	Antioxidants, redox reactions, protective systems	KK	1304
Jan 31	Th	Photosynthesis: CO_2 assimilation, photorespiration	KK	1304
Feb 4	M	Photosynthesis: NO_3, NO_2, and NH_3 assimilation	KK	1304

Feb 5	Tu	C/N balance in C3, C4, and CAM photosynthesis	KK	1304
Feb 6	W	Clock systems and diurnal regulation	KK	1304
Feb 7	Th	Starch structure, biosynthesis, and metabolism	KK	1304
Feb 11	M	Synthesis of sugars, amino acids, and their phloem transport	KK	1304
Feb 12	Tu	Regulation of photosynthesis: Feedback via gene repression	KK	1304
Feb 13	W	Review	KK	1304
Feb 14	Th	**Exam 2**	KK	1304
Feb 18	M	Sucrose import by sinks, its metabolism, sugar signaling	KK	1304
Feb 19	Tu	Polysaccharides: Cell wall structure, biosynthesis, metabolism	KK	1304
Feb 20	W	Glycolysis: Overview	KK	1304
Feb 21	Th	Glycolysis: Update on enzymes and their significance	KK	1304
Feb 25	M	Oxidative pentose phosphate pathway	KK	1304
Feb 26	Tu	Mitochondrial functions: Electron transport, $^{+}$H gradients	KK	*1301
Feb 27	W	Mitochondrial functions: Overview of citric-acid cycle	KK	1304
Feb 28	Th	Citric acid cycle: Update on the enzymes and their significance	KK	1304
Mar 4-7		no Class - Spring Break		
Mar 11	M	Regulation of primary metabolism	KK	1304
Mar 12	Tu	**Exam 3**	KK	1304
Mar 13	W	Fatty acid desaturation	BR	*1301
Mar 14	Th	Fatty acid synthesis I	BR	1304
Mar 18	M	Fatty acid synthesis II	BR	1304
Mar 19	Tu	Fatty acid oxidation I	BR	1304
Mar 20	W	Fatty acid oxidation II	BR	1304
Mar 21	Th	Health promoting secondary products	BR	1304
Mar 25	M	Flavonoids I	BR	1304
Mar 26	Tu	Flavonoids II	BR	*1301
Mar 27	W	Phenolics and ESPS synthase	BR	1304
Mar 28	Th	Terpene synthesis	BR	1304
April 1	M	Carotenoids	BR	1304
April 2	Tu	Alkaloids I	BR	1304
April 3	W	Alkaloids II	BR	1304
April 4	Th	**Exam 4**	BR	1304
April 8	M	Thermodynamics of ligands binding to proteins	DM	1304
April 9	Tu	Saturable binding of molecules to proteins	DM	1304
April 10	W	Cooperativity: Hill and Monod-Wyman-Changeux models	DM	1304
April 11	Th	Equilibrium enzyme kinetics	DM	1304
April 15	M	Steady-state enzyme kinetics	DM	1304
April 16	Tu	Allosteric enzymes: cooperative kinetics	DM	1304
April 17	W	Metabolic Control Analysis: kinetics applied to pathways	DM	1304
April 18	Th	Flux Balance Analysis: systems modeling of metabolism	DM	1304
April 22	M	Applications of Flux Balance Analysis	DM	1304
April 23	Tu	Discussion, integration and review for exam V	DM	*1301
April 24	W	**Exam 5**	DM	1304

Fifield 1304 is in the central hallway, first floor.
Fifield *1301 is adjacent to the main lobby.
Instructors: DM (Donald McCarty), KK (Karen Koch), BR (Bala “Saba” Rathinasabapathi)

Course Prerequisites

A course in introductory biology that includes plant biology (BSC 2010/11 or equivalent) and a course in 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.

Required Textbooks

1. *Biochemistry & Molecular Biology of Plants*, Second edition, print or electronic version, 2015, Wiley Blackwell
2. A general biochemistry textbook - Check online booksellers for inexpensive older versions. The following is free online –
   Biochemistry, 5th edition, by Berg, Tymoczko and Stryer, New York: WH Freeman, 2002, http://www.ncbi.nlm.nih.gov/books/NBK21154/

Course Home Page

From e-Learning (Canvas): 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://elearning.ufl.edu, click on the Continue button under Canvas 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.

Attendance Policy

Course grading will include class participation (discussions during class and ongoing dialog between students and faculty during presentations). Also, 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 (1 or 2) will not necessarily impact student performance in the course. However, students should contact the course organizer to discuss options and strategies of how to make up missed work.

Quizzes and homework

Quizzes and homework assignments will be scheduled by each instructor.

Exams

There will be five exams, each worth 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. Some exams will be given in class, and others will be take-home. Exams will consist of questions (multiple-choice, fill in the blank, short and long answer) and problems. Exams will cover details of structure, function, and pathways, major concepts, problem solving, and data analysis.

Make up exams and coursework 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	%	Letter Grade	Grade Points	%
A	4.0	92-100	C	2.0	65-68
A-	3.67	87-91	C-	1.67	60-64
B+	3.33	83-86	D+	1.33	55-59
B	3.0	79-82	D	1.0	52-54
B-	2.67	73-78	D-	0.67	50-53
C+	2.33	69-72	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.
Plagiarism: Please know the definition in an academic context. You may NOT use direct text from anyone or their website without "quotation marks." Simple citation at the end of a borrowed section of their work is NOT adequate. It is also unacceptable to modify their wording slightly, and then add a quotation.

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/
4. Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

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.