BCM 678 Perspectives in Biochemistry – Fall 2015

Instructor:	Carlos Castañeda	Phone:	315-443-3673
Office:	3-010 Center for Science & Technology	E-mail:	cacastan@syr.edu
Office Hours:	TBA or by appointment	Website:	**blackboard.syr.edu (BCM.678)**
Meetings:	MW 8:00-9:20, LSB 126		

Prerequisites:

(1) Two semesters of Organic Chemistry,
(2) Undergraduate-level understanding of chemical thermodynamics and kinetics as covered in a high-quality course in General Chemistry,
(3) Graduate student standing or permission from the instructor.

Course Description:

This rapidly paced survey of Biochemistry will be completed in one semester. The emphasis is on **unifying and understanding** concepts of Chemistry and Biology rather than memorizing material. The course requires a graduate-level background in science so that we can consider about 60-70% of biochemical topics that are typically included in a two-semester biochemistry sequence. At times, we will focus on state-of-the-art topics in biochemistry not covered in the textbook. I will strive to make this course as fun, informative, and interactive as possible.

Topics that are covered in depth include: Amino acids & peptides, protein structure, protein folding, structural biology tools, thermodynamics, enzyme kinetics, enzymatic mechanisms, enzyme regulation, lipids, membranes, nucleotides, bioenergetics, glycolysis, TCA cycle, electron transport chain, oxidative phosphorylation, gluconeogenesis, glycogen metabolism, , fatty acid catabolism and anabolism, metabolic integration, protein synthesis, protein degradation, and cell signaling.

Important topics that are covered briefly include: Nucleic acid structure, recombinant DNA, DNA replication and repair, transcription, cell biology, molecular motors, photosynthesis, pentose phosphate pathway, nitrogen acquisition and amino acid metabolism, synthesis and degradation of nucleotides. **In depth resource material covering these topics is available to students in chapters of the required text.**

Learning Outcomes:

After taking this course, the students will be able to:

1. Students will be able to analyze emerging issues in Biochemistry against the background of information accumulated in the field in the past.

2. Students will acquire the tools and understanding to explore aspects of Biochemistry that are not covered in course lectures.

3. Students will be able to recall and utilize fundamental unifying concepts in Biochemical situations, as in the mathematical structure of the laws of thermodynamics and equilibrium, the forces that drive protein folding and quaternary association, bioenergetics & metabolism.

Requirements:

All students must purchase the Biochemistry textbook:

R.H. Garrett and C.M. Grisham, *Biochemistry*, 5th edition (2013) ISBN: 978-1-133-10629-6

Several options are available for you:

Option 1. Purchase the textbook and OWL homework from
http://www.cengagebrain.com/course/1-20NL3CU

Option 2. Purchase the textbook and OWL homework direct from the SU bookstore.

Supplementary Reading Material:

Voet and Voet. *Biochemistry*, 4th edition (2011) – very thorough and detail-oriented textbook.

Berg, Tymoczko, Stryer. *Biochemistry*, 7th edition (2012) – text commonly used in undergraduate courses.

Grading:

Problem sets (20%), 3 exams (total 55%), final in-class presentation (15%), and participation (10%).

A-/A: >85-100% B-/B/B+: >70-85% C-/C/C+: 60-70%

This grading scale is approximate.

It is very important that you keep up with the course reading material, as we will cover a lot in a short period of time. For this reason, we will have occasional problem sets and JITT (just-in-time teaching) exercises (part of your participation grade) to ensure that topics are reinforced and that course material is being read PRIOR to class.

Participation is key. You are expected to attend all lectures.

Exams will consist of multiple-choice, short-answer questions, etc. I encourage all of you to work together to teach each other. The best way to learn something is to teach. However, you are expected to complete all assignments ON YOUR OWN.

This is all meant to help you, the student, master the course material. If you have any questions or concerns, feel free to contact me for an appointment or see me during office hours. Let me know if something is unclear!

Course Specific Policies on attendance, late work, make up work, examinations if outside normal class time, etc.:

Students should make an appointment with the lecturer to discuss items outside normal lecture times. A student who misses a lecture should contact the instructor.

Academic Integrity

Syracuse University's academic integrity policy reflects the high value that we, as a university community, place on honesty in academic work. The policy defines our expectations for academic honesty and holds students accountable for the integrity of all work they submit. Students should understand that it is their responsibility to learn about course-specific expectations, as well as about university-wide academic integrity expectations. The university policy governs appropriate citation and use of sources, the integrity of work submitted in exams and assignments, and the veracity of signatures on attendance sheets and other verification of participation in class activities. The policy also prohibits students from submitting the same written work in more than one class without receiving written authorization in advance from both instructors. The presumptive penalty for a first instance of academic dishonesty by an undergraduate student is course failure, accompanied by a transcript notation indicating that the failure resulted from a violation of academic integrity policy. The presumptive penalty for a first instance of academic dishonesty by a graduate student is suspension or expulsion. SU students are required to read an online summary of the university's academic integrity expectations and provide an electronic signature agreeing to abide by them twice a year during pre-term check-in on MySlice. For more information and the complete policy, see http://academicintegrity.syr.edu.

Disability-Related Accommodations

If you believe that you need accommodations for a disability, please contact the Office of Disability Services (ODS), http://disabilityservices.syr.edu, located at 804 University Avenue, room 309, or call 315-443-4498 for an appointment to discuss your needs and the process for requesting accommodations. ODS is responsible for coordinating disability-related accommodations and will issue "Accommodation Authorization Letters" to students with documented disabilities as appropriate. Since accommodations may require early planning and generally are not provided retroactively, please contact ODS as soon as possible.

You are also welcome to contact me privately to discuss your academic needs although I cannot arrange for disability-related accommodations.

Religious Observances Policy

SU religious observances policy, found at http://supolicies.syr.edu/emp_ben/religious_observance.htm, recognizes the diversity of faiths represented among the campus community and protects the rights of students, faculty, and staff to observe religious holidays according to their tradition. Under the policy, students are provided an opportunity to make up any examination, study, or work requirements that may be missed due to are religious observance provided they notify their instructors before the end of the second week of classes. For fall and spring semesters, an online notification process is available through MySlice/StudentServices/Enrollment/MyReligiousObservances from the first day of class until the end of the second week of class.

Tentative Class Schedule

Date		Material	Chapter
8/31/2015	M	Introduction to Biochemistry, Water, pH, pKa	1,2
9/2/2015	W	Amino Acids, and Protein Intro – Primary Structure	4
9/7/2015	M	--- NO CLASS --- LABOR DAY	
9/9/2015	W	Thermodynamics in Biological Systems, Protein Folding	3 and 6
9/14/2015	M	Proteins – Protein Folding and Forces	3 and 6
9/16/2015	W	Proteins – Purification	5
9/21/2015	M	Proteins – Secondary structure, higher order structure	5,6
9/23/2015	W	Proteins - Tools of structural biology (e.g. X-Ray, NMR)	6
9/25/2015	F*	**Exam 1 - CH 1-6 + notes**	
9/28/2015	M	Enzyme kinetics 1	13
9/30/2015	W	Enzyme kinetics 2	13
10/5/2015	M	Enzyme mechanisms 1	14
10/7/2015	W	Enzyme mechanisms 2	14
10/12/2015	M	Enzyme regulation	15
10/14/2015	W	Lipids, Membranes, Membrane Proteins e.g. Potassium Channel	8, 9
10/19/2015	M	**Exam 2 - CH 13-15, 8-9 + notes**	
10/21/2015	W	Carbohydrates & Metabolism Overview	7, 17
10/26/2015	M	Glycolysis 1	18
10/28/2015	W	Glycolysis 2	18
11/2/2015	M	TCA Cycle	19
11/4/2015	W	Electron Transport Chain & Oxidative Phosphorylation	20
11/9/2015	M	Gluconeogenesis and Pentose Phosphate Pathway	22
11/11/2015	W	Fatty Acid Synthesis and Oxidation	23,24
11/13/2015	F*	**Exam 3 - CH 17-20, 22-24 + notes**	
11/16/2015	M	Integration of Metabolism	27
11/18/2015	W	Overview of Transcription, Translation	29-30
11/21 – 11/29		--- NO CLASS --- Thanksgiving Break	
11/30/2015	M	"A day in a protein's life"	31
12/2/2015	W	Cell signaling	32
12/7/2015	M	Presentations	
12/9/2015	W	Presentations	