

BIOE 135

Biochemistry for Engineers

Spring, 2018

Professor: Prof. Eva de Alba

Office Hours: Mondays and Wednesdays (11:30 am-1:00 pm). S&E Building 2. Rm 382.

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Lecture: Mondays and Wednesdays (9:00 am to 10:15 am). COB 114. From January 16th to May 4th.

Discussion Sessions: Mondays (10:30-11:20 am). COB 261. From January 16th to May 4th.

Required Text: This course requires the textbook:

1) Fundamentals of Biochemistry 5th Edition by Donald Voet, Judith G. Voet & Charlotte W. Pratt. (2016) Wiley ISBN: 978-1118918401

Additional readings: Additional readings can be found at the UC Merced Kolligian Library, or through the ILL system.

I. Course Overview: Biochemistry involves the characterization of the macromolecules of life from both structural and functional standpoints. An in-depth understanding of the chemical, structural, and functional properties of biomolecules is an essential step towards comprehending the molecular basis of Biology and being able to design and implement the engineering solutions to biological and biomedical problems that are at the core of Biological Engineering. Students in this course will learn the fundamental concepts of biomolecular structure and function, the chemical and structural properties of proteins, nucleic acids, lipids and carbohydrates, the mechanisms for their assembly and function, and the tools/approaches used in their isolation and characterization. The emphasis of BIOE135 is on meeting the specific educational needs of bioengineering majors and thus focuses on the more analytical and quantitative aspects of the discipline.

II. Course Learning Goals and Outcomes: *By the end of this course, students will be able to:*

1. Describe, understand and use the fundamental tools and techniques employed for the structural and functional analysis of biomolecules.
2. Learn the basic concepts of biomolecular structure and function and their connection with their biological roles.
3. Describe, understand and rationalize the different types of biomolecules, their chemical

and structural properties, and how are those properties utilized in performing their biological function.

4. Show mastery of fundamental topics in biochemistry, including sequence/structure/function relationships; physical factors determining biomolecular structure, folding and stability; methods and techniques for structural and functional analysis of biomolecules; enzymatic catalysis and regulation; ligand binding and cooperativity; lipids and membranes, biomolecular transport; conformational changes. At the end of the course, the students should be able to converse with scientists and read technical literature about all these topics.

5. Articulate the scientific vocabulary used in communicating scientific information in biochemistry and biomolecular engineering.

III. Relation to the following ABET Problem Learning Outcomes (PLOs):

(a) an ability to apply knowledge of mathematics, science, and engineering (b) an ability to design and conduct experiments, as well as to analyze and interpret data
(e) an ability to identify, formulate, and solve engineering problems
(f) an understanding of professional and ethical responsibility
(g) an ability to communicate effectively
(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
(i) a recognition of the need for, and an ability to engage in life-long learning (j) a knowledge of contemporary issues
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

III. Course Policies:

1. Attendance is mandatory. This course requires the user of clickers to answer questions during class, so each student is responsible for bringing a clicker in working condition. Scientific calculator will be needed for the review sessions. No cell phone or recording devices are allowed in class.

2. Recitation Sections: Recitation sections are provided to help the student learn and understand the material from lectures. Students need to come to recitation sections prepared with questions and participate actively on them to get their full value. During most recitations, the TA will either give a quiz or assign a homework set. There are no make-up quizzes or homework sets. Work must be shown for homework assignments, and these cannot be turned in late.

IV. Course Requirements and Grading:

Prerequisites by Topic: MATH 21, PHYS 9 or 19, CHEM 8 and 10

Grading for BIOE 135

60% Exams:

Midterm Exam – 30%

Final Exam – 30%

20% Class Participation (Students will be quizzed regularly. The students will be informed of their cumulative score to date from class participation before the midterm exam and two weeks before the final exam)

20% Quizzes and Homework from Recitation Sections

Exam dates/times cannot be modified for anyone unless there is written and certified justification of the need to change

The final course grade will be calculated from the overall numerical score obtained during the course converted onto a letter grade according to the following recipe:

A+ :94-100%

A : 87-93%

A- : 81-86%

B+ : 76-80%

B : 71-75%

B- : 66-70%

C+ : 61-65%

C : 56-60%

C- : 50-55%

D : 45-49%

F : < 45

Academic Dishonesty Statement:

a. Each student in this course is expected to abide by the University of California, Merced's Academic Honesty Policy. Any work submitted by a student in this course for academic credit will be the student's own work.

b. You are encouraged to study together and to discuss information and concepts covered in lecture and the sections with other students. You can give "consulting" help to or receive "consulting" help from such students. However, this permissible cooperation should never involve one student having possession of a copy of all or part of work done by someone else, in the form of an e mail, an e mail attachment file, a diskette, or a hard copy. Should copying occur, both the student who copied work from another student and the student who gave material to be copied will both automatically receive a zero for the assignment. Penalty for violation of this Policy can also be extended to include failure of the course and University disciplinary action.

c. During examinations, you must do your own work. Talking or discussion is not permitted during the examinations, nor may you compare papers, copy from others, or collaborate in any way. Any collaborative behavior during the examinations will result in failure of the exam, and may lead to failure of the course and University disciplinary action.

Disability Statement: Accommodations for Students with Disabilities: The University of California Merced is committed to ensuring equal academic opportunities and inclusion for students with disabilities based on the principles of independent living, accessible universal design and diversity. Requests for academic accommodations are to be made during the first three weeks of the semester, except for unusual circumstances. Students are encouraged to register with Disability Services Center to verify their eligibility for appropriate accommodations.

Counseling and Psychological Services: The mission of UC Merced Counseling and Psychological Services (CAPS) is to support the mental health and well-being of our students. It is the intention of all CAPS staff to provide a safe, confidential atmosphere of acceptance and accessibility to professionals in the field of psychology.

Contact Information (Confidential Help)

Phone: (209) 228-4266
counseling@ucmerced.edu

Discrimination & Sexual Violence Prevention: The University of California is committed to creating and maintaining a community where all individuals who participate in university programs and activities can work and learn together in an environment free of harassment, exploitation or intimidation.

Contact Information

Phone: (209) 285-9510
msalvador2@ucmerced.edu, Michael Salvador, Director of Compliance,

CARE Office: Campus Advocacy, Resources, & Education (CARE) provides prevention education for the UC Merced community to achieve an environment free from the threat of sexual violence, dating/domestic violence, and stalking. They provide free and confidential assistance for all UC Merced affiliates (including Undergraduate students, Graduate students, Staff and Faculty).

Contact Information (Confidential Help)

Campus Advocate: Valara Villanueva
(209) 386-2051

Food Assistances (HEROES): CalFresh is a monthly stipend system to purchase food at markets and food stores.

Contact Information

Phone: 209-228-41320
heroes@ucmerced.edu

Tentative Lecture Schedule: Spring 2018 (Note: Lecture schedule might be modified)

Week 1

Chapter 2- Chemical and Physical Properties of Water

Week 2

Chapter 3- Nucleotides, Nucleic Acids, and Genetic Information

Week 3

Chapter 4- Amino Acids

Week 4

Chapter 5- Proteins Primary Structure, Working with Proteins

Week 5

Chapter 6- Proteins Three-Dimensional Structure

Week 6

Chapter 7- Protein Function (Ligand Binding and Cooperativity)

Week 7

Chapter 8- Carbohydrates

MIDTERM EXAM

Week 8

Chapter 9- Lipids and Biological Membranes

Week 9

Chapter 10- Membrane Transport

Week 10

Chapter 11- Enzyme Catalysis

Week 11

Chapter 12- Enzyme Kinetics, Inhibition, and Control

Week 12

Chapter 13- Biochemical Signaling

Week 13

Chapter 14- Nucleic Acid Structure

Week 14

Chapters 15-16- DNA Replication, Recombination, Transcription and RNA Processing

Week 15

Chapter 17- Protein Synthesis

Week 16

Chapter 18- Regulation of Gene Expression

Review of Covered Material

FINAL EXAM: Tuesday May 8th; 11:30 am – 2:30 pm; COB 114