

CHEM 3831: Advanced Protein Biochemistry

FALL 2019

Instructor: Dr. Martin Margittai

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Class hours: MWF 9:00 AM – 9:50 AM, Olin Hall 103

Office hours: Tuesdays 2:00 PM – 3:00 PM, or by appointment

Course description:

This advanced biochemistry course provides fundamental insights into the chemistry and physics of proteins. It will investigate how amino acids form proteins with highly complex three dimensional structures and how these structures mediate function. Topics will range from protein folding to enzyme kinetics and will emphasize basic principles. We will examine key research articles and their contribution to our current understanding of proteins. The course bridges the gap between the research literature and introductory Protein-Biochemistry. Students will learn how to extract important information out of primary research articles and how to place this information into the larger context of protein science.

Grading:

Exams 1-3 (20% each), paper critique (10%), group assignments (10%), presentation (20%).

Exams: There are two 1-hour midterm exams during the quarter, plus a 2-hour cumulative final exam. Each exam is worth 100 points. Exam questions will be non-multiple choice.

Paper Critique: Students will write a 1-page critique (Font: Arial, Size: 11, Margin: 1 inch) of a primary research paper. A link to the paper will be posted on Canvas in the third week of the quarter. The critique should be submitted electronically to above email address and is due November 1 at 11:59 PM. Only one submission is permitted. This assignment is worth 50 points.

Group Assignments: There will be two in-class group assignments. These activities are worth 25 points each.

Presentation: Students in groups of 2 (and 3) will present a primary research paper. These papers and additional information on presentation time and grading will be provided during the quarter. Presentations are worth 100 points.

Suggested readings:

Lehninger Principles of Biochemistry (7th edition) by Nelson and Cox

Links to primary research papers and classic review articles will be posted on Canvas and complement the main text.

Dates	Topics Covered	Reading Chapters
09/09/19	Water: Weak Interactions and Solvation	2
09/11/19	Water: Weak Acids and Bases/Buffers and Hydrolysis	2
09/13/19	Amino Acids	3
09/16/19	Protein Primary Structure	3
09/18/19	Protein Purification	3
09/20/19	Protein Sequencing and Synthesis	3
09/23/19	Secondary Structure	4
09/25/19	Tertiary Structure/Fibrous Proteins	4
09/27/19	Tertiary Structure/Soluble Proteins	4
09/30/19	Exam 1	
10/02/19	Quaternary Structure	4
10/04/19	Protein Denaturation and Folding	4
10/07/19	Assisted Protein Folding	4
10/09/19	Protein Dynamics and Degradation	4
10/11/19	Protein Misfolding and Disease	4
10/14/19	Intrinsically Disordered Proteins and Phase Separation 1	
10/16/19	Intrinsically Disordered Proteins and Phase Separation 2	
10/18/19	Protein Function: Myoglobin	5
10/21/19	Protein Function: Hemoglobin 1	5
10/23/19	Protein Function: Hemoglobin 2	5
10/25/19	How Enzymes Work	
10/28/19	Exam 2	
10/30/19	Enzyme Kinetics 1	6
11/01/19	Enzyme Kinetics 2	6
	(Paper Critique Due)	
11/04/19	Enzyme Kinetics 3	6
11/06/19	Enzymatic Reactions 1	6
11/08/19	Enzymatic Reactions 2	6
11/11/19	Presentations	
11/13/19	Presentations	
11/15/19	Presentations	
11/20/19	Final Exam (comprehensive), 8:00 am – 9:50 am, Olin 103	