

# CHEM 3831: Advanced Protein Biochemistry

FALL 2020

**Instructor:** Dr. Martin Margittai

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**Class hours:** MWF 11:00 AM — 11:50 AM, Boettcher Center Auditorium 101

**Office hours (zoom):** 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.

<b>Grading:</b>	midterm exams	300 points
	final exam	200 points
	presentations	200 points
	participation	200 points
	paper critique	100 points

**Exams:** There are two 1-hour midterm exams during the quarter, plus a 2-hour cumulative final exam. Each midterm exam is worth 150 points. The final exam is worth 200 points. Exam questions will be non-multiple choice.

**Presentations:** Each student will present 2 primary research papers. These papers and additional information on presentation time and grading will be provided during the quarter. Each presentation is worth 100 points.

**Participation:** Throughout the course there will be multiple opportunities for discussing papers and concepts. Participation in these discussions is worth 200 points.

**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 week 7 of the quarter. The critique should be submitted electronically to above email address and is due November 18 at 11:59 PM. Only one submission is permitted. This assignment is worth 100 points.

## Suggested readings:

Lehninger Principles of Biochemistry (7<sup>th</sup> edition) by Nelson and Cox

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

<b>Dates</b>	<b>Topics Covered</b>	<b>Reading Chapters</b>
09/14/20	Water: Weak Interactions and Solvation	2
09/16/20	Water: Weak Acids and Bases/Buffers and Hydrolysis	2
09/18/20	Amino Acids	3
09/21/20	Protein Primary Structure	3
09/23/20	Protein Purification	3
09/25/20	Protein Sequencing and Synthesis	3
09/28/20	Secondary Structure	4
09/30/20	Tertiary Structure/Fibrous Proteins	4
10/02/20	Tertiary Structure/Globular Proteins	4
<b>10/05/20</b>	<b>Exam 1</b>	
10/07/20	Quaternary Structure	4
10/09/20	Protein Denaturation and Folding	4
10/12/20	Protein Folding 1	<b>paper presentations</b>
10/14/20	Protein Folding 2	<b>paper presentations</b>
10/16/20	Protein Folding 3	<b>paper presentations</b>
10/19/20	Chaperones 1	<b>paper presentations</b>
10/21/20	Chaperones 2	<b>paper presentations</b>
10/23/20	Chaperones 3	<b>paper presentations</b>
10/26/20	Protein Aggregation 1	<b>paper presentations</b>
10/28/20	Protein Aggregation 2	<b>paper presentations</b>
10/30/20	Liquid-Liquid Phase Separation 1	<b>paper presentations</b>
11/02/20	Liquid-Liquid Phase Separation 2	<b>paper presentations</b>
<b>11/04/20</b>	<b>Exam 2</b>	
11/06/20	How Enzymes Work	6
11/09/20	Enzyme Kinetics 1	6
11/11/20	Enzyme Kinetics 2	6
11/13/20	Enzyme Kinetics 3	6
11/16/20	Enzymatic Reactions 1	6
11/18/20	Enzymatic Reactions 2	<b>(Paper Critique Due)</b> 6
11/20/20	Discussion of critiqued paper	
<b>12/01/20</b>	<b>Final Exam</b> (comprehensive), 10:00 am – 11:50 am	