

Protein Structure and Function Syllabus for Spring 2022 Term

GENERAL INFORMATION

RUTGERS CATALOG DESCRIPTION

50:115:422 Protein Structure and Function (3): Basic structural principles of polypeptides, mechanisms of enzyme catalysis, biophysical techniques used in the determination of protein structure, protein folding, protein-protein interactions, protein engineering. **Prerequisite:** 50:115:403 (General Biochemistry I).

AT THE GRADUATE LEVEL

56:115:522 Protein Structure and Function (3): Basic structural principles of polypeptides, mechanisms of enzyme catalysis, biophysical techniques used in the determination of protein structure, protein folding, protein-protein interactions, protein engineering. **Prerequisites:** No formal prerequisites but students should consult with the instructor and with their research/program advisors to confirm that the course is appropriate for their background and their course of study.

Course Format: Lectures

Instructor: **Dr. Guillaume Lamoureux**
Office: Joint Health Sciences Center 216C
Office Hours: By appointment
Email: guillaume.lamoureux@rutgers.edu
Website: <http://lamoureuxlab.org/teaching.html>

Lectures: Mondays from 6:00 PM to 8:50 PM
Location: FA-219

Textbook: **Kessel & Ben-Tal, *Introduction to Proteins: Structure, Function, and Motion*, Second Edition.**
(The electronic version of the textbook is available from the Robeson Library website. If you are considering using another textbook as main reference, please check with the instructor first.)

COURSE OBJECTIVES

By the end of the course, students will be expected to understand the main concepts and techniques related to protein structure and function and to develop an appreciation for current research in the field. The following topics will be covered: (1) Protein structure, (2) Techniques for protein structure determination and prediction, (3) Protein stability and denaturation, (4) Protein engineering, (5) Protein folding and dynamics, (6) Protein-ligand interactions, (7) Enzyme catalysis.

COURSE GRADE

The final grade for the course is composed as follows: **30% for the “follow-up questions” (3% for each lecture), 40% for the oral presentation (10% for the detailed outline and 30% for the presentation itself), and 30% for the final exam.** The minimum passing grade for the course is 60%.

ONLINE COURSE MATERIAL

All material for the course will be posted on Canvas (<https://canvas.rutgers.edu>). Please consult the website regularly and set your notifications so that you get informed of any updates.

ADDITIONAL READING

The Kessel & Ben-Tal textbook is meant as a focus point only. It is your responsibility to seek out additional reading material if you miss any of the background knowledge or if you wish to consolidate your understanding. Please consult the instructor if you are not sure where to find the additional information you might need.

BEFORE EACH LECTURE

At the beginning of each new lecture, you are expected to have read the textbook sections covered in the previous lecture (see Calendar below) and to come prepared with follow-up questions—some of which you will have submitted electronically ahead of time. You are also expected to have at least browsed the material to be covered during the new lecture and to come with specific learning objectives in mind, having already identified the notions that may be more challenging.

FOLLOW-UP QUESTIONS (ONLINE SUBMISSION FORM)

Follow-up questions related to the topics associated with a given lecture need to be submitted no later than one hour before the following lecture. (For instance, following the January 31 lecture on “Noncovalent interactions in biomolecules”, you are expected to read section 1.3 of the textbook and submit at least one question no later than February 7 at 5:00 PM.) Note that there are 11 lectures for which online submissions will be marked but only 10 of them are needed to get full marks.

ORAL PRESENTATIONS

You will be asked to prepare and deliver a 20-minute oral presentation on a topic related to the course, chosen from a list provided ahead of time. The presentation is meant to be pedagogical—in the style of a short lecture or “journal club” presentation—and should be prepared so that your classmates are able to understand the topic. The presentation will be followed by a question period, during which students and instructor will be allowed to ask questions. The presentation will be evaluated on the quality and correctness of the material and on the clarity and effectiveness of the delivery. Although you will not be directly evaluated on your answers to the questions, consider these as a good opportunity to get feedback from the class and to rectify any misconception about the material you presented.

The oral presentations will be held on **March 21** and **May 2**. The date assigned to each student will be determined based on the topic chosen. You will also be asked to submit a detailed outline of your presentation **at least one week ahead of the presentation**. This outline should describe what you intend to present with enough detail that the instructor can give you feedback on what you should consider adding or removing from your presentation.

FINAL EXAM (ORAL)

The final exam will be a one-on-one oral exam lasting about 30 minutes and composed of two parts: (1) a “specialized” part, in which you will be asked questions related to a topic or paper you will have been assigned to read ahead of time, and (2) a “general” part, in which you will be asked questions about the material of the course in general. You will be evaluated on your overall understanding of the concepts and terminology and on your ability to use them in discussing a topic or analyzing a problem. You will not be expected to have memorized any of the biochemical/biological data (molecular structures, protein classes, enzyme classes, etc.) and will be allowed to briefly consult the textbook during the exam—to see a table or a figure, for instance.

Note that the topics for the “specialized” part of the exam will be chosen from the same list of topics used for the oral presentations—excluding the one you prepared for your own oral presentation.

ACADEMIC INTEGRITY

Rutgers University takes academic dishonesty very seriously. By enrolling in this course, you assume responsibility for familiarizing yourself with the Academic Integrity Policy and the possible penalties (including suspension and expulsion) for violating the policy. As per the policy, all suspect-

ed violations will be reported to the Office of Community Standards. Academic dishonesty includes (but is not limited to): cheating, plagiarism, aiding others in committing a violation or allowing others to use your work, failure to cite sources correctly, fabrication, using another person's ideas or words without attribution, re-using a previous assignment, unauthorized collaboration, sabotaging another student's work. If in doubt, please consult the instructor. Please review the Academic Integrity Policy at <http://academicintegrity.rutgers.edu>.

STUDENTS WITH DISABILITIES

Rutgers University welcomes students with disabilities into all of the University's educational programs. In order to receive consideration for reasonable accommodations, a student with a disability must contact the appropriate disability services office at the campus where you are officially enrolled, participate in an intake interview, and provide documentation: <https://ods.rutgers.edu/students/documentation-guidelines>. If the documentation supports your request for reasonable accommodations, your campus's disability services office will provide you with a Letter of Accommodations. Please share this letter with your instructors and discuss the accommodations with them as early in your courses as possible. To begin this process, please complete the registration form at <https://webapps.rutgers.edu/student-ods/forms/registration>.

CALENDAR OF LECTURES

Please note that this calendar may change as the semester proceeds. The "Reading" column lists the sections of the Kessel & Ben-Tal textbook you are expected to read. The letter "Q" at the end of a line means that you are also expected to submit questions related to that material before the following lecture.

Date		Topics	Reading	
Jan. 24	Lecture	Introduction, Proteins in living organisms	1.1, 1.2	
Jan. 31	Lecture	Noncovalent interactions in biomolecules	1.3	Q
Feb. 7	Lecture	Primary and Secondary protein structure	2.1, 2.2, 2.3	Q
Feb. 14	Lecture	Tertiary protein structure	2.4	Q
Feb. 21	Lecture	Quaternary structure, PTMs	2.5, 2.6	Q
Feb. 28	Lecture	Structure determination and prediction	3.1, 3.2, 3.3	Q
Mar. 7	Lecture	Structure determination and prediction (cont'd)	3.4, 3.5, 3.6, 3.7	Q
Mar. 14		SPRING RECESS (no classes)		
Mar. 21	Presentations	TBA		
Mar. 28	Lecture	Protein stability, Protein engineering	4.1, 4.2, 4.3, 4.4	Q
Apr. 4	Lecture	Protein dynamics	5.1, 5.2, 5.3, 5.4	Q
Apr. 11	Lecture	Protein-ligand interactions	8.1, 8.2, 8.3	Q
Apr. 18	Lecture	Protein-ligand interactions (cont'd)	8.4, 8.5, 8.6	Q
Apr. 25	Lecture	Enzyme catalysis	9.1 to 9.6	Q
May 2	Presentations	TBA		
TBA		FINAL EXAM		