

CHEM 5386: Proteins
Spring 2019
Tues/Thurs 12:30-1:50 pm, CHEM 304
(Revised 12/20/18)

Instructor:

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Course Description: This course will cover advanced biochemistry topics related to proteins. Topics will include protein structure, structure-function relationships, and current methodologies for examining proteins in addition to current findings in primary literature.

Prerequisites: Fundamental biochemistry (e.g., CHEM 3375, CHEM 4375, or CHEM 5375). Proteins builds directly on the material covered in these introductory courses. If you have not mastered that material, you begin this course at a significant disadvantage.

Course Format: Multiple instructional formats will be used to accommodate different learning styles. Students are expected to be active participants in their learning by reading the assigned material, engaging in the material presented, and participating in classroom activities.

Assigned reading material: Students are expected to read the material assigned before class in preparation for a discussion of the more challenging aspects of the topic.

Problem sets and student presentations: Some material will be taught through problem sets (both in and out of class) and student presentations. This information is as important as other material presented in the text or in lecture, and will be included in assessments.

Course Objectives

After completion of this course, the student should be able to:

- Understand the role of protein sequence and structure in biological mechanisms.
- Interpret experimental data and relate that interpretation to the current understanding of protein structure, function, and evolution.
- Design experiments to test hypotheses about the chemical and physical characteristics of protein structure and function.
- Identify critical elements that govern a particular function or structural component of a protein.
- Use contemporary tools to analyze the structure, sequence, domain topology, and motifs of a protein relevant to their thesis research.
- Work cooperatively in teams to analyze, present, and critique a recently published primary literature article.
- Assess the quality of presentations by others and oneself.

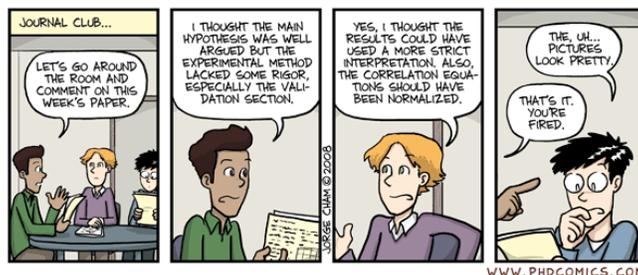
Course Grades and Assessment

There are 500 possible points to earn in this course. Your performance will primarily be assessed by two traditional exams (100 possible points each), active participation in regular journal clubs (100 points for a team-based presentation and 50 points for individual participation in other article discussions), and a comprehensive Final Exam (150 possible points). Letter grades are determined as follows:

- A: $x > 447$ pts
- B: $397 < x < 447$ pts
- C: $347 < x < 397$ pts
- D: $297 < x < 347$ pts
- F: $x < 297$

The instructor reserves the right to adjust the above grading scheme depending on student performance. Any changes to the above policy will be announced in class and on TRACS.

Journal Clubs: This course applies lecture/textbook concepts to contemporary studies of protein structure and function through regular journal club presentations. Students will be assigned to small groups, and each group assigned a paper to present over two class days. The small group will guide the discussion by the entire class about the hypothesis, experimental design, data analysis, and conclusion of the paper. Therefore, the entire class has the responsibility to thoroughly read each assigned paper and relevant background literature, in order to have a fruitful in-class discussion. The presentation/leadership of the discussion is worth 100 points for each member of the presenting small group. For each journal club, each non-presenting student will submit a written assignment reflecting on the article; details for these response assignments will be provided in class.



Exams: The exams will contain a combination of multiple-choice questions, problems, and short answers. They will draw on material covered by lectures, textbook reading, suggested problems, problem sets, and the journal club papers and discussions. Spring semesters are often very busy with graduate school and job interviews. Make-up exams are allowed, but will only be given if an absence is discussed with Dr. Lewis *in sufficient advance of test day*. In other words: as soon as you know you will be absent from class, please let her know via email!

While all exams are effectively cumulative, the midsemester exams will emphasize topics covered since the previous exam. The final exam is cumulative.

Exam	Possible Points	Dates
1	100	Thursday, February 28 th
2	100	Thursday, April 18 th
Final	150	Tuesday, May 14 th at 11 am

Exam Policies: Exams will begin 5 minutes after the scheduled class start time (12:35 pm) and end at the scheduled class end time (1:50 pm). No student will be allowed additional time without documented need by the Office of Disability Services.

Exams are carefully and consistently graded. All exam corrections must be petitioned for **in writing no sooner than 48 hours and no later than two weeks** with a clear, **written** explanation of why you should receive additional points *as well as* evidence for the correct answer. At that time, the entire exam may be re-graded, resulting in gain or loss of points on other questions not being contested. Grade corrections outside the above window will not be considered.

If you must leave the room during an exam, leave your exam with Dr. Lewis. In an emergency evacuation, remain in the vicinity of the classroom if safety permits and return when allowed. Dr. Lewis will determine whether there is sufficient time to complete the exam.

Extra Credit: No individualized extra assignments will be given.

Resources

Textbooks: The required textbook for the class is Williamson, M., How Proteins Work (2011) Garland Science, Taylor & Francis Group: New York, NY. ISBN 978-0-8153-4446-9.

An additional text that you are likely to find useful is Creighton, TE., Proteins: Structural and Molecular Properties, 2nd ed. (1993) W. H. Freeman: New York NY. ISBN 0-7167-7030-X. This text is out of print, but there are many used copies available for sale online. If you are planning to continue to study protein biochemistry or biophysics, this is an excellent book for your library.

Finally, the texts used for other biochemistry courses may be helpful, including Biochemistry by Voet & Voet and Fundamentals of Biochemistry by Voet, Voet, & Pratt.

Attendance Policy: While attendance is not taken, ***you are expected to attend every class.*** Attendance is important to fully understand the material; merely reading the textbook is insufficient. There will be material covered in class that is not in the reading and which will be on quizzes and exams. Because attendance is not taken, there are no excused absences.

Exams: Exams must be taken on the scheduled day; make-up exams will only be given if an absence is discussed with Dr. Lewis in advance of test day. If a student arrives late, they will have the remainder of the class period to complete the exam.

Quizzes: Depending on student performance, there may be occasional pop quizzes. Make-up quizzes will not be given. If a student misses a quiz due to absence or tardiness, the grade for that quiz will be a zero.

TRACS: A TRACS site will be used extensively during this course for both resources and assignments. Please refer to it frequently. You must have a valid Texas State University username and password.

Email questions to instructor: Please email questions, especially about course content! If the question is relevant to the entire class, the response will be posted on TRACS in the “Spring 2019 e-mail responses” folder in a manner that anonymizes the original query.

Professionalism and Respect: Both the University and Dr. Lewis are committed to an educational community in which each individual is respected, appreciated, and valued. Class rosters are provided with the student's legal name. All requests to address you by an alternate name, pronunciation, and/or gender pronoun will be honored. Please advise Dr. Lewis (either in person or by email) of this preference early in the semester.

Special Needs Information: Students with special needs as documented by the Office of Disability Services should identify themselves at the beginning of the semester in order for accommodation to be made. If accommodations are needed for in-class exams, the exams must be taken at the Testing, Research Services, and Evaluation Center (TREC) at the date and time the exam is administered in class. Students are strongly advised to schedule TREC exam times as early as possible in the semester. Exceptions to this policy will only be made under extraordinary circumstances, as determined by the instructor.

Drop Policy: The automatic "W" deadline is March 22, 2019 at 11:59 pm. After April 2, 2019, students cannot drop any course. Students may *withdraw* from the University (*i.e.*, drop all courses, and go to zero credit hours for the current semester) by April 25, 2019. Note that withdrawal from the University is not the same as dropping a course.

Academic Integrity: The University Honor Code “require[s] all members of this community to be conscientious, respectful, and honest”:

<http://www.txstate.edu/honorcodecouncil/Academic-Integrity.html>

More broadly, the practice of science is founded upon principles of honesty, trust, accountability, and respect. Without such a foundation, the entire enterprise would crumble. Therefore, the Honor Code is strictly enforced in this course, and any violations will be pursued.

For this course, the academic integrity policy includes the following:

- copying or paraphrasing the work of others, including a text, journal article, another student's work from this or a previous semester or this or another class, any site on the Internet, is explicitly forbidden.
- all sources of information must be clearly acknowledged, in all written and oral work, including visual aids used during oral presentations.
- in written work, referencing or otherwise acknowledging the source of text (even a portion of a single sentence) that has been **copied directly or closely paraphrased is still considered plagiarism**. If you cannot communicate the concept or idea in your own words and phrasing, then you do not sufficiently understand it. Talk with your colleagues and/or professors (including Dr. Lewis) to help you clarify!
- all problem sets are to be completed individually, unless you are explicitly instructed to work in groups.

A complete description of the Texas State Honor Code is at

<http://www.txstate.edu/effective/upps/upps-07-10-01.html>

Violation of the Honor Code will result in academic penalties at the instructor's discretion, up to and including failure in the course.

COURSE OUTLINE:

Class	Date	Topic	Corresponding Text*
1	22-Jan	Introduction Protein Structure & Evolution	Chapter 1
2	24-Jan	Protein Structure & Evolution Protein Domains	Chapter 2
3	29-Jan	Protein Domains	
4	31-Jan	Journal Club 1, Part 1	Fasan <i>et al</i> (2008) <i>J Mol Biol</i> 383:1069
5	5-Feb	Journal Club 1, Part 2	
6	7-Feb	Oligomers	Chapter 3
7	12-Feb	Oligomers Protein Interactions <i>In Vivo</i>	Chapter 4
8	14-Feb	Protein Interactions <i>In Vivo</i>	
9	19-Feb	Journal Club 2, Part 1	Dao <i>et al</i> (2018) <i>Mol Cell</i> 69:965
10	21-Feb	Journal Club 2, Part 2	
11	26-Feb	Problem Set Review	
12	28-Feb	Exam 1	
13	5-Mar	Protein Flexibility and Dynamics	Chapter 6
14	7-Mar	Protein Flexibility and Dynamics	
15	12-Mar	Journal Club 3, Part 1	Brosey <i>et al</i> (2013) <i>Nucleic Acids Res</i> 41:2313
16	14-Mar	Journal Club 3, Part 2	
	18-22-Mar	<i>Spring Break</i>	
17	26-Mar	How Proteins Make Things Move	Chapter 7
18	28-Mar	How Proteins Make Things Move	
19	2-Apr	Journal Club 4, Part 1	Perez <i>et al</i> (2015) <i>Nature</i> 524:433
20	4-Apr	Journal Club 4, Part 2	
21	9-Apr	How Proteins Transmit Signals	Chapter 8
22	11-Apr	Journal Club 5, Part 1	Su <i>et al</i> (2016) <i>Science</i> 352:595
23	16-Apr	Journal Club 5, Part 2	
24	18-Apr	Exam 2	
25	23-Apr	Protein Complexes: Molecular Machines	Chapter 9
26	25-Apr	Journal Club 6, Part 1	Robinson <i>et al</i> (2016) <i>Cell</i> 166:1411
27	30-Apr	Journal Club 6, Part 1	
28	2-May	Review/Wrap-Up	
	14-May 11 am – 1:30 pm	COMPREHENSIVE FINAL EXAM	

* Additional reading may be assigned through the semester. Note that the above topics, schedule, and exam content are subject to change as needed. Students will be notified *in class* of any changes.