

**CHEM 5386: Proteins**  
**Spring 2021**  
Tues/Thurs 12:30-1:50 pm  
**Remote Delivery**  
~~CHEM 100 (Tues)~~ and Zoom (Thurs)  
(Revised 2/23/21)

**Instructor:**

Dr. Karen A. Lewis  
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Open Office Hours: M-F 9-10 am and by appointment

**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:** This course will be administered as a synchronous, hybrid class, using the “flipped” classroom format. Pre-class lectures will be presented via Canvas. Class meetings will be dedicated to demonstrations of technology, collaborative work, and journal club presentations. On Tuesdays, we will meet face-to-face in CHEM100. On Thursdays, we will meet remotely via Zoom. Students must use their Texas State NetID log-in for both Zoom and Canvas platforms.

***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 700 possible points to earn in this course. Your performance will be assessed by active participation in regular journal clubs (200 points for a team-based presentation and 200 points for individual participation and response to other article discussions), and two traditional exams (150 points each). Details for each assessment type are described below.

	Points Each	Opportunities	# Dropped	Subtotal
Journal Club Presentation	200	1	0	200
Journal Club Response	25	9	1	200
Take-Home Exam	150	2	0	300
			<b>TOTAL</b>	<b>700</b>

Letter grades are determined as follows:

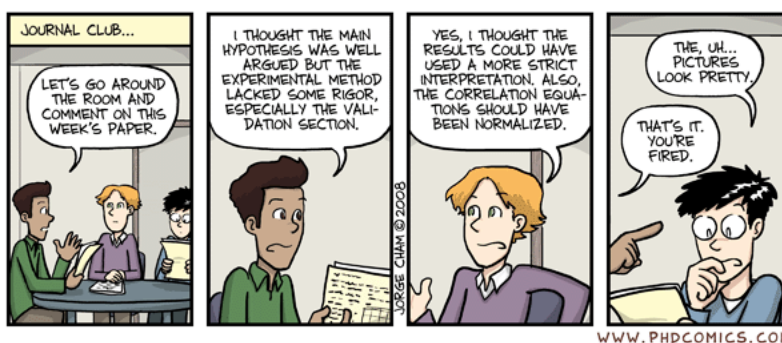
- A:  $x > 626$  pts
- B:  $626 < x < 556$  pts
- C:  $556 < x < 486$  pts
- D:  $486 < x < 416$  pts
- F:  $x < 416$

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 and 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, every member of this course has the responsibility to thoroughly read each assigned paper and relevant background literature, in order to have a fruitful in-class discussion.

The presentation and leadership of the class discussion is worth 200 points for each member of the presenting small group.

For the other nine journal clubs, each non-presenting student will submit a written assignment reflecting on the article worth 25 points. At the end of the semester, the lowest response assignment grade will be dropped.



**Exams:** Two take-home exams will assess individual student comprehension and interpretation of both the flipped lecture material and the journal club articles.

Exam	Possible Points	Dates
1	150	Open: Mar 11, 2 pm Due: Mar 22, 6 pm
2	150	Open: Apr 29, 2 pm Due: May 11, 6 pm

**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, 2<sup>nd</sup> 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.

World Wide Web: Most of science does not rely on textbooks.

**Technology:** The most current minimum system requirements for the electronically-delivered components of this course (e.g., Canvas and Zoom) can be found on the ITAC website for [Remote Learning and Collaborating Resources for Students](#). Please note that a webcam is encouraged, but not required, for this course.

**Scientific Journals:** Biochemistry and molecular biology are constantly growing fields that change rapidly. Therefore, textbooks may be out of date by the time they reach press. The best and most recent information is found in scientific journals.

Therefore, the majority of this course will be comprised of journal club presentations and discussions of both classical and contemporary protein biochemistry and biophysics articles. Review articles found in most journals are a great summary of the current understanding on a topic and are a good entry into understanding the background of a given topic or study.

**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. However, if you are absent during your scheduled journal club presentation days, points will be deducted from your grade for that assignment.

**Canvas:** A course Canvas site will be used extensively during this course for both resources and assignments. Pre-class lectures will be posted here, and you are expected to log in regularly. You must have a valid Texas State University NetID and password.

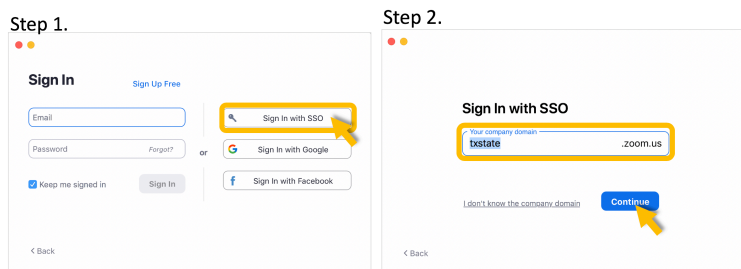
Since Texas State has fully transitioned to Canvas as the new learning management system (LMS), TRACS has been sunsetted. Spring 2021 will be only the second semester that Dr. Lewis has used Canvas for a full course, as it may be for many students too. She is therefore still learning how the Canvas gradebook calculates course grades. Therefore, please note that the Canvas gradebook will be an accurate record of individual grade items, but what Canvas shows for the course average may not be accurate. Dr. Lewis' standard practice for any LMS gradebook is to maintain a separate Excel spreadsheet, which is used to calculate end-of-semester course grades. Dr. Lewis strongly recommends that each student similarly records and tracks their own individual assignment grades in a spreadsheet, as well as retain copies of all graded work for the semester.

**Zoom:** The synchronous component of this course and all office hours will be administered via Zoom. You must log in to Zoom using your Texas State University NetID and password, using the "SSO login" mechanism.

Per University policy, every class meeting will be password-protected to prevent Zoom-bombing. The Zoom link and password for class will be posted on the course Canvas site.

The main Zoom classroom meeting will be recorded, and posted to Canvas and/or Mediaflo for posterity and post-class review. Any Zoom breakout rooms, in which students work in small groups to complete the in-class tasks, will not be recorded.

Please be sure to routinely check your displayed name and profile picture. They need to be professional and appropriate for an educational setting. To alter either your displayed name or your profile picture, you may adjust the “participant settings” in Zoom. A detailed protocol on how to do that will be posted to the course Canvas site. Additional information about the professional use of Zoom for class and office hour meetings is detailed below.



**Email questions to instructor:** You are welcome to email questions to Dr. Lewis. If the email is relevant to the entire class, the response will be anonymized and posted to Canvas discussion boards. You can check this discussion board before emailing, to see if someone else had the same question. (Insider tip: if you have a question about something, it's very likely that someone else is also wondering about it, too!)

**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” via a Zoom meeting, through a private Zoom-chat message, or by email) of this preference early in the semester.

In order to provide the most enriching learning experience, CHEM 5386 will be held synchronously. However, this approach introduces a unique set of concerns and issues around professionalism, as we are teaching, learning, and researching from our homes instead of in a common, neutral location. Students and faculty are full partners in fostering a virtual classroom environment which is conducive to learning. Our actions should promote respect for both one another and the traditions of collegiate learning. This includes synchronous online sessions such as those conducted in Zoom or MS Teams, among other venues.

*Audio/Visual Professionalism:* Per University policy, students are expected to dress and act appropriately and professionally for all video and synchronous sessions. This includes creating videos for classes and participating in real-time video conferences or exams. It is expected that the video be turned on and you be in a private setting. Please do not plan to join Zoom meetings while you are driving or not in a confidential environment, to respect your privacy and ensure your safety. It is also recommended that you use headphones with a microphone to minimize audio interference.

At the start of class, please have your audio muted and, if at all possible, your video “on”. Your display name should be professional, and you are encouraged to also have an appropriate picture as your Zoom profile picture. (Insider tip: “appropriate” does not equal a fancy professionally-photographed headshot, so don't stress over that! However, do avoid extremely casual pictures – such as those that may include red plastic cups, swimwear, etc.)

If your circumstances are such that the video feed is at all difficult (e.g., unstable internet connection, personal physical surroundings, etc.), please know that you are not required to activate your video feed. You may fully participate in class via audio and/or the Zoom chat function; if you have specific concerns, please do not hesitate to discuss them with Dr. Lewis. There are almost always solutions!

*Active Participation:* During the synchronous Zoom class meetings, it will be very important to create the opportunity for everyone to actively and meaningfully participate in whole-class discussions in the main room. Different rates of streaming may compromise the timing of individuals who are speaking simultaneously, and it can be challenging to avoid talking over one another in the Zoom classroom, especially during lively and vigorous discussion! Therefore, when you have a question and/or comment in the main Zoom room, please use the Zoom

“raise hand” function. Dr. Lewis will acknowledge you, and then you can un-mute your microphone and proceed with your comment/question.

*Netiquette:* Texas State policy (PPS 4.02) states that disruptive behaviors will not be tolerated in any type of learning environment. Examples of such behaviors include but are not limited to: making loud noises, speaking without recognition, making personal threats or insults, eating or drinking in classrooms, sleeping during class, using electronic equipment prohibited by the instructor or disrespectful of other students, using inappropriate or vulgar language, or taking other actions that others might find offensive, demeaning, or disrespectful.

Any violations of this policy will be dealt with according to TXST policy UPPS No. 07.10.05, Student Behavior Assessment Team. For further guidance, please see AA/PPS No. 02.03.02 (4.02) and Section 2.02 of Texas State’s Code of Student Conduct.

**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 30, 2021 at 11:59 pm. After that deadline, 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 22, 2021. 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.

**COVID-19 Contingency Plans:** The continuing global pandemic caused by SARS-CoV-2 requires not only that this course be delivered remotely, but also that we institute contingency plans for if/when either the instructor or a student falls ill.

The University requests that all students, faculty, and staff who test positive for COVID-19 or who are identified as a close contact report in [Bobcat Trace](#). This is a secure web application for reporting positive COVID-19 cases and will guide contact tracing efforts at Texas State.

It is vital that we all follow the [Bobcat Pledge](#), including the shared responsibility to practice healthy behaviors and follow the health and safety guidelines, which shows respect for others and helps prevent the spread of COVID-19 on campus and in the surrounding community.

*Instructor gets sick:* The pre-class lectures materials for CHEM 5386 will be prepared well ahead of time to buffer any potential delays due to instructor illness. If Dr. Lewis contracts the virus, she will self-isolate and the course will convert to 100% remote via Zoom and Canvas. She will continue to lead the class remotely as long as symptoms allow.

If Dr. Lewis' symptoms interfere with her ability to host either the synchronous class meetings or office hours, a substitute faculty will take her place and serve as the synchronous class Zoom host, journal club discussion guide, and provide substitute office hours until Dr. Lewis recovers. **Take-home message: class will keep going even if Dr. Lewis gets sick.**

*Student gets sick:* All students should follow the [10 Guiding Principles for Health, Safety, and Wellness](#) at Texas State, including the requirement to wear a [cloth face covering](#) and perform a [self-assessment](#) each day before coming to campus. If you are sick, **do not go to school or work**. If you have COVID-19 symptoms, contact your healthcare provider or the [Student Health Center](#) (512-245-2161) for evaluation and testing for COVID-19. The [Student Roadmap](#) contains valuable information regarding safe practices and procedure for successful reopening of our campus. If any illness impacts your ability to participate in this course, contact the [Dean of Students Office](#) with appropriate documentation.

**Take-home message: in most cases, the existing learning opportunities and grading policies for CHEM 5386 are sufficient to handle an illness, including COVID-19, without any additional adjustment.** In extraordinary circumstances, as determined by Dr. Lewis, documentation through the Dean of Students Office will be required before any special allowance can be considered.

**COURSE OUTLINE:**

Class	Date	Topic	Pre-Class Canvas Lecture (Corresponding Chapter)	In-Class	Journal Club Article
1	19-Jan	Protein Structure & Evolution	(Ch 1)	Lecture	
2	21-Jan	Protein Domains	(Ch 2)	Lecture, Group Work	
3	26-Jan	Bioinformatic Tools: Databases		Lecture, Group Work	
4	28-Jan	Bioinformatic Tools: Modeling		Lecture, Group Work	
5	2-Feb	Evolution & Enzymology	Enzyme Kinetics (Ch 5)	Journal Club #1	Fasan <i>et al</i> (2008) <i>J Mol Biol</i> 383:1069
6	4-Feb				
7	9-Feb			Journal Club Review	
8	11-Feb	Protein Interactions	Protein-Protein Interaction (Ch 3,4)	Journal Club #2.1	Walls <i>et al</i> (2020) <i>Cell</i> 180:281
<del>9</del>	<del>16-Feb</del>				
<del>10</del>	<del>18-Feb</del>				
<del>11</del>	<del>23-Feb</del>				
12	25-Feb	Protein Folding & Dynamics		Journal Club #2.2 (40 min) Journal Club #3.1 (40 min)	Walls <i>et al</i> (2020) <i>Cell</i> 180:281 Dao <i>et al</i> (2018) <i>Mol Cell</i> 69:965
13	2-Mar			Journal Club #3.2 (80 min)	Dao <i>et al</i> (2018) <i>Mol Cell</i> 69:965
14	4-Mar			Journal Club #4.1 (80 min)	Senior <i>et al</i> (2020) <i>Nature</i> 577:706
15	9-Mar			Journal Club #4.2 (40 min) Journal Club #5.1 (40 min)	Senior <i>et al</i> (2020) <i>Nature</i> 577:706 Brosey <i>et al</i> (2013) <i>Nucleic Acids Res</i> 41:2313
16	11-Mar			Journal Club #5 (80 min)	Brosey <i>et al</i> (2013) <i>Nucleic Acids Res</i> 41:2313

15-19-Mar		<i>Spring Break</i>			
17	23-Mar	How Proteins Make Things Move		Lecture, Group Work	Chapters 7, 8
18	25-Mar			Journal Club #6	Perez <i>et al</i> (2015) <i>Nature</i> 524:433
19	30-Mar				
20	6-Apr		Protein Motors (Ch 7)	Journal Club #7	Gebhardt <i>et al</i> (2006) <i>Proc Nat Acad Sci USA</i> 103:8680
21	8-Apr				
22	13-Apr	How Proteins Transmit Signals	Kinase Cascades (Ch 8)	Journal Club #8	Su <i>et al</i> (2016) <i>Science</i> 352:595
23	15-Apr				
24	20-Apr		G-Protein Signaling (Ch 8)	Journal Club #9	Varma <i>et al</i> (2019) <i>Proc Nat Acad Sci USA</i> 116:14547
25	22-Apr				
26	27-Apr		Nuclear Hormone Receptors (Ch 8)	Journal Club #10	Kojetin <i>et al</i> (2015) <i>Nat Commun</i> 6:8013
27	29-Apr				