### CHEM 5386: Proteins Fall 2016 Monday and Wednesday 12:30-1:50 pm, ED 4007

day and Wednesday 12:30-1:50 pm, ED (Revised 2/9/17)

**Instructor:** 

Dr. Karen A. Lewis Email: karen.lewis@txstate.edu Office Hours: Monday 8 am – 9 am Tuesday 3 pm – 5 pm Thursday 9 am – 11 am and by appointment Office: CENT 404 Phone: 512-245-6391

**<u>Course Description</u>**: 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:** CHEM 3375, CHEM 4375, or CHEM 5375. Proteins builds directly on the material covered in these courses. If you have not mastered that material, you begin this course at a significant disadvantage.

**<u>Course Format:</u>** 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**

The course will include problem sets and quizzes (150 possible points), a group journal club presentation and critique (100 possible points), two exams (200 possible points), and a comprehensive Final Exam (150 possible points). Letter grades are determined as follows:

A = 537-600 pts B = 477-536 pts C = 417-476 pts D = 357-416 pts

A total less than or equal to 356 will result in a final grade of F.

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

<u>Quizzes:</u> In-class quizzes, including unannounced quizzes, will be periodically used to assess student knowledge and progress. In particular, a quiz will be given at the beginning of each journal club session. Students are advised to closely read the assigned journal club article in preparation for both the quiz and the journal club discussion. There are <u>no</u> make-up quizzes.

<u>Assignments:</u> In-class and take-home assignments related to current course topics will be given, including scientific reading and writing assignments as well as oral presentations. Details about these assignments will be provided at appropriate times during the semester.

<u>Exams</u>: The exams will contain a combination of multiple-choice questions, problems, short answers, and/or essays. They will draw on material covered by lectures, textbook reading, suggested problems, problem sets, student presentations, and other assignments. Make-up exams will only be given if an absence is discussed with Dr. Lewis in sufficient advance of test day.

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

Exam	<b>Possible Points</b>	Dates
1	100	Wednesday, February 15 <sup>th</sup>
2	100	Wednesday, April 5 <sup>th</sup>
Final	150	Thursday, May 10 <sup>th</sup> 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 <u>in</u> <u>writing</u> **no sooner than 48 hours and no later than two weeks** with a clear, <u>written</u> 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. The instructor 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., <u>How Proteins Work</u> (2011) Garland Science, Taylor & Francis Group: New York, NY. ISBN 978-0-8153-4446-9.

An additional text that you might find helpful is Creighton, TE., <u>Proteins: Structural and</u> <u>Molecular Properties</u>, 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 <u>Biochemistry</u> by Voet & Voet and <u>Fundamentals of Biochemistry</u> by Voet, Voet, & Pratt.

<u>Attendance Policy</u>: 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:* 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:** You are welcome to email questions. If the email is relevant to the entire class, the response will be posted on TRACS in the "Spring 2017 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 28, 2017 at 11:59 pm. After March 28, 2017, 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 27, 2017. Note that withdrawal from the University is <u>not</u> the same as dropping a course.

<u>Academic Integrity:</u> 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 <u>will</u> result in academic penalties at the instructor's discretion, up to and including failure in the course.

# **COURSE OUTLINE:**

Class #	Date	Торіс	<b>Corresponding Chapter*</b>
1	18-Jan	Introduction Protein Structure & Evolution	Chapter 1
2	23-Jan	Protein Structure & Evolution	
3	25-Jan	Protein Domains	Chapter 2
4	30-Jan	Problem Set 1	
5	1-Feb	Oligomers	Chapter 3
6	6-Feb	Oligomers	
7	8-Feb	Journal Club 1, Part 1	Ahmed <i>et al</i> (2015) Nat Commun 6:7354
8	13-Feb	Journal Club 1, Part 2	
9	15-Feb	Exam 1	
10	20-Feb	Protein Interactions In Vivo	Chapter 4
11	22-Feb	Journal Club 2, Part 1	Petrova and Sauer (2012) PNAS 109:16690
12	27-Feb	Journal Club 2, Part 2	
13	1-Mar	Protein Flexibility and Dynamics	Chapter 6
14	6-Mar	Journal Club 3, Part 1	Brosey <i>et al</i> (2013) <i>Nucleic Acids Res</i> 41:2313
15	8-Mar	Journal Club 3, Part 2	
	13-15-Mar	Spring Break	
16	20-Mar	How Proteins Make Things Move How Proteins Transmit Signals	Chapter 7, 8
17	22-Mar	Journal Club 4, Part 1	Perez <i>et al</i> (2015) <i>Nature</i> 524:433
18	27-Mar	Journal Club 4, Part 2	
19	29-Mar	Journal Club 5, Part 1	Su <i>et al</i> (2016) Science 352:595
20	3-Apr	Journal Club 5, Part 2	
21	5-Apr	Exam 2	
22	10-Apr	Protein Complexes: Molecular Machines Multienzyme Complexes	Chapter 9, 10
23	12-Apr	Journal Club 6, Part 1	Jeronimo <i>et al</i> (2016) <i>Mol</i> <i>Cell</i> 64:455
24	17-Apr	Journal Club 6, Part 2	
25	19-Apr	Journal Club 7, Part 1	Young <i>et al</i> (2016) <i>Nature</i> 540:453
	24-Apr	No class (EB 2017 Meeting)	
26	26-Apr	Journal Club 7, Part 2	
10-May 11 am		COMPREHENSIVE FINAL EXAM	

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