

Course Title and Number: CHEM 4334
Instructor: Dr. Ricardo A. Bernal
TA: Alejandro Rodriguez

Day, Time, and Location (room and building):

Class: Monday/Wednesday CCSB G.0706 from 12:00-1:20 pm
Lab: Wednesday CCSB 3.0716 from 3:00-5:50 pm

Office Hours: **Bernal**, by appointment
Jinliang Wang, by appointment

Email Address: rbernal@utep.edu; arodriguez109@miners.utep.edu
Campus Office Number: Bernal (CCSB G.0504), Rodriguez (CCSB G.0910)

Office Phone Number: Bernal - 747-6918 Alex Rodriguez - 747-8432

Course Description

The course will focus on the function and structure of macromolecular complexes and proteins and emphasizes the physical and chemical foundations of molecular biology. The class will be an introduction to modern structural biology with descriptions of methods used to study structure and dynamics of macromolecules, and their application to various biological systems including soluble and membrane-bound proteins. The two instructors will focus on theories as well as practical aspects of the two major techniques employed in structural analyses of macromolecules at atomic resolution, namely cryo-EM and X-ray crystallography. Contents of the course include the basics of amino acids, primary, secondary and tertiary structure, three-dimensional structure determination (x-ray crystallography and cryo-Electron Microscopy). The latter is an emerging discipline that permits understanding of large biological complexes such as viruses.

The laboratory will reflect the topics covered in class but will include hands-on experimentation and structure determination. This course should give you a good idea what research is all about.

After successful completion of the course, students should be able to demonstrate the following skills:

- Laboratory
 - UV spectroscopy to determine bacterial growth rates and protein concentration
 - Expressing proteins in bacteria
 - Using chromatography methods to purify proteins
 - Run, stain and destain SDS-PAGE gels
 - Use computational software to reconstruct protein structures from high-resolution images
- General
 - Lab safety
 - Research ethics
 - Maintaining lab notebook
 - Measuring volumes and weights (using micropipettes, weighing balances, etc.)
 - Communicating research findings

Lab Scope: A practical exercise in biochemical techniques meant to familiarize the students with protein structure and function.

Textbooks & Other Required Materials

- The students will work in groups and each group will need a laptop on which to do computational work to determine structures.
- No Textbook needed for this class. If you want a reference book then I suggest the following optional book

Crystallography Made Crystal Clear
3rd Edition
A Guide for Users of Macromolecular Models
Authors: Gale Rhodes
eBook ISBN: 9780080455549
Paperback ISBN: 9780125870733

- **>Clicker REEF Polling account (<http://reef-education.com>) and a wi-fi enabled device (phone or tablet)** will be required for all quizzes. Forgotten device or lack of charge will not be a valid excuse for missed quizzes!!!!
- You will need a lab coat for the lab component
- Lab notebook/binder (could be an e-lab book)

Course Information and web-site

The material related to this course (e.g., syllabus, news, reading material, slides, etc.) will be available through Blackboard. The instructor will upgrade the information every week as needed, therefore you are encouraged to consult the information available on course website (Blackboard) on a weekly basis.

Prerequisites

It is recommended that students take CHEM 3330 (Introductory Biochemistry) and pass with at least a B before taking this course.

Grading:**LECTURE**

- Multiple Quizzes (reef polling every lecture and final average will count as an exam grade 25%)
- 3 Exams (75%)
- Attendance will be kept by way of quizzes and will determine if your grade gets bumped up in cases where you are on the borderline for next letter grade up.

LAB

- Poster presentation at the end of the semester (50%)
- Lab notebooks and Lab reports (25%)
- Group Participation (no one person can do everything) (10%)
- Attendance/Lab Safety Compliance (15%)

Reef quiz average will count as an exam grade. A straight average of all the exams will determine the overall grade. NO exam will be dropped and only excused absences (official University recognized) will be allowed for missed exams. There will be no "extra credit" or additional assignments given at the end of the semester so please do not come begging to have your grade bumped up for no reason. You are in complete control over your grade so please try hard from the first day of class to the last.

All grades of Incomplete must be accompanied by an Incomplete Contract that has been signed by the instructor of record, student, departmental chair, and the dean. Although UTEP will allow a maximum of one year to complete this contract, the College of Science requests it be limited to one month based upon completion data. A grade of Incomplete is only used in extraordinary circumstances confined to a limited event such as a missed exam, project, or lab. If the student has missed a significant amount of work (e.g. multiple assignments or tasks), a grade of Incomplete is not appropriate or warranted. Please add this to your spring syllabi. Generally, I do not give grades of Incomplete and so please do not insist on it unless it meets the above criteria (extraordinary circumstances).

Requirements: Safety goggles*
Covered footwear (for example no flip-flops or sandals)
Lab notebook/binder to insert lab reports and to keep lab notes*
Lab Coat (ACS in Chemistry office sells paper ones)*
*These must be purchased by the student

Lab Work: **Research cannot be scheduled easily for a 3 hour lab period and so you will be required to come into the lab outside of the scheduled lab times. That is just the nature of real research!**

Lab Reports Each laboratory module will require the creation of a laboratory report with introduction, methods, results, and analysis of results. TA or instructor will let you know when each is due.

Withdrawal Policy: The last day for you to withdraw from any course with an automatic "W" is *listed in the UTEP Academic Calendar*. Please note that it is the student's responsibility to officially withdraw from a course. I will not administratively drop anyone after the deadline.

Class Attendance: Class (lecture + lab) attendance is required. Attendance will be routinely taken. Students are responsible for attending lecture and lab regularly and knowing what takes place during classes. This includes not only the material covered in the class, but also all announcements, handouts, changes in the syllabus, etc. *If you **must** miss a class, you need to make a special effort to learn what occurred during your absence.*

It is expected that the material be read over *before* the topic is presented in class. With this background, the lectures and the lab will prove to be more meaningful.

There will often be times when you must come in after hours or perhaps stay late to finish a lab. This is normal for research so please be prepared to participate.

Disability: If you have or suspect a disability and need accommodations you should contact Disabled Student Services Office (DSSO) at 747-5148 or at dss@utep.edu or come by Room 106 Union East Building.

List of things NOT to do:

- 1) **Do NOT** Complain about lab taking too long or having to come in after hours. That is how research goes.
- 2) **Do NOT** Bring FOOD or DRINK into the LAB
- 3) **Do NOT** Cheat on quizzes or exams
- 4) **Do NOT** Be late to lecture or lab.
- 5) **Do NOT** Copy lab reports or poster information.
- 6) **Do NOT** Violate lab rules (safety/lab etiquette)
- 7) **Do NOT** Perform unauthorized experiments
- 8) **Do NOT** Take supplies, experiments and equipment out of the lab
- 9) **Do NOT** Bring friends or family into lab