University of Oklahoma
College of Arts and Sciences
Chemistry and Biochemistry

CHEM 5240: Biochemical and Biophysical Methods

Spring 2017 (modules 1 & 2)

Instructor: Christina Bourne
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Office Hours: by appointment
Learning Management System: canvas.ou.edu

Course Meeting Time, Location: Jan. 17 – April 2, Mon / Wed 11:30-12:50am, SLSRC 2430

Course Prerequisite: CHEM 5200 Principles of Biochemistry (section 001) or permission of the instructor. This is a core course for students pursuing Biochemistry coursework as their Program of Study.

Course Description: The primary objective of this course is to prepare students in the theory and practicalities of biochemical experiments in the research laboratory. The course content will focus on the physical, chemical, and biochemical principles underlying modern techniques in the laboratory. Through examples and discussion of experimental protocols, students will learn the basic principles and practical applications of analytical and preparative techniques used in current biochemical research.

Course Goals: To become familiar with common techniques, to understand the basis of why they work, to become skilled in good experimental design and to incorporate rigor into this design, and to have the resources to support deeper learning as students progress on their research careers.

Texts and Materials: There is no required textbook. Class material will comprise information commonly found in these textbooks (available at the library, or by request, from me), and from journal articles provided on the Canvas class site (or by the student, as assigned).

- Sheehan, David (2009). *Physical Biochemistry: Principles and Applications, 2nd ed.,* John Wiley & Sons, Ltd.
- Van Holde, Johnson, Ho, (2006) *Principles of Physical Biochemistry, 2nd edition*. Pearson Prentice Hall
- Lakowicz, Joseph R. (2006) *Principles of Fluorescence Spectroscopy, 3rd edition.* Springer Science
- Cook, Paul F. and Cleland. W.W. (2007) *Enzyme Kinetics and Mechanism* Taylor & Francis Group, LLC

Teaching Philosophy: At the level of graduate instruction, my role as instructor is to provide you with information that will facilitate discussion and ultimately your learning about the topic. My job is not to spend the entire class lecturing, or to just tell you all the answers (and I don't know them all anyway!).

Expectations: You are expected to show up, *on time*, for *every* scheduled class. You are expected to have completed the assigned readings before class, and come prepared to discuss the content.

Absences: Given that there are only 20 scheduled meetings, every meeting will be important and absences should be avoided. Should an absence be unavoidable, proper documentation indicating the absence qualifies as excused according to the definitions of the provost of OU must be provided to avoid consequences. Every unexcused absence will result in a drop of one-half of a letter grade (ie., for 1 unexcused absence your 100% grade will be dropped to 95%, etc.).

Assignments: Given that there are only 20 scheduled meetings, it is expected that students will complete assignments on time. ***No make-up work or late assignments will be accepted***; late assignments will be given a "0" grade.

This syllabus and schedule is a guide. The instructor reserves the right to change any times contained in this syllabus. This includes, but is not limited to: course content, scheduled dates, and calculation of the final grade.

Breakdown of course work:

Exams	30%	Feb. 19th, April 2nd (15% each)
Quizzes	20%	Feb. 5th, Mar. 12th (10% each)
Class participation	10%	Throughout course
Assignments (see additional notes in syllabus)	15%	Assignment 1: Information and experimental protocol for assigned sequence
	15%	Assignment 2: Hypothesis and experimental protocols for your current research

Tentative Schedule

Date	Topic & Readings
Lecture 1: Jan. 17	Introduction, review, discussion Experimental design considerations, types of graphic representations
Lecture 2: Jan. 22	Spectroscopy & Secondary structure measurements
Lecture 3: Jan. 24	Spectroscopy & Secondary structure measurements
Lecture 4: Jan. 29	Preparative and Analytical Electrophoresis
Lecture 5: Jan. 31	DNA / Cloning Techniques and Enzymes
Lecture 6: Feb. 5	Quiz 1; Recombinant protein expression & purification
Lecture 7: Feb. 7	Recombinant protein expression & purification; Assignment 1 due (5pm)
Lecture 8: Feb. 12	Gene expression techniques
Lecture 9: Feb. 14	DNA sequencing, mutations, editing
Lecture 10: Feb. 19	EXAM
Lecture 11: Feb. 21	Protein binding and kinetics (SPR, BLI)
Lecture 12: Feb. 26	Enzyme kinetics and inhibition
Lecture 13: Feb. 28	Methods to measure interactions: genetic tools
Lecture 14: Mar. 5	Methods to measure interactions: tools using immunological reagents
Lecture 15: Mar. 7	Methods to measure interactions: thermodynamics and calorimetry
Lecture 16: Mar. 12	Quiz 2; Methods to measure interactions: fluorescence
Lecture 17: Mar. 14	Methods to measure interactions: fluorescence
Lecture 18: Mar. 26	Methods to measure interactions: crosslinking, AUC;

Lecture 19: Mar. 28	Methods to measure interactions: scattering techniques;
Lecture 20: April 2	EXAM
April 4th, 5pm	Assignment 2 due

Assignment 1: Students will be given a nucleic acid sequence and expected to use available online tools and course materials to complete assignment worksheet (provided during class). This will be due by 5pm on Feb. 7th (see note above about no late work accepted). An assignment box will be opened on Canvas for submissions.

Assignment 2: Students should select **two discussed biochemical / biophysical techniques** and apply them to their *current research project*. It is OK if you are already carrying out these experiments, but **they should be of your own design**. Include a hypothesis (and make sure this is actually what your experiments will test), appropriate positive and negative controls, what the data are expected to look like, and how you will know if your hypothesis was correct (or partially correct, as frequently is the case). You should approach this as if it were your General Exam, so you should include some depth to the background. You have a 5 page limit. You must include citations (the cited works will NOT count against your page limit). This will be due by 5pm on April 4th (see note above about no late work accepted). An assignment box will be opened on Canvas for submissions.

University Policies

Codes of Behavior

Each student should acquaint themselves with the University's codes, policies andprocudures involving academic misconduct, grievances, sexual and ethnic harassment, and discrimination basedon physical handicap. Students engaging in academic misconduct (including cheating, plagiarism, and any other action that may improperly affect evaluation) will be subject to sanctions in accordance with the Norman Campus Academic Misconduct Code. Grade sanctions could range from a zero for the specific assignment to an "F" for the course. University sanctions can be sever, i.e., explusion from the University.

Academic Integrity

Cheating is strictly prohibited at the University of Oklahoma, because it devalues the degree you are working hard to get. As a member of the OU community it is your responsibility to protect your educational investment by knowing and following the rules. For specific definitions on what constitutes cheating, review the Student's Guide to Academic Integrity at http://integrity.ou.edu/students_guide.html.

To be successful in this class, all work on exams and quizzes must be yours and yours alone. You may not receive outside help. On examinations and quizzes you will never be permitted to use your notes, textbooks, calculators, or any other study aids unless I give permission. Should you see someone else engaging in this behavior, I encourage you to report it to myself or directly to the Office of Academic Integrity Programs. That student is devaluing not only their degree, but yours, too. Be aware that it is my professional obligation to report academic misconduct, which I will not hesitate to do. Sanctions for academic misconduct can include expulsion from the University and an F in this course, so don't cheat. It's simply not worth it.

Religious Observance
It is the policy of the University to excuse the absences of students that result from religious observances and to reschedule examinations and additional required classwork that may fall on religious holidays, without penalty.

Reasonable Accommodation Policy
Students requiring academic accommodation should contact the Disability Resource Center for assistance at (405) 325-3852 or TDD: (405) 325-4173. For more information please see the Disability Resource Center website http://www.ou.edu/drc/home.html Any student in this course who has a disability that may prevent him or her from fully demonstrating his or her abilities should contact me personally as soon as possible so we can discuss accommodations necessary to ensure full participation and facilitate your educational opportunities.

Title IX Resources and Reporting Requirement
For any concerns regarding gender-based discrimination, sexual harassment, sexual assault, dating/domestic violence, or stalking, the University offers a variety of resources. To learn more or to report an incident, please contact the Sexual Misconduct Office at 405/325-2215 (8 to 5, M-F) or smo@ou.edu. Incidents can also be reported confidentially to OU Advocates at 405/615-0013 (phones are answered 24 hours a day, 7 days a week). Also, please be advised that a professor/GA/TA is required to report instances of sexual harassment, sexual assault, or discrimination to the Sexual Misconduct Office. Inquiries regarding non-discrimination policies may be directed to: Bobby J. Mason, University Equal Opportunity Officer and Title IX Coordinator at 405/325-3546 or bjm@ou.edu. For more information, visit http://www.ou.edu/eoo.html.

Adjustments for Pregnancy/Childbirth Related Issues
Should you need modifications or adjustments to your course requirements because of documented pregnancy-related or childbirth-related issues, please contact your professor or the Disability Resource Center at 405/325-3852 as soon as possible. Also, see http://www.ou.edu/eoo/faqs/pregnancy-faqs.html for answers to commonly asked questions.