

**BCHM 32200 – Analytical Biochemistry II**  
**Syllabus**  
**Spring, 2017**

**INSTRUCTOR:**

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**COURSE OBJECTIVES**

The primary objectives of this course are to introduce students to both classical and modern biochemical methods for the isolation and analysis of biological molecules, with an emphasis on proteins and nucleic acids. Principles and theory of techniques will be presented during lecture periods followed by application of the techniques during lab periods. Methods include affinity chromatography, electrophoresis, centrifugation, immunoblotting, quantitative PCR, mass spectrometry, and bioinformatics. Basic lab skills and concepts will be reinforced and use of the scientific method will be incorporated into the lab experiments. Students will learn proper scientific communication skills by writing lab reports.

**LEARNING OUTCOMES**

BCHM 32200 students will understand the molecular principles of life based on the core disciplines of biology, chemistry and physics.

BCHM 32200 students will be skilled laboratory scientists. They will perform a wide variety of biochemical and molecular techniques.

BCHM 32200 students will understand the scientific method. They will understand the concepts and importance of hypotheses, experimental design to test hypotheses, and data analysis in the creation of new knowledge.

BCHM 32200 students will acquire information literacy: the ability to locate, evaluate, and utilize information in the disciplines of biochemistry and molecular biology that is required for research, data analysis, and communication.

BCHM 32200 students will communicate scientific knowledge, experiments and conclusions effectively as writers.

BCHM 32200 students will understand the contributions of our discipline to society, including improvements to medicine, agriculture, the economy and the environment.

## **TEXTBOOK AND COURSE MATERIAL**

We have been experiencing the course without a textbook. Reading material from various sources will be provided to you via Blackboard or the internet.

Each week a PDF file containing instructions and information for the lab experiments will be posted to the course Blackboard page. **You are required to print this file and bring it with you to lab. You will need these instructions to conduct the experiments properly.** We are not allowed to print handouts for courses now. It is the student's responsibility to do this.

**You MUST read the lab instructions ahead of time. A short quiz will be given each week at the beginning of the morning lecture period on the lab instructions to make sure students are coming to lab prepared.**

## **TIME AND PLACE**

Lecture: Monday 11:30-12:20pm, BCHM 112  
Lab: Monday 1:30-4:20pm, BCHM 112

Attendance Policy:

Attendance in the lectures and laboratory is mandatory. The laboratory facilities used by this class are only available during the scheduled laboratory session. Thus it is not possible to make up labs at other times. In the event that an absence from lab is unavoidable, you should contact the instructor in advance. At the discretion of the instructor you may be able to make up the laboratory by submitting a short (5 typewritten pages) paper discussing the subject of that lab exercise. **Unexcused lab or lecture absences will result in a score of 0 on that week's quiz and/or the lab question set relevant to the week.** Please be aware that we will often use part of the morning lecture time to set up experiments in the lab.

## **BLACKBOARD LEARN**

The course syllabus, lecture notes, lab instructions, extra reading material, and grading keys for quizzes and exams will be available via the Purdue University Blackboard Learn site at: <https://mycourses.purdue.edu/>

## **LAB SAFETY**

Per new departmental requirements for laboratory safety, all students **MUST** wear lab coats, safety glasses, and gloves at all times while lab is in session. Students are responsible for providing their own lab coats. Safety goggles and gloves are available in the lab, but students may wish to provide their own safety glasses as well. Students that do not bring a lab coat will be asked to leave and will not be allowed to re-enter until they have one. Missing lab due to not having a lab coat will count as an unexcused absence and will affect the student's final grade as described below.

## **ASSESSMENT**

The two exams are non-cumulative and will mainly focus on the theory behind the methods learned and not on the lab exercises themselves. They may consist of multiple choice and short answer questions.

The grading for this course will be as follows:

Exam 1	20%
Exam 2	20%
Pre-lab quizzes	15%
Lab data & question sheets	25%
Final lab report	20%

The cutoff values for letter grades are as follows:

90-100%	A
88-89%	A-
86-87%	B+
80-85%	B
78-79%	B-
76-77%	C+
70-75%	C
68-69%	C-
60-67%	D
< 60%	F

Missing an exam or failure to turn in a lab data sheet will result in a grade of 0 being recorded unless documented justification is presented. Any request to be excused from an exam must include official documentation (doctor's note, request from academic advisor, etc) explaining why the exam was or will be missed. Makeup tests will be scheduled in consultation with the instructor.

If you have any disagreements with the way any of your exams or lab reports have been graded, please consult the grading key and then discuss them with the TA. In the event this does not resolve your concerns, please take them up with the instructor.

Requests for re-grades must be submitted no later than the end of the second class period after the graded exam or lab report has been returned.

**Lab data and question sheets:**

Each week, your group should have all data collection and analyses completed and uploaded to your OneDrive folder. In addition, there will be a sheet of data interpretation questions to turn in through the Blackboard Learn the following week at the beginning of the morning lecture period (11:30). These should be done independently, not as a group.

We have new Surface Pro tablets to use in the newly renovated teaching lab. All lab notebooks should be kept in OneNote. We are working on the best way to save files so they are accessible to you outside the lab. This will include access to your lab notebook.

**Final lab report:**

Instead of a final exam for this course, you will be required to write a research-style manuscript in the format of the Journal of Biological Chemistry that describes the purification, identification, and characterization of your enzyme, including appropriate figures and tables to present your experimental results. More details will be provided near the end of the semester. The final paper will be due on **Monday, May 01**.

1. Title page - title of lab project, your name and your lab partners' names.

2. Introduction - Briefly describe background information related to the project and state the overall goal of the project. This section should be 1-2 pages, double-spaced.
3. Methods - Describe the procedures used to conduct the experiments in sufficient detail so someone with the appropriate knowledge and skill could use your report to repeat the experiment. There is no length restriction for this section – use as much space as needed.
4. Results – Present, in an organized manner, the most important data acquired during the semester. This section should consist of graphic objects illustrating the results (graphs, photos, tables, etc) and text describing these results, in the form of a “story”. This section should be on the order of ~10 pages, double-spaced, although the length is not as important as the clarity and organization of the content.
5. Discussion – provide a concise discussion of the results you obtained during the project. Specifically, address whether or not data supported your hypotheses. Speculate why unexpected results might have been observed and suggest explanations for why any experiments didn’t work as expected. Give your interpretations as to the quality of the data obtained and what you learned/discovered from the experiments. This section should be roughly 3-4 pages, double-spaced, although the length is not nearly as important as the content.

### **EXTRA CREDIT**

There will be no opportunity for extra credit.

### **ACADEMIC MISCONDUCT**

Academic misconduct of any kind will not be tolerated in any course offered by the Department of Biochemistry. Information on Purdue’s policies with regard to academic misconduct can be found at: [http://www.purdue.edu/usp/acad\\_policies/student\\_code.shtml](http://www.purdue.edu/usp/acad_policies/student_code.shtml).

To provide you with an unambiguous definition of academic misconduct, the following text has been excerpted from "Academic Integrity: A Guide for Students", written by Stephen Akers, Ph.D., Executive Associate Dean of Students (1995, Revised 1999, 2003), and published by the Office of the Dean of Students in cooperation with Purdue Student Government, Schleman Hall of Student Services, Room 207, 475 Stadium Mall Drive West Lafayette, IN 47907-2050.

“Purdue prohibits "dishonesty in connection with any University activity. Cheating, plagiarism, or knowingly furnishing false information to the University are examples of dishonesty." [Part 5, Section III-B-2-a, [University Regulations](#)] Furthermore, the University Senate has stipulated that "the commitment of acts of cheating, lying, and deceit in any of their diverse forms (such as the use of substitutes for taking examinations, the use of illegal cribs, plagiarism, and copying during examinations) is dishonest and must not be tolerated. Moreover, knowingly to aid and abet, directly or indirectly, other parties in committing dishonest acts is in itself dishonest." [University Senate Document 72-18, December 15, 1972]

More specifically, the following are a few examples of academic dishonesty which have been discovered at Purdue University.

- substituting on an exam for another student
- substituting in a course for another student
- paying someone else to write a paper and submitting it as one's own work
- giving or receiving answers by use of signals during an exam
- copying with or without the other person's knowledge during an exam
- doing class assignments for someone else

- plagiarizing published material, class assignments, or lab reports
- turning in a paper that has been purchased from a commercial research firm or obtained from the internet
- padding items of a bibliography
- obtaining an unauthorized copy of a test in advance of its scheduled administration
- using unauthorized notes during an exam
- collaborating with other students on assignments when it is not allowed
- obtaining a test from the exam site, completing and submitting it later
- altering answers on a scored test and submitting it for a regrade
- accessing and altering grade records
- stealing class assignments from other students and submitting them as one's own
- fabricating data
- destroying or stealing the work of other students

Plagiarism is a special kind of academic dishonesty in which one person steals another person's ideas or words and falsely presents them as the plagiarist's own product. This is most likely to occur in the following ways:

- using the exact language of someone else without the use of quotation marks and without giving proper credit to the author
- presenting the sequence of ideas or arranging the material of someone else even though such is expressed in one's own words, without giving appropriate acknowledgment
- submitting a document written by someone else but representing it as one's own

### **EMERGENCY PREPAREDNESS**

In the event of a major campus emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances. To get information about changes in this course consult the class Blackboard site or e-mail or phone the instructor.

See document at end of syllabus for more emergency procedures information from Purdue. Please use this website as well for complete information on Purdue's emergency procedures and guidelines: [http://www.purdue.edu/epps/emergency\\_preparedness/index.html](http://www.purdue.edu/epps/emergency_preparedness/index.html)

### **ON-LINE COURSE EVALUATIONS**

During the last two weeks of the semester, you will be provided an opportunity to evaluate this course and your instructor(s). To this end, Purdue has transitioned to online course evaluations. On Monday of the fifteenth week of classes, you will receive an official email from evaluation administrators with a link to the online evaluation site. You will have two weeks to complete this evaluation. Your participation in this evaluation is an integral part of this course. Your feedback is vital to improving education at Purdue University. I strongly urge you to participate in the evaluation system.

## LECTURE/LAB TOPIC SCHEDULE

Week	Date	Lecture Topic	Lab Exercises
1	Jan 9	Course introduction; Bioinformatics, evolutionary relationships between proteins	Using bioinformatics tools (homology searching, multi-sequence alignments, etc.)
<b>2</b>	<b>Jan 16</b>	<b>MLK Holiday</b>	
3	Jan 23	Studying enzyme structure and function	Site Mutagenesis
4	Jan 30	Recombinant protein expression	Recombinant protein expression
5	Feb 06	Chromatography, protein purification	Affinity purification of proteins
6	Feb 13	Electrophoresis and protein separation methods	Protein analysis by SDS-PAGE
7	Feb 20	Use of antibodies in biochemical research	Quantitative Western blotting, assessing protein yield, in-gel protein digestion for mass spec analysis
8	Feb 27	Analysis of proteins by mass spectrometry (1)	Completion of Western Blotting
9	Mar 06	Analysis of proteins by mass spectrometry (2)	Protein identification by mass spectrometry
<b>10</b>	<b>Mar 13</b>	<b>Spring Break</b>	
11	Mar 20	Spectroscopic methods for protein analysis	<b>EXAM I</b>
12	Mar 27	Intro to enzyme catalysis and regulation	Enzyme assays
13	Apr 03	Molecular interactions/ substrate binding specificity	Substrate specificity
14	Apr 10	Enzyme kinetics	Michaelis-Menten enzyme kinetics
15	Apr 17	Enzyme inhibition	Analyzing enzyme inhibition
16	Apr 24	<b>EXAM II</b>	Group work time for final research papers
17	May01	<b>Turn in your final report</b>	