



## DEPARTMENT OF BIOCHEMISTRY

### BCHM 32200 – Analytical Biochemistry II CRN: 11181

#### Syllabus Spring, 2026

**Location:** Lab Prep and Lab ***attendance each week is mandatory.***

**Instructional Modality:** Face-to-Face

## COURSE DESCRIPTION AND INFORMATION

**Course credit hours:** 2 credits

**Pre-requisites:** BCHM 22100

**Course Description:** Modern biochemical techniques for the purification and characterization of proteins. This is a project-oriented course where students begin by purifying a recombinant enzyme by affinity chromatography and then characterize various biochemical properties of the enzyme throughout the semester. Emphasis will be placed on quantitative analyses, including measurements of enzyme activity and inhibition, molecular interactions, and oligomeric state. Students will learn basic principles of designing assays to measure biochemical phenomena. Use of bioinformatics and computational modeling tools for protein structure analysis will be integrated. The course will culminate with preparation of a manuscript-style report describing the enzyme characterization.

**Course Objectives:**

1. Give students practical experience with the process of isolating and characterizing biochemical properties of proteins and enzymes.
2. Expose students to classical and modern methods employed in protein characterization, including computational tools used to augment wet lab experiments. Methods include site-directed mutagenesis, recombinant protein expression, affinity and size exclusion chromatography, electrophoresis, centrifugation, immunoblotting, spectrophotometry, enzyme activity assays, mass spectrometry, bioinformatics, and protein structural modeling.
3. Introduce students to the early stages of the drug discovery process, including target identification and validation.
4. Provide students opportunities to develop hypotheses based on existing knowledge, and design appropriately controlled experiments to specifically test those hypotheses.

5. Give students practice effectively communicating scientific research results in writing.

**Learning Outcomes:**

1. Students will be able to apply the scientific method to a specific research problem. This will include the design of hypotheses based on finding and evaluating information available in primary literature, design of experiments to test hypotheses, and analysis of experimental data to determine if hypotheses are supported.

*Methods of assessment: Weekly lab data submissions, weekly lab question sets, final report*

2. Students will demonstrate proficiency in the application of modern biochemical and molecular techniques for the purification and characterization of proteins.

*Methods of assessment: Weekly lab instruction quizzes, weekly lab data submissions, weekly lab question sets, mid-term and end-of-semester exams*

3. Students will be able to explain the theoretical principles behind modern research methods for protein purification and characterization

*Methods of assessment: Weekly lecture quizzes, mid-term and end-of-semester exams*

4. Students will understand the contributions of the course methods to society, especially to the fields of drug discovery and agricultural biotechnology.

*Methods of assessment: Weekly lecture quizzes, Final report*

5. Students will be able to effectively document and communicate research results and their meaning in writing.

*Methods of assessment: Final report (including submissions of individual sections throughout semester)*

**Format Notes.**

- Students will engage in a continuous research project throughout the semester. The project assignment will be described in week 1 and will culminate with a final written report describing the project and results obtained in week 15.
- Each week will have a specific lab objective to complete with instructions provided. Most weeks will have an associated lecture that teaches principles and theory of the primary method being used in the lab. There are no in-person lectures. Recorded lectures are available via Brightspace with each week's course module. Students are required to view the lecture on their own time each week before the scheduled Lab Prep period, and to pass a short online quiz based on the lecture content.
- Each week a set of follow-up questions will be assigned after the lab period that will focus on the lab experiments and on data analysis. These questions will be due the following week.

## LEARNING RESOURCES, TECHNOLOGY & TEXTS

**Textbook:** There is no textbook to purchase for this course. The professor is in the final stages of publishing a lab manual for this course and the chapters will be provided to you via Brightspace each week. These contain background info and lab instructions. Additional reading material, including literature articles will be provided via Brightspace when needed. Sections of your Stryer Biochemistry textbook also provide some useful information on methods used in this course.

**Brightspace:** Course files will be made available on the course Brightspace page. This includes the lab instructions for each week, the course syllabus, the lecture videos, and accessory readings. ***Students should print the lab instructions and bring them to lab each week. The instructions are needed to conduct the experiments properly.***

**Computers:** Our teaching lab is equipped with PC laptop computers for each student. Students do not need to bring their own computer to lab. Lab computers are exclusively for use on the course project during the lab period. Computers must always remain in the lab room. Downloading or installing any non-course related programs or files or use of the computers for any purpose other than the assigned course project is strictly forbidden. All software needed for conducting experiments and analyzing data will be pre-installed on the lab laptop computers.

## ATTENDANCE POLICY

This is a laboratory course that focuses on development of practical research skills. Maximizing the educational value of the course therefore requires students to be present in lab, actively engaged in the activities. Lab attendance is mandatory every week. **PLEASE NOTE THAT WE USE THE MORNING LAB PREP PERIOD TO START LAB EXPERIMENTS SO THE POLICY APPLIES TO BOTH MORNING AND AFTERNOON PERIODS.** **Any unexcused absence from a lab prep or lab period will result in a score of 0 for all of that week's assessments, including pre-lab quizzes, data submission, and post-lab questions.** You may only miss lab for an excused medical or professional reason. You must communicate ahead of time to the instructor and provide documentation if asked. If unable to attend a lab session, students will still be responsible for completing all weekly assignments and quizzes and should communicate with their research group to obtain the data collected in the lab periods so that they can answer the weekly question sets. Students must keep in mind that it is not practical to have make-up lab sessions.

In general, students need to inform the instructor immediately of any anticipated or actual conflicts that will affect the timely submission of an assignment or the ability to take an exam. In cases of excusable absences like bereavement, quarantine, jury or military duty, parental leave, or medical emergencies, the student or the student's representative should contact the Office of the Dean of Students via email or phone at 765-494-1747. Brightspace includes a link to the Dean of Students under 'University Policies and Statements'.

## ASSIGNMENTS AND ASSESSMENTS

Grading for BCHM 32200 will be determined from the following assignments and assessments. The relative contribution of each is defined in the table at the end.

**Weekly Lecture Quizzes.** There will be a brief online quiz associated with the lecture video posted each week. This quiz, which assesses lecture topic comprehension, must be completed each week by midnight the night before the lab.

**Weekly Lab Instruction Quizzes.** There will also be a brief online quiz assessing each week's lab instructions. This is primarily to ensure students have read the instructions ahead of time in preparation for the week's lab activities. Prior preparation is essential to completing the labs on time and avoiding unnecessary mistakes. The quiz must be completed each week for students to be eligible for lab participation.

**Weekly Lab Data Submission.** At the end of each lab period, students will need to submit their dataset, as directed at the end of the lab instructions. The basis for evaluation of the data will be defined at the end of the instructions as well. All data must be submitted before leaving the lab. Data is submitted as a group and everyone in the group will receive the same grade for the data submission.

**Weekly Lab Question Sets.** A set of data interpretation questions will be assigned after the lab each week. These questions must be answered individually by each student, not as a group, but are based on the group's lab data. Answers to the lab question set are due before the subsequent week's lab prep period begins.

**Exams.** There will be 2 exams, the first roughly at mid-term, and the second the week before dead week at the end of the semester. The exams focus primarily on the theory from the lectures and background information from the lab instruction files. However, they also include a data analysis section based on the lab activities. The second exam is not cumulative.

**Final Report.** Instead of a final exam, you will be required to write a manuscript-style lab report in the format of a biochemistry journal article (Abstract, Introduction, Results, Discussion, Methods) that describes the purification, identification, and characterization of your enzyme, including appropriate figures and tables to present your experimental results from throughout the semester. Detailed instructions will be provided at the beginning of the semester and opportunities to turn in rough drafts of individual sections for feedback will be provided during the second half of the semester.

### **BCHM 32200 Grading Breakdown:**

Exam 1	20%
Exam 2	20%
Lecture quizzes	5%
Pre-lab quizzes	5%
Lab data	15%
Lab question sets	15%
Final lab report	20%

### **The cutoff values for letter grades are as follows:**

92-100%	A
90-91%	A-

88-89%	B+
82-87%	B
80-81%	B-
78-79%	C+
72-77%	C
70-71%	C-
60-69%	D
Below 60%	F

Missing an exam or failure to turn in the final report or lab question sheets on time 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.

**Questions about grades.** If you have any disagreements with the way any of your exams, quizzes, or assignments have been graded, please consult the grading key, if available, 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 next lab period after the graded exam, quiz or assignment has been returned.

**Extra credit.** There are no official opportunities for extra credit in this course.

**Obtaining extra help.** The instructor will be available to answer questions immediately after class, during lab, or by appointment (arranged in class or by e-mail). Alternatively, you can submit questions by e-mail. The lab TA will not hold office hours but will provide extra help by appointment or e-mail.

Review sessions are generally scheduled a couple days prior to the two exams

**Incomplete grades.** A grade of incomplete (I) will be given only in unusual circumstances. To receive an 'I' grade, a written request must be submitted prior to the instructor prior to the last day of classes. The request must describe the circumstances, along with a proposed timeline for completing the course work. Submitting a request does not ensure that an incomplete grade will be granted. If granted, you will be required to fill out and sign an "Incomplete Contract" form that will be turned in with the course grades. Any requests made after the course is completed will not be considered for an incomplete grade.

## LAB SAFETY

### Required Attire and Personal Protective Equipment (PPE)

- Attire: Closed-toe shoes; long pants (full leg coverage required); long hair tied back; no loose clothing or dangling jewelry.
- PPE during experiments: Lab coat, safety glasses or goggles, and gloves. Note that gloves and safety goggles will be provided but students are expected to provide their

- own lab coat and keep it clean during the semester. Dust masks may be required occasionally.
- During exams or dry lab activities, appropriate attire is still required, but PPE is not necessary

### **Glove Use and Hygiene**

- Gloves should be properly sized (small, medium, and large are available at benches; XS and XL are available with the extra glove boxes).
- Gloves should be worn when actively performing experimental procedures.
- Personal items (phones, backpacks, etc.) and computers should not be handled while wearing gloves.
- Torn or heavily soiled gloves should be replaced immediately.
- Used gloves must be discarded in the recycling bin and not left on benchtops for reuse.
- Gloves must be removed when leaving the lab.

### **General Lab Conduct**

- Food, drinks, cosmetics, and other consumable items should not be visible or used in the lab. These items may be stored in backpacks or lunchboxes but must be used outside the lab.
- Coats, bags and other personal items must be stored so as not to interfere with lab traffic and lab bench use. The room contains hooks for coats and bags and there is limited space under the benches for storing these personal items.
- Students may not perform experiments without an instructor or TA present.
- Unauthorized experiments are not permitted.

### **Bench Cleanup Responsibilities**

After lab activities have been completed, students should:

- Wipe up spills.
- Dispose of trash properly.
- Label and store samples as instructed.
- Wash glassware.
- Wind micropipettors to their maximum volume.
- Return all items to their designated locations.

TAs and instructors will only be responsible general cleaning of benches and equipment after lab. Failure to clean up as directed will result in a reduction to the lab data grade.

### **Waste Disposal**

Please follow EHSA guidelines when disposing of waste:

- Chemically contaminated disposable plastics (e.g., pipette tips, cuvettes, weigh boats) should be emptied and placed in the labeled 5-gallon containers.
- Biohazardous or look-alike waste should be placed in biohazard containers.
- Gloves should be placed in the designated glove recycling container.
- Hazardous chemicals should be placed in a labeled container in the fume hood.

### **Additional Expectations**

- Phones and electronic devices are only allowed for course-related purposes.

- Know the evacuation routes and shelter-in-place procedures. Instructors and TAs will review these at the beginning of the course.

## ACADEMIC MISCONDUCT

Academic integrity is one of the highest values that Purdue University holds. Individuals are encouraged to alert university officials to potential breaches of this value by either emailing [integrity@purdue.edu](mailto:integrity@purdue.edu) or by calling 765-494-8778. While information may be submitted anonymously, the more information is submitted the greater the opportunity for the university to investigate the concern. More details are available on the Academic Resources table on your Brightspace homepage.

Any incidence of academic misconduct will be reported to the Office of the Dean of Students. Academic misconduct may result in disciplinary sanctions including expulsion, suspension, probated suspension, disciplinary probation, and/or educational sanctions. In addition, such misconduct will result in punitive grading such as:

- receiving a lower or failing grade on the assignment, or
- assessing a lower or failing grade for the course

Punitive grading decisions will be made after consultation with the Office of the Dean of Students. Please note reported incidences of academic misconduct go on record for reference by other instructors. Further, a record of academic misconduct is likely to influence how current/future situations are handled.

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

Any plagiarism on the final reports will result in a grade of 0. Plagiarism will be assessed using the Turnitin originality checker available in Brightspace.

**Important Note on Course Materials:** All materials used in this course, including lecture videos, lab instructions, assignments, exams, quizzes, and answer keys are subject to copyright protection. Distribution of any course material to any persons or entity other than registered course participants is strictly prohibited without written permission from the instructor.

### Responsible Use of AI in Completing Coursework

Advancements in Artificial Intelligence (AI) provide students with unparalleled access to information and problem-solving capabilities. However, with these advantages come the responsibilities of ethical use and academic integrity. This statement outlines the expectations and guidelines for the responsible use of AI in our course. By adhering to these guidelines, students will 1) Uphold academic honesty and personal integrity, 2) Ensure equitable access

and opportunities for all students, 3) Develop skills for critical thinking and independent reasoning, and 4) Understand the strengths and limitations of AI tools.

**Guidelines for Responsible Use:**

1. **Acceptable Uses:** Students are welcome to use freely available AI tools to assist in understanding theoretical concepts presented and encountered in the course.
2. **Prohibited Uses:** AI tools cannot be used in any way in the completion of quizzes, weekly question sets, or the final reports (except as a tool to find appropriate literature articles to cite). AI tools cannot be used to assist in the processing or interpretation of data, including performing calculations. All data processing and analysis must be conducted as instructed in the weekly protocols.
3. **Accessibility and Data Privacy:** All students must have equal access to AI tools. Therefore, only use of freely available AI tools are permitted. Students must be cautious when sharing personal or sensitive information with AI platforms and should be familiar with the terms of service of any third-party AI tools.

**Consequences for Misuse:** Misuse of AI tools in coursework, which includes but is not limited to producing unoriginal work, uncited use of AI-generated content, or unauthorized assistance on assessments, will be considered a breach of academic integrity. Consequences will follow the Purdue's policies on academic dishonesty as detailed above, which may include grade penalties, course failure, or more severe disciplinary actions.

**Reflection & Discussion:** Students are encouraged to reflect on their experiences using AI tools and to discuss openly any ethical or academic concerns. During this course, you will have opportunities to explore use of AI as a tool in research and to discuss your thoughts about advancements in AI and their implications in academia.

The promise of AI in enhancing learning and research is vast, but it must be used judiciously. Responsible use not only ensures academic honesty but also maximizes genuine learning and skill development. Students are urged to approach AI as a supplementary tool, not a replacement for their unique intellectual capacities and insights.

## **NON-DISCRIMINATION POLICY**

Purdue University is committed to maintaining a community that recognizes and values the inherent worth and dignity of every person; fosters tolerance, sensitivity, understanding, and mutual respect among its members; and encourages each individual to strive to reach his or her potential. A hyperlink to Purdue's full Nondiscrimination Policy Statement is included in the Academic Resources table on your Brightspace homepage.

## **ANTI-HARASSMENT POLICY**

Purdue University is committed to maintaining an environment that recognizes the inherent worth and dignity of every person; fosters tolerance, sensitivity, understanding and mutual respect; and encourages its members to strive to reach their potential. The most effective way to work toward preventing Harassment is through education that emphasizes respect for every individual.

Harassment in the workplace or the educational environment is unacceptable conduct and will not be tolerated. Purdue University is committed to maintaining an educational and work climate

for faculty, staff and students that is positive and free from all forms of Harassment. This policy addresses Harassment in all forms, including Harassment toward individuals with legally protected status for reasons of race, gender, religion, color, age, national origin or ancestry, genetic information or disability and Harassment toward individuals for other reasons such as sexual orientation, gender identity, gender expression, marital status or parental status. Full details of Purdue's anti-harassment policy can be found here:

<http://www.purdue.edu/policies/ethics/iiic1.html>

The Vice President for Ethics & Compliance website includes a list of [Student Policies](#). Among those is the [Violent Behavior policy](#), which explains that Purdue is committed to providing a safe and secure campus environment for members of the university community. Purdue strives to create an educational environment for students and a work environment for employees that promote educational and career goals. Violent behavior impedes such goals. Therefore, violent behavior is prohibited in or on any University facility or while participating in any university activity.

## MENTAL HEALTH

**If you find yourself beginning to feel some stress, anxiety and/or feeling slightly overwhelmed, try [Therapy Assistance Online \(TAO\)](#)**, a web and app-based mental health resource available courtesy of Purdue Counseling and Psychological Services (CAPS). TAO is available to all students at any time by creating an account on the [TAO Connect website](#), or downloading the app from the App Store or Google Play. It offers free, confidential well-being resources through a self-guided program informed by psychotherapy research and strategies that may aid in overcoming anxiety, depression and other concerns. It provides accessible and effective resources including short videos, brief exercises, and self-reflection tools.

**If you need support and information about options and resources**, please contact or see the [Office of the Dean of Students](#). Call 765-494-1747. Hours of operation are M-F, 8 a.m.- 5 p.m.

**If you find yourself struggling to find a healthy balance between academics, social life, stress, etc.,** sign up for free one-on-one virtual or in-person sessions in West Lafayette with a [Purdue Wellness Coach at RecWell](#). Student coaches can help you navigate through barriers and challenges toward your goals throughout the semester. Sign up is free and can be done on BoilerConnect.

If you're struggling and need mental health services: Purdue University is committed to advancing the mental health and well-being of its students. If you or someone you know is feeling overwhelmed, depressed, and/or in need of mental health support, services are available. For help, such individuals should contact [Counseling and Psychological Services \(CAPS\)](#) at 765-494-6995 during and after hours, on weekends and holidays, or by going to the CAPS offices in [West Lafayette](#)

## ACCESSIBILITY AND ACCOMODATIONS

Purdue University strives to make learning experiences as accessible as possible. If you anticipate or experience physical or academic barriers based on disability, you are welcome to

let me know so that we can discuss options. You are also encouraged to contact the Disability Resource Center at: [drc@purdue.edu](mailto:drc@purdue.edu) or by phone: 765-494-1247.

Every member of our course should be able to access, use, and learn from the materials we share. This includes all course-related digital content that you and I share in the course. This approach helps promote equal access for everyone at Purdue and is mandated federally by [Title II of the Americans with Disabilities Act \(ADA\)](#). We will work together to provide this access within our Brightspace course.

- My part, as instructor, is to make sure all course materials shared to Brightspace, such as documents, slides, videos and audio, and images, meet accessibility guidelines and to assist you in making sure anything you share is accessible.
- Your role, as a student, is to make sure anything you post for other students to engage with is also accessible, such as peer grading, peer feedback, and discussion board posts. This expectation is built into all course assignments that require you to post to Brightspace.
- A good starting place for you is to bookmark and review the [Innovative Learning Accessibility Checklist](#) for guidance on creating accessible materials.
- When selecting materials to share on our Brightspace from Purdue Libraries catalog or databases, best practices include choosing items that:
  - Can be downloaded in full
  - Are available in EPUB or HTML formats
  - Include alternative text for written materials or captions for audio/visual content

If the Disability Resource Center (DRC) has determined reasonable accommodations that you would like to utilize in my class, you must release your Course Accommodation Letter to me. Instructions on sharing your Course Accommodation Letter can be found by visiting: [How To Use Your Course Accommodation Letter](#). Additionally, you are strongly encouraged to contact me as soon as possible to discuss implementation of your accommodation.

The instructor will arrange to provide test accommodation for those who have them as a part of their DRC Course Accommodation Letter (CAL). It is imperative that students release their CALs to the instructor as soon as they are available so that arrangements can be made well in advance of exams. We may be unable to implement test accommodations if we do not have access to your CAL.

## **BASIC NEEDS SECURITY**

If you are facing challenges securing basic needs such as food, housing, transportation, health services, or access to technology or childcare resources and believe this may affect your performance in the course, please contact the Office of the Dean of Students (ODOS) to help coordinate with [community resources](#). These services vary by location. In **West Lafayette**, see the [Basic Needs Program](#) website, or email [basicneeds@purdue.edu](mailto:basicneeds@purdue.edu).

## 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 beyond the instructor's control. Relevant changes to this course will be posted onto the course website or can be obtained by contacting the instructors or TAs via email or phone. You are expected to read your @purdue.edu email on a frequent basis.

See Purdue's Information on [Emergency Preparation and Planning](#). This website covers topics such as Severe Weather Guidance, Emergency Plans, and a place to sign up for the Emergency Warning Notification System. I encourage you to download and review the [Emergency Preparedness for Classrooms document](#).

The first day of class, I will review the **Emergency Preparedness plan for our specific classroom**. Please make note of items like:

- The location to where we will proceed after evacuating the building if we hear a fire alarm.
- The location of our Shelter in Place in the event of a tornado warning.
- The location of our Shelter in Place in the event of an active threat such as a shooting.

## 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). You will also be asked to provide an evaluation of the TA. Near the end of the semester 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. You are strongly urged to participate in the evaluation system. Your feedback will help improve the course for future students.

## DISCLAIMER

This syllabus is subject to change. Changes will be brought to your attention as far ahead of time as possible.

## LECTURE/LAB TOPIC SCHEDULE

Week#	Lecture Topic	Lab Exercises
1	Course overview; Bioinformatics	Using bioinformatics tools (homology searching, sequence alignments, etc.)
2	Protein structure and function	Site-directed mutagenesis
3	Recombinant protein expression	Recombinant protein expression
4	Chromatography and protein purification	Protein affinity purification
5	Protein electrophoresis	Protein analysis by SDS-PAGE, measuring protein concentration
6	Use of antibodies in biochemical research	Quantitative immunoblotting
7	Spectroscopy and mass spectrometry	<b>Exam 1;</b> protein mass spectrometry
8	Studying protein hydrodynamic properties	Determining protein oligomeric state
9	Enzyme catalysis and regulation	Enzyme assays
10	Enzyme kinetics	Steady state enzyme kinetics
11	Molecular recognition	Substrate specificity
12	Enzyme Inhibition	Enzyme inhibition
13	Protein structure determination	Ligand docking and optimization
14	No lecture for second exam week	<b>Exam 2</b>
15	Writing scientific papers	Writing workshop for research papers