Georgia Institute of Technology

SYLLABUS
CHEM 4582: Biochemistry Laboratory II (with Mini-CUREs)

Fall 2026

Instructor

Dr. Mary E. Peek
Principal Academic Professional
School of Chemistry and Biochemistry

Meeting Times

Lectures: Mondays, 12:30 - 1:20 pm – location to be determined

Laboratory Sessions: Wednesdays and Thursdays, 12:30 - 6:15 pm, Boggs 2-59

Prerequisites

Students must have earned a minimum grade of "D" in the following courses:

- CHEM 3522: Biochemistry II
- CHEM 4581: Biochemistry Laboratory I

Course Description

Biochemistry Laboratory II (CHEM 4582) is a 3-credit lecture and laboratory course on the biophysical characterization of biological macromolecules. CHEM 4582 will include at least 6-weeks of course-based undergraduate research experiences (CUREs). Students in CHEM 4582 will contribute to one of the offered projects this term. The research will only be conducted during the latter half of the semester - hence the term "mini-CUREs." Students will investigate one of the following projects offered this semester:

- **Biometals CURE** (offered by Dr. Amit Reddi) seeks to understand how metals influence heme trafficking in cells
- **Environmental Biotechnology CURE** (offered by Dr. Raquel Lieberman) seeks to discover novel enzymes capable of breaking down plastics to address the global plastic pollution crisis
- **Ribosome CURE** (offered by Dr. Loren Williams) seeks to understand and characterize interactions between ribosomal RNA and proteins involved in RNA metabolism and gene regulation
- **Kinase CURE** (led by Dr. Mary Peek) seeks to discover novel inhibitors of kinase activity as potential treatments for cancer or cardiovascular disease
- **Protein Engineering CURE** (mentored by Dr. Andrew McShan) seeks to design novel proteins capable of preventing protein misfolding that leads to neurodegenerative diseases

The five hallmarks of CUREs are (1) scientific practices, (2) discovery, (3) relevance, (4) collaboration, and (5) iteration.

Course Objectives

CHEM 4582 is designed to:

- Expand undergraduate research to all biochemistry majors through
- Cultivate students' ability to design and conduct biochemical experiments
- Promote critical thinking throughout the scientific method
- Foster a strong laboratory safety culture
- Develop strong collaboration and communications skills

Learning Outcomes

By the end of this course, students will be able to:

- Conduct experiments to investigate biomolecular structure, function, and/or interactions
- Generate, critically analyze, and interpret biochemical data
- Design experiments for characterizing biomolecules
- Communicate results effectively in writing and orally
- Work effectively in a team

Required Course Materials

- Educational content is provided for free via Canvas

- Laboratory safety gear includes:
  - Safety glasses (or over-the-glasses safety glasses or goggles for students wearing eyeglasses)
  - A cotton or cotton blend laboratory coat
  - Closed-toed shoes
  - Clothing that covers the torso from the neck to the ankles

- Standard software used in CHEM 4582 includes:
  - PyMOL
  - Chem3D
  - AutoDock Vina
  - LoggerPro
  - GraphPad Prism
  - Microsoft Office

The Biochemistry Teaching Laboratory is equipped with laptops at each workstation for student use during laboratory sessions.

Grading Policy

Final grades in CHEM 4582 will be computed based on the following scheme:

- 15% Pre/Post-Lab Assignments
- 15% Learning Activities
- 10% Experimental Design
- 10% Laboratory Performance
- 15% Data Analysis and Quality

- 15% Laboratory Report (Draft and Final Report)
- 20% Communication (ELNs, CURE Presentation, and Collaboration)

Final grades in CHEM 4582 will be assigned based on the following averages:

- 90-100% = A
- 80-89% = B
- 70-79% = C
- 60-69% = D
- <60% = F

Description of Grading Components

Pre-Lab Assignments: Pre-lab assignments will cover key critical thinking concepts needed to conduct experiments, calculations, and safety associated with the day's experiment. Pre-lab assignments must be completed by 12 noon on the day of your laboratory session.

Post-Lab Assignments: Post-lab assignments will challenge students to reflect on the experiment that was conducted through key observations, skills development, and introspection. Post-lab assignments will typically be due the day after your laboratory session.

Learning Activities: During the first week of classes, students will conduct a series of online safety and technical training assignments online. Students will NOT report to the residential laboratory during the first week. Due to an Institute Biosafety Committee (IBC) protocol, students are required to complete General Biosafety and Recombinant DNA Training led by Georgia Tech's Office of Environmental Health and Safety (EHS). Details will be provided in Canvas.

Throughout the semester, students will have low-stakes learning activities to complete during lecture sessions. Many learning activities will involve group work, so it is advantageous to attend lectures. However, assignments will be made available on Canvas to students who miss lecture for partial credit.

Experimental Design: Students will design a biochemical experiment that is not a part of your CURE. The experiment may involve your CURE topic or any other topic investigating a protein, nucleic acid, carbohydrate, or lipid at the molecular level. The experimental design will not be conducted but rather will showcase your understanding of the scientific method. The proposed experimental design will be evaluated based on its scientific merit and clarity.

Laboratory Performance: Students will be evaluated on their performance (i.e. work ethic) in the residential laboratory sessions each week. Performance criteria include:

- Reporting to lab on time
- Wearing appropriate clothing and personal protective equipment
- Making safe and smart choices during the experiment including appropriate chemical waste handling
- Working with sufficient efficiency and diligence (irrespective of speed) to complete the experiment during the laboratory period and not waste time

Data Analysis & Quality: Data generated during experiments will be evaluated on qualities such as accuracy of data analysis and reasonableness of measurements. Students will not need to submit anything extra for Data Quality grades. TAs will evaluate data presented in the student's ELN. Note: It is imperative that data is reported in the ELN appropriately for accurate grading of data analysis and quality.

Laboratory Reports: Students will complete a draft of the Kinetics laboratory report and then a revised final submission. The final report is weighted significantly higher than the draft. Note: Feedback on the draft is not exhaustive. Please consult the Laboratory Report Writing Guide and supplemental resources for help with writing your laboratory reports.

ELN Maintenance: Students will maintain detailed records of the work that they conduct during all residential laboratory periods using Microsoft Word and subsequent conversion to PDF. Raw data files should also be submitted to Canvas. More guidance on ELN maintenance will be provided in Canvas. ELNs will typically be due on the day after your laboratory session.

CURE Team Presentation: At the end of the semester, each team will have up to a 45-min time block to present your results during a symposium-style laboratory session. Groups will be evaluated on your PowerPoint file submission, PowerPoint presentation composition, and delivery including teamwork, flow, and overall quality of the delivery. More details about CURE Team Presentation requirements will be provided via Canvas.

Collaboration: Students will conduct reflection assignments to monitor your perceptions of collaborations in the CURE. At the end of the course, students will evaluate yourselves and your peers in your CURE team. Assignments will be scored based on the level of feedback. Periodic observations of student collaboration will also be made by CURE project stakeholders (i.e. project hosts) and TAs.

Course and Institute Policies

Attendance

Students are expected to abide by Georgia Tech's Policy on Attendance. Although regular attendance in the lecture and laboratory sessions is required for the best academic training in Biochemistry, student health and wellbeing are of utmost importance. In-person attendance in lectures and laboratory sessions is expected.

We plan to address student absenteeism from the laboratory according to the following plan:

- In the event of an illness or medical emergency, please seek medical attention instead of reporting to the laboratory session. Please inform me as soon as possible regarding your absence from the laboratory session and when you resume classes so that we may try to schedule a makeup laboratory opportunity or alternative online experiment (no guarantees about an online alternative, though). Ongoing health-related absences will be addressed according to guidance offered by the Office of the Dean of Students or by my discretion.

- Making up missed laboratory experiments will be made with careful coordination where possible.

- If participation in your CURE is affected for any reason, then other provisions for making up the missed group work will be made on a case-by-case basis at my discretion.

- Institute-approved absences from class include conference presentations, representing GT at an event including some sports-related activities. Unfortunately, medical school interviews, graduate school interviews, weddings, or other personal endeavors are not considered Institute-approved absences. Please contact Dr. Peek as soon as possible to work out reasonable arrangements for handling any anticipated or unexpected absences from class. For more information, please consult the Institute Approved Absences site.

Wearing Masks

The University System of Georgia encourages people to wear masks based on their preference and assessment of personal risk. Masks are available for students in the Biochemistry Teaching Laboratory. Please consult Georgia Tech's guidance on isolation and quarantine regarding COVID-19.

Academic Integrity

All students are expected to follow the Georgia Tech Academic Honor Code.

Plagiarism

Using the words or work of another as if it were one's own is plagiarism. Plagiarism is inappropriate in this laboratory and in all other situations and is a violation of the Georgia Tech Honor Code. Here are some steps to help you avoid plagiarism:

- Do not quote others in the text of your laboratory reports. Instead, practice developing mature technical writing skills by expressing your ideas in your own words.
- Do not copy chemical structures, chemical reactions/mechanisms, or any other artwork from others, particularly published work (even if cited) and other students. Published work is copyrighted and should not be reprinted as part of laboratory reports without explicit permission from the editor.
- Do not use a past, present, or potentially future peer's laboratory report as a role model. The tendency to copy phrases, expressions, data and/or ideas is too prevalent. Such collaborations are not authorized.
- Occasionally experimental work in this laboratory will be done in teams or groups. While data should be shared, perform data analyses independently and write your laboratory reports independently.
- Work on all assignments independently unless you have been given explicit permission to collaborate by the instructor.

Use of Artificial Intelligence (AI)

Students may **not** use AI for generating ELNs or laboratory reports (draft or full) or answering pre- and post-laboratory questions. AI may be used for brainstorming ideas, background research, and information gathering, particularly during CUREs, and should be cited in ELNs with the AI name, prompts used, and AI output clearly described. AI may **not** be used for generating figures and/or final written content for any assignments in the course.

Acceptable Student Conduct

Students are expected to abide by Georgia Tech's Student Code of Conduct.

Accommodations For Students With Disabilities

If you have learning needs that require special accommodations, please contact the Office of Disability Services (ODS) to register your documentation attesting to your disabling condition. Students who

have registered should inform me during the first week of classes about your approved accommodation. Your information must be published in Georgia Tech's new online portal called AIM.

Georgia Tech Resources

Emergencies: call GT Police at **(404) 894-2500**

Academic Support

- Academic Success: Tutoring and Academic Support
- Naugle Writing and Communication Center
- Academic Advisors for the School of Chemistry and Biochemistry

Personal Support (Student Life Assistance)

Students may request a meeting with the Dean of Students, report concerns using the online referral form, or verify class absences.

Student Life also has numerous departments including:

- Center for Mental Health Care & Resources
- Students' Temporary Assistance and Resources (STAR Services) which houses the Campus Closet, Klemis Kitchen, crisis housing support, and the Dean Griffin Hip Pocket Loan
- Wellness Empowerment Center

National Resources

- National Suicide Prevention Lifeline | 1-800-273-8255 | Free 24/7 support
- The Trevor Project: 1-866-488-7386 | Online Chat | Text "START" to 687687