BCHM 290: Experimental Design Seminar

Spring, 2026

Course Information

Instructional Modality: Face-to-Face
CRN: 54185
Course Credit Hours: 2

Consultation Times:
The professorand the TAs will be available via email and during/after the lecture sessions. Review sessions will be held during standard lecture times prior to each exam.Additional office hours can be made available upon request atthe professor's discretion.

Course Description

The objective of this course is to prepare students for the intellectual challenges of scientific research. The course will introduce the scientific method and provide a conceptual overview of several major experimental approaches used in biochemistry. Student teams will develop critical thinking skills by applying these principles to assigned experimental problems. Specific issues that will be examined include testing hypotheses versus proving them, the difference between correlation and causation, observation and serendipity, the perils of dogma, the importance of replication of experimental results, false positives and false negatives, necessity andsufficiency, the importance of positive and negative controls, the fundamentals and importance of statistics, and in vitro versus in vivo approaches and the strengths and weaknesses of both.

Learning Resources, Technology, and Texts

Textbook:
No textbook is required. Various readings will be assigned during the semester.

Brightspace:
All assignments and course materials will be posted to the course's Brightspace page. I strongly recommend that you subscribe to email updates when course announcements are posted. Sometimes this option is automatically enabled, and sometimes it is not.

Course Learning Outcomes

Students will have an understanding of the scientific method. They will be able to develop hypotheses, design experiments, and critically analyze results to create new knowledge.

Students will have an appreciation of ethical issues facing professionals in the life sciences.

Students will communicate scientific knowledge, experiments and conclusions effectively.

BCHM 290: Experimental Design Seminar

Spring, 2026

Assignments

Short Homework:
Short homework assignments will be due at the beginning of some class periods. They are usually meant to prepare you for the discussion and problems presented in class.

Experimental Design Proposals:
These are longer homework assignments that require you to propose experiments to test hypotheses including appropriate controls. They also require explanations of the theory and topics relevant to the methods used.

Class Participation:
This is a discussion-based course, and thus your participation in class will count towards your grade. If you have something to contribute when the professor asks for input, don't hesitate to raise your hand!

Formal Research Presentation:
At the end of the course, each lab group will present their findings to the other groups by giving a formal research presentation. This will require the groups to walk through the concept behind their project as well as their data slides.

Honors Contracting:
Honors contracting is not currently available for this course.

The grade breakdown for the course is as follows (450 points in total):

Midterm Exam:	75 points
Final Exam:	75 points
Short Homeworks:	60 points
Experimental Design Proposals:	200 points
Class Participation:	40 points

Grading Scale

This course follows a typical letter-grade percentage scale:
A: 90% or above
B: 80% to 89%
C: 70% to 79%
D: 60% to 69%
F: below 60%

BCHM 290: Experimental Design Seminar

Spring, 2026

Attendance Policy

As participation points are part of the final grade, I encourage you to attend and contribute whenever possible.This course will include problem solving during class so failure to attend could place students at a disadvantage. Slides from the instructor will be available on Brightspace after class along with recordings of the instructor's voice, but these may not capture all the relevant information.

University policy states that you are expected to attend every scheduled class.That being said, we will not be recording attendance separately from awarding points for your in-class contributions. Note that some homework assignments are also complete as in-class exercises.

Course Schedule

Note: this schedule is tentative. Lecture topics are subject to change.Assignment due dates can be moved back, but never forward.

Week	Lecture Topic	Assignment Due:
1	Introduction and the Scientific Method	
	Mechanisms, Variables, and Groups	
2	Controls and Western Blots	
	PCR	Short Homework 1
3	Data Analysis	
	Confirmation Bias	
4	Experimental Design 1 In-class Exercise	
	Exploratory Research, Telomerase	
5	Protein Mutational Analysis	Experimental Design 1
	Short Homework2 In-class Exercise	
6	Experimental Error I	
	Experimental Error II	
7	RT-PCR	Short Homework 3
	Scientific Career Paths	
8	Genetic Screens	
	Exam Practice Questions and Review	Experimental Design 2
9	**Midterm Exam**	
	Review of Midterm	
SB	**No class – Spring Break**	
10	Course Plans and Homework Concepts	
	Testing Hypotheses Using Statistics	
11	Population Statistics and *t*-tests	
	Scientific Communication – Jigsaw Activity	Short Homework 4
12	Bioinformatics: Large Data Sets	

	CRISPR-Cas9 Gene Editing	
13	Short Homework 5 In-class Exercise	
	Research Misconduct	
14	Authorship and Peer Review	
	Scientific Funding – Grant Review Panel Activity	
15	Exam 2 Review Session	Experimental Design 3
	Exam 2	

Additional Course Policies

Notice of Copyright Protection of Course Materials

See the University Policies and Statements section of Brightspace for guidance on Use of Copyrighted Materials. Effective learning environments provide opportunities for students to reflect, explore new ideas, post opinions openly, and have the freedom to change those opinions over time. Students and instructors are the authors of the works they create in the learning environment. As authors, they own the copyright in their works subject only to the university's right to use those works for educational purposes Students may n ot copy, reproduce, or post to any other outlet (e.g., YouTube, Facebook, or other open media sources or websites) any work in which they are not the sole or joint author or have not obtained the permission of the author(s).

Protect Purdue

Any student who has substantial reason to believe that another person is threatening the safety of others by not complying with Protect Purdue protocols is encouraged to report the behavior to and discuss the next steps with their instructor. Students also have the option of reporting the behavior to the Office of the Student Rights and Responsibilities. See also Purdue University Bill of Student Rights and the Violent Behavior Policy under University Resources in Brightspace.

Academic Integrity

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 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 our course Brightspace under University Policies and Statements.

BCHM 290: Experimental Design Seminar

Spring, 2026

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 the following website: http://www.purdue.edu/studentregulations/student_conduct/regulations.html

Any incidence of academic misconduct will be reported to the Office of the Dean of Students (ODOS). 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 ODOS. 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.

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, Student 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]

BCHM 290: Experimental Design Seminar

Spring, 2026

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”

Appropriate Use of AI

Generative AI tools such as ChatGPT and Gemini can be helpful for specific (often repetitive) tasks. However, everyone needs to be aware that these tools can and will fabricate facts, literature references, and credit for discoveries. They won’t even feel shame in doing so:

they're merely algorithms, after all. Thus, you must be extremely diligent in checking every statement made by a generative AI tool to ensure its accuracy. Since fabricating literature references and plagiarism are serious academic integrity violations***I strongly recommend against using generative AI to write any text that is included in assignment submissions.***

Since exams are given in-person, the assignments in this course that are the most likely culprits for AI usage are the short homework and experimental design proposals. As I mentioned above: do not use AI to write any part of your submissions for these assignments. Instead, consider using it as a tool to assist your understanding in the following ways

- Evaluate whether the answer you wrote fully addresses the question
- Suggest wording changes to make your answer more precise or less wordy
- Ask for alternative explanations that your answer doesn't consider

These uses of AI can assist you in answering the question without inadvertently plagiarizing text from online resources or fabricating references to publications. Remember to always double-check claims from an AI tool and to ask the professor if you have any questions about the course policies.

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.

A link to Purdue's Information on Emergency Preparation and Planning is provided below:
https://www.purdue.edu/ehps/emergency-preparedness/

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 (PDF) or (Word).

The first day of class, I will review the Emergency Preparedness plan for our specific classroom, following Purdue's required Emergency Preparedness Briefing. 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.

Online Course Evaluations

During the last two weeks of the semester, you will be provided with 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.

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. In pursuit of its goal of academic excellence, the University seeks to develop and nurture diversity. The University believes that diversity among its many members strengthens the institution, stimulates creativity, promotes the exchange of ideas, and enriches campus life. Purdue's full Nondiscrimination Policy Statement is available at the following webpage: https://www.purdue.edu/home/ea_eou_statement/

Mental Health

If you find yourself beginning to feel some stress, anxiety and/or feeling slightly overwhelmed, try WellTrack**.** Sign in and find information and tools at your fingertips, available to you at any time.

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 with a Purdue Wellness Coach at RecWell. Sign up is free and can be done on BoilerConnect. Students in Indianapolis will find support services curated on the Vice Provost for Student Life website.

BCHM 290: Experimental Design Seminar

Spring, 2026

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 or Indianapolis.

Basic Needs Security

Any student who faces challenges securing their food or housing and believes this may affect their performance in the course is urged to contact the Dean of Students for support. There is no appointment needed, and Student Support Services is available to serve students from 8 a.m. to 5 p.m. Monday through Friday.

Accessibility and Accommodations

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 (drc@purdue.edu, 765-494-1247).

Disclaimer

This syllabus is subject to change.