

**BCHM 49800 Syllabus
Fall/Spring/Summer**

Research in Biochemistry

INSTRUCTOR

Any faculty member in the Department of Biochemistry may assume responsibility for guiding a BCHM 49800 research project. In addition, Purdue faculty in science-related departments outside of the Department of Biochemistry may assume responsibility for supervising a BCHM 49800 project with the approval of the project by the student's biochemistry faculty mentor.

PREREQUISITES

Permission from Instructor

Undergraduate level BCHM 36100 Minimum Grade of D- (may be taken concurrently) or Undergraduate level BCHM 56100 Minimum Grade of D- (may be taken concurrently) and BCHM 32200 Minimum Grade of D- (may be taken concurrently)

COURSE OBJECTIVES

BCHM 49800 is intended to provide the opportunity for in-depth, independent, undergraduate research. The students enrolled in this course will learn how to devise hypotheses, design experiments that test their hypotheses, record their data in laboratory notebooks, critically analyze the results of their analyses, and present their findings to others in written form.

- Students are strongly encouraged to enroll in BCHM 49800 and start independent research by their 5th semester (beginning of junior year).
 - Laboratory research provides experiential learning that cannot be acquired through formal coursework.
 - Laboratory research provides intensive exposure to modern research techniques, the scientific method, and troubleshooting protocols.
 - Laboratory research provides intensive exposure to specialized fields in biochemistry and current events in the field that cannot be covered in formal coursework.
 - Students who participate in research over the course of multiple semesters gain in-depth exposure to scientific vocabulary, learn to appreciate the variety of approaches that lead to scientific discovery, and can fully appreciate what it means to pursue a career in science.
- Students are strongly encouraged to engage in an appropriate and *independent* research project.
 - Students and faculty mentors should work together to identify a project that is commensurate with the student's ability.
 - Students are expected to participate in experimental design, including formulating a hypothesis, generating an experiment to test the hypothesis, formulating appropriate controls, troubleshooting unexpected results and interpreting the final conclusions.
 - Through this experience, students will gain appreciation for discovering knowledge firsthand rather than reading from a textbook.

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- Students will gain experience in critical thinking through their undergraduate research project.
 - Students will critically analyze their data for accuracy.
 - Students will critically analyze their research to determine if it appropriately tested their hypothesis.
 - Students will gain analytical and communication skills that are important for most professions that directly and peripherally involve life sciences.

DEPARTMENTAL LEARNING OUTCOMES ADDRESSED BY THIS COURSE

BCHM 49800 students will understand the scientific method. They will be able to develop hypotheses, design experiments, and critically analyze results to create new knowledge.

BCHM 49800 students will communicate scientific knowledge, experiments and conclusions effectively as speakers and writers.

BCHM 49800 students will use scientific instrumentation to evaluate the activity or function of biological macromolecules.

BCHM 49800 students will demonstrate knowledge of analytical and preparative methods that can be applied to biochemistry.

BCHM 49800 students will demonstrate knowledge of accepted safe laboratory practices.

BCHM 49800 students will demonstrate laboratory experience working with a diverse group of individuals as part of a research team.

BCHM 49800 students will demonstrate the ability to organize and document laboratory procedures and results.

BCHM 49800 students will describe research projects in an oral presentation that can be readily understood by a general scientific audience.

BCHM 49800 students will appreciate the ethical issues facing professionals in the life sciences.

TEXTBOOK

There is no assigned textbook for this course. Background information will be largely derived from reviews and the primary scientific literature.

LABORATORY TIME AND PLACE

To be arranged with the course instructor.

CREDIT HOURS AND ATTENDANCE

Students should enroll for a minimum of 1 credit up to a maximum of 6 credits per semester. Five hours per week in the lab corresponds to 1 unit of credit during a regular 15-week semester. During the 8-week regular summer session, students will earn 1 credit for 10 hours of research per week. During the 4-week Maymester session, students

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will earn 1 credit for each 20 hours of research per week. In general, one credit requires approximately 75 hours of research. Any activity relevant to the student's research experience (e.g. attending lab meetings, reading necessary literature, etc.) will count toward the approximately 75 hours of work per credit hour.

Specific hours in the lab should be worked out between the course instructor and the student. In general, students should strive to commit to large blocks of time in the lab (>3 hours) to increase productivity. It is understood that students may sometimes need to change their schedule and make up hours at another time. Advance notice of change of schedule should be given to the course instructor and where applicable, the graduate student, post-doctoral research associate, technician, or research associate who directly supervises the student as a matter of common courtesy. Failure to meet these attendance policies will affect the grade associated with BCHM 49800. BCHM 49800 may not be added after the first week of the semester except with explicit permission of the course instructor. Students who enter the laboratory after the first week are still expected to participate in ~ 75 hours of research per credit hour.

The course instructor will meet with BCHM 49800 students at least once per week to discuss research progress and provide guidance for the next week.

Attendance Policy during COVID-19: Students should stay home and contact the Protect Purdue Health Center (496-INFO) if they feel ill, have any symptoms associated with COVID-19, or suspect they have been exposed to the virus. In the current context of COVID-19, in-person attendance will not be a factor in the final grades, but the student still needs to inform the instructor of any conflict that can be anticipated and will affect the submission of an assignment or the ability to take an exam. Only the instructor can excuse a student from a course requirement or responsibility. When conflicts can be anticipated, such as for many University-sponsored activities and religious observations, the student should inform the instructor of the situation as far in advance as possible. For unanticipated or emergency conflict, when advance notification to an instructor is not possible, the student should contact the instructor as soon as possible by email, through Brightspace, or by phone. When the student is unable to make direct contact with the instructor and is unable to leave word with the instructor's department because of circumstances beyond the student's control, and in cases of bereavement, quarantine, or isolation, the student or the student's representative should contact the Office of the Dean of Students via email or phone at 765-494-1747. Our course Brightspace includes a link on Attendance and Grief Absence policies under the University Policies menu.

ACADEMIC GUIDANCE IN THE EVENT A STUDENT IS QUARANTINED/ISOLATED

If you become quarantined or isolated at any point in time during the semester, in addition to support from the Protect Purdue Health Center, you will also have access to an Academic Case Manager who can provide you academic support during this time. Your Academic Case Manager can be reached at acmq@purdue.edu and will provide you with general guidelines/resources around communicating with your instructors, be available for academic support, and offer suggestions for how to be successful when learning remotely. Importantly, if you find yourself too sick to progress in the course, notify your academic case manager and notify me via email or Brightspace. We will make arrangements based on your particular situation. The Office of the Dean of Students (odos@purdue.edu) is also available to support you should this situation occur.

PROTECT PURDUE PLAN

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The Protect Purdue Plan, which includes the Protect Purdue Pledge, is campus policy and as such all members of the Purdue community must comply with the required health and safety guidelines. Required behaviors in this class include: staying home and contacting the Protect Purdue Health Center (496-INFO) if you feel ill or know you have been exposed to the virus, wearing a mask in classrooms and campus buildings, at all times (e.g., no eating/drinking in the classroom), disinfecting desk/workspace prior to and after use, maintaining proper social distancing with peers and instructors (including when entering/exiting classrooms), refraining from moving furniture, avoiding shared use of personal items, maintaining robust hygiene (e.g., handwashing, disposal of tissues) prior to, during and after class, and following all safety directions from the instructor.

Students who are not engaging in these behaviors (e.g., wearing a mask) will be offered the opportunity to comply. If non-compliance continues, possible results include instructors asking the student to leave class and instructors dismissing the whole class. Students who do not comply with the required health behaviors are violating the University Code of Conduct and will be reported to the Dean of Students Office with sanctions ranging from educational requirements to dismissal from the university.

Any student who has substantial reason to believe that another person in a campus room (e.g., classroom) is threatening the safety of others by not complying (e.g., not wearing a mask) may leave the room without consequence. The student is encouraged to report the behavior to and discuss 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.

MENTAL HEALTH

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 support, services are available. For help, such individuals should contact Counseling and Psychological Services (CAPS) at (765) 494-6995 or <http://www.purdue.edu/caps/> after hours, on weekends and holidays, or by going to the CAPS office on the second floor of the Purdue University Student Health Center (PUSH) during business hours.

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 or by phone: 765-494-1247.

GRADING

The assigned grade for BCHM 49800 will necessarily reflect the priorities and expectations of the supervising faculty member. Some suggested guidelines for assigning grades are provided below.

A: Student assumes responsibility for directing project. Demonstrates clear understanding of hypothesis tested and of experimental approaches used to test hypothesis. Student keeps an accurate record of experiments neatly written in a laboratory notebook. Student has no issues with attendance or written assignments.

B: Student has modest understanding of hypothesis tested and of experimental approaches used to test hypothesis. Student keeps an accurate record of experiments

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neatly written in a laboratory notebook. Student has no issues with attendance or written assignments.

C: Student has modest understanding of hypothesis tested and of experimental approaches used to test hypothesis. Student is not reliable regarding hours in lab or is not reliable in maintaining an accurate lab notebook or has failed to perform acceptably on the written assignments.

D: Student has poor understanding of research project. Student is not reliable regarding hours in lab or is not reliable in maintaining an accurate lab notebook or has failed to perform acceptably on the written assignments.

F: Student fails to grasp basic concepts driving research project. Student has substantial issues regarding hours in lab or in maintaining an accurate lab notebook or has failed to perform acceptably on the written assignments.

Students are strongly advised to ask the course instructor what their expectations are of a BCHM 49800 student. Please keep in mind that expectations are likely to reflect curricular and lab experience of the student.

COURSE REQUIREMENTS

Students will submit a brief 1 page description of the proposed research project to the course instructor by the fifth week of the semester. This description should include a brief background that illuminates the problem of interest, the hypothesis to be tested and a brief summary of the experiments to be used to test the hypothesis. The supervising faculty member and/or a laboratory mentor is encouraged to assist the student in this project.

At the end of the semester, students will submit a 2-5 page paper in Journal of Biological Chemistry format describing their research project, the hypothesis being tested, how the experiments performed addressed their hypothesis, the results of the experiments, whether the results supported or disproved the hypothesis, and future experiments that would further their research project.

ACADEMIC MISCONDUCT

Academic misconduct of any kind will not be tolerated in BCHM 49800. Information on Purdue's policies can be found at <http://www.purdue.edu/ODOS/osrr/integrity.htm>.

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]

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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.

NON-DISCRIMINATION POLICY STATEMENT

Purdue University's non-discrimination policy will be upheld in this course. Purdue University is committed to maintaining a community which 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 own 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.

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Purdue University views, evaluates, and treats all persons in any University related activity or circumstance in which they may be involved, solely as individuals on the basis of their own personal abilities, qualifications, and other relevant characteristics.

For more information, see

http://www.purdue.edu/policies/pages/human_resources/nondisc_pol.html

IDENTIFICATION OF SUPERVISING FACULTY MEMBERS

Please see <http://www.ag.purdue.edu/biochem/undergrad/Pages/ResearchOps.aspx> for suggestions on how to identify a supervising faculty research mentor.

SAFETY TRAINING

If students have not already done so, they must complete safety training before they can enroll in BCHM 49800. Review the University's Chemical Hygiene Plan manual and complete the Online Personal Protective Equipment Training:

Chemical Hygiene Plan (Two parts)

Part 1: Basic Lab Safety Fundamentals:

- a. Go to <https://purdue.vividlms.com/>
- b. Register to create a new account and login
- c. Complete the 3 modules and take the exam
- d. Print the certificate and bring it to BCHM 120.

Part 2: Laboratory Specific Chemical Hygiene Plan:

- a. Read the CHP manual:
<https://www.purdue.edu/ehps/rem/documents/programs/chp2014.pdf>
- b. Print out the form under Appendix A and take it to your research lab's principal investigator (PI) to discuss laboratory-specific safety. Sign the form and bring it to BCHM 120.

Personal Protective Equipment:

<https://www.chem.purdue.edu/chemsafety/Training/PPETrain/PPetrainCert.pdf>

This training should be performed by your research lab's principal investigator (PI) or your immediate supervisor. Complete and sign the form. Your PI must also sign the form.

Deliver the completed forms to the BCHM Main Office (120).

In addition, during the COVID-19 pandemic, all students working in research labs must read and sign SOPs for each room they are accessing. See your PI or lab supervisor for the SOPs. Failure to follow SOPs and the Protect Purdue Pledge may result in dismissal from the lab.