

BCHM 56600

SYLLABUS

General Biochemistry

CRN: 35327

Course Credit Hours: 4

Spring,
M/T/Th/F

INSTRUCTIONAL MODALITY

Face-to-Face, Lecture,

All lectures will be recorded and available for students to download from boilercast:

<http://www.itap.purdue.edu/learning/tools/boilercast/>

Note: Some small group discussions, activities and interactions cannot be captured efficiently and recordings will not fully replicate these activities outside of class. Materials used during class will be provided on Brightspace.

Emergency Zoom: If it is necessary to move the course online due to COVID or other emergency a Zoom link will be provided

PREREQUISITES

Students must have a minimum grade of C- in one of the following courses (or equivalent): CHM 25600, CHM 25700, CHM 26200, CHM 26605, MCMP 20500, CHEM 3420. You are expected to have a basic understanding of organic chemistry.

COURSE OBJECTIVES

BCHM 56600 provides an overview of the fundamental principles that determine the biochemical and structural properties of amino acids, nucleic acids, lipids and carbohydrates. The course will connect those properties to the structure and function of macromolecules (e.g. proteins, DNA, membranes). The catalytic mechanisms, kinetic properties and regulation of enzymes will be covered with an emphasis on the interpretation of data. Examples of experimental approaches used to separate and analyze specific macromolecules will be presented.

LEARNING OUTCOMES

Students will be able to:

1. Identify and interpret the role of weak chemical forces in macromolecular structure and function.
2. Apply the principles of chemistry and thermodynamics to explain the higher order structure of proteins, nucleic acids, and membranes.
3. Interpret chemical and kinetic data to evaluate the specificity, catalytic mechanism and regulation of enzymes.
4. Compare and contrast the roles of lipids and proteins in membrane structure and function.
5. Propose and evaluate approaches for the separation and/or analysis of specific macromolecules based on their chemical and physical properties and the weak chemical forces involved.
6. to understand the major metabolic pathways that sustain life. Metabolic pathways comprise a series of linked, enzyme-catalyzed reactions.
7. Decipher the logic of the enzyme-facilitated chemical transformations of the core metabolic pathways.
8. Examine the structure of selected enzymes, their regulation, and the biochemical mechanisms by which enzymes catalyze metabolic reactions will be analyzed in detail.

TEXTBOOK (required)

- Berg, J.M, Gatto, G. J. Jr, Hines, J., Tymoczko, T. L, and Stryer, L. Biochemistry **10th edition (2023)** (W. H. Freeman & Co.) ISBN:9781319333621 (paperback), ISBN:9781319498405 (loose leaf)

OR

- E-editions with electronic problems, support, etc. are also available, SBN:9781319486785
- **NOTE:** older editions have similar information, but they are not identical to the 10th, and the order of chapters is different in the 10th (e.g. nucleic acids are much later in the 10th edition)

BRIGHTSPACE

The syllabus for the course, lecture notes, readings and grading keys will be available via the Purdue University Brightspace site at:

<https://purdue.brightspace.com/d2l/login>

TECHNOLOGY REQUIREMENTS (in-class computer)

In-class **quizzes** may require access to Brightspace. Please **bring a laptop or tablet computer to class capable of using Brightspace for these sessions**. It may be possible to take the quizzes on a smart phone, but less convenient. Access to the internet could be helpful during other class sessions for answering practice questions or researching problems.

PURDUE HONOR PLEDGE

Purdue's Honor Pledge was developed by students to advance a supportive environment that promotes academic integrity and excellence. It is intended that this pledge inspires Boilermakers of all generations to stay "on track" to themselves and their University. ***"As a boilermaker pursuing academic excellence, I pledge to be honest and true in all that I do. Accountable together - we are Purdue."***

ASSESSMENT

The assessments for this course will include:

| | |
|-------------------------------------|------------|
| Exam 1 | 100 points |
| Exam 2 | 100 points |
| Exam 3 | 100 points |
| Exam 4 | 100 points |
| Quizzes, 20 points each (6, drop 2) | 80 points |
| Homework (2 x 10 points) | 20 points |

The cutoff values for letter grades are as follows:

| | | |
|----------------------|-----|---|
| 450 points | 90% | A |
| 400 points | 80% | B |
| 350 points | 70% | C |
| 300 points | 60% | D |
| 299 points and below | | F |

The final date to withdraw from the course with no grade recorded is January 26. After that, if you drop the course, you will receive a grade of W. The last day to drop the course with a grade of W is April 16. After April 16, I am required to enter a letter grade based on your achievements in the course. If this is a required course in your major or plan of study, please consult with your advisor before dropping the course.

Final Exam

The final will not be comprehensive. The date and time of the final exam are scheduled by the University and cannot be rescheduled during finals week. You must take the final during the scheduled final exam time.

Exam or Quiz Absences

Missing an exam or quiz will result in a grade of 0 being recorded unless documented justification for the absence is presented. The instructor must be contacted in advance via email. Any request to be excused from a quiz or exam must include official documentation (doctor's note, request from academic advisor, COVID restriction, etc) explaining why the exam was or will be

missed. Makeup exams will be scheduled in consultation with the instructor.

Grading and Corrections

We will do our best to grade with accuracy and consistency, but errors may occur. If you have any disagreements with the way your exam or assignment has been graded, consult with a course TA. If you wish to have your exam or quiz regraded then submit a written explanation for why the score should be changed. Requests for regrading must be submitted (email or in-person) no later than one week after the graded exam, quiz or assignment has been returned.

EXTRA CREDIT

There are no opportunities for extra credit.

OBTAINING EXTRA HELP

The professor and the Teaching Assistant will be available to answer your questions immediately after class or at TA office hours. Alternatively, you can submit questions by e-mail. We will do our best to answer the question by return e-mail within 24 hours or in the next class period for items relevant to all students. Alternatively, students may wish to use the discussion forum on the course website where peers and instructors can provide responses. This site will be monitored by the instructors to identify complications and student difficulties.

ON-LINE COURSE EVALUATION

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.

CLASS ATTENDANCE

Students are expected to be present for class or take personal responsibility for learning the course material.

Do not come to class if you are sick. There is not a requirement to attend any lectures in person. Lectures will be recorded by Boilercast and available online through Brightspace. They are divided into content areas to help you keep the material organized. There is no set time that you are required to be online, however, it is strongly recommended that you create a schedule for watching the lectures if you do not attend class. There is no limit to how many times you can view a lecture video or any other content.

That being said, outside of an excused absence, the instructor and the TA are not responsible for helping you to catch up should you fall behind in this graduate course. The best mechanism to keep up to date with this course may be to attend lectures.

When conflicts or absences 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 absences when advance notification to the instructor is not possible, the student should contact the instructor as soon as possible by email. 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 falling under excused absence regulations, the student or the student's representative

should contact or go to the [Office of the Dean of Students website](#) to complete appropriate forms for instructor notification. Under academic regulations, excused absences may be granted for cases of grief/bereavement, military service, jury duty, parenting leave, or emergent or urgent care medical care. For details, see the [Academic Regulations & Student Conduct section](#) of the University Catalog website.

USE OF AI

Students may use artificial intelligence (AI) language models, such as ChatGPT, in this course. Students who use AI in any of their assignments in this course, including homework, quizzes, and exams must disclose how AI was used. All source material must be referenced appropriately – note that ChatGPT and other AI does not provide scientific references and may not be accurate. ***You are responsible for ensuring accuracy in content and cited references.***

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 or by calling 765-494-8778. While information may be submitted anonymously, the more information that is submitted provides the greatest opportunity for the university to investigate the concern. Information on Purdue's policies with regard to academic misconduct can be found at:
<http://www.purdue.edu/odos/osrr/academic-integrity/index.html>

You should familiarize yourself with these policies, particularly if you are new to US academic institutions. All apparent violations of these policies will be referred to the Office of the Dean of Students (ODOS). Academic dishonesty may result in a grade of 0 for the assignment or a grade of F for the course.

"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.

- 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
- obtaining an unauthorized copy of a test in advance of its scheduled administration
- using unauthorized notes during an exam
- obtaining a test from the exam site, completing and submitting it later
- altering answers on a scored test and submitting it for a regrade

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

- the syllabus easter egg is a quiet stream in the middle of the forest

COPYRIGHT

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 not 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).

NONDISCRIMINATION POLICY

Nondiscrimination -- 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.

Purdue University prohibits discrimination against any member of the University community on the basis of race, religion, color, sex, age, national origin or ancestry, marital status, parental status, sexual orientation, disability, or status as a veteran. The University will conduct its programs, services and activities consistent with applicable federal, state and local laws, regulations and orders and in conformance with the procedures and limitations as set forth in (http://www.purdue.edu/purdue/ea_eou_statement.html) which provides specific contractual rights and remedies.

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. The University will not tolerate Harassment of its faculty, staff or students by persons conducting business with or visiting the University, even though such persons are not directly affiliated with the University.

Purdue Anti-Harassment Policy (III.C.1): <http://www.purdue.edu/policies/ethics/iic1.html>

EMERGENCIES



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 on the course website or can be obtained by contacting the instructors or TAs via email. You are expected to read your @purdue.edu email on a frequent basis.

EMERGENCY NOTIFICATION PROCEDURES are based on a simple concept – if you hear a fire alarm inside, proceed outside. If you hear a siren outside, proceed inside.

- **Indoor Fire Alarms** mean to stop class or research and immediately **evacuate** the building.
 - Proceed to your Emergency Assembly Area away from building doors. **Remain outside** until police, fire, or other emergency response personnel provide additional guidance or tell you it is safe to leave.
- **All Hazards Outdoor Emergency Warning Sirens** mean to immediately seek shelter (**Shelter in Place**) in a safe location within the closest building.
 - "Shelter in place" means seeking immediate shelter inside a building or University residence. This course of action may need to be taken during a tornado, a civil disturbance including a shooting or release of hazardous materials in the outside air. Once safely inside, find out more details about the emergency*. **Remain in place** until police, fire, or other emergency response personnel provide additional guidance or tell you it is safe to leave.

In all cases, you should seek additional clarifying information by all means possible...Purdue Emergency Status page, text message, email alert, TV, radio, etc...review the **Purdue Emergency Warning Notification System multi-communication layers at: <https://www.purdue.edu/ehps/emergency-preparedness/purduealert/index.php>*

EMERGENCY RESPONSE PROCEDURES

- Review the **Emergency Procedures Guidelines**
https://www.purdue.edu/emergency_preparedness/flipchart/index.html
- Review the **Building Emergency Plan** (available on the Emergency Preparedness website or from the building deputy) for:
 - evacuation routes, exit points, and emergency assembly area
 - when and how to evacuate the building.
 - shelter in place procedures and locations

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](#). 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 office on the second floor of the Purdue University Student Health Center (PUSH) during business hours

BASIC NEEDS SUPPORT

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 8 a.m.-5 p.m. Monday through Friday. Considering the significant disruptions caused by the current global crisis as it related to COVID-19, students may submit requests for emergency assistance from the [Critical Needs Fund](#)

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 at: drc@purdue.edu or by phone: 765-494-1247.

BCHM 566**Tentative Class Schedule****Spring**

| Date | Topic | Chapter/reading | Assignment |
|--------------|--|------------------------|-------------------|
| Week 1 | Weak chemical bonds, water, free energy | Chap. 1 | |
| Week 1 | pH, weak acids, titration curves | Chap. 1 | |
| Week 1 | Amino acids/peptide bond | Chap. 2 | |
| Week 2 | Secondary, tertiary structure | Chap. 2 | |
| Week 2 | Protein folding | Chap. 2 | |
| Week 3 | Structure/function examples | Chap. 2 | |
| Week 3 | Structure/function – fibrous proteins | Chap. 2 | |
| Week 3 | Hemoglobin-oxygen binding, cooperativity | Chap. 3 | |
| Week 4 | Enzymes, introduction | Chap. 5 | |
| Week 4 | Enzymes, kinetics | Chap. 5 | |
| Week 4 | Enzymes inhibition | Chap. 5 | |
| Week 4 | Enzymes – catalysis, serine proteases | Chap. 6 | |
| Week 5 | Enzymes – metal ions | Chap. 6 | |
| | END OF EXAM 1 material | | |
| Week 5 | Enzymes – catalysis – myosin | Chap. 6 | |
| Week 5 | Enzymes – catalysis – allosteric regulation | Chap. 7 | |
| 2/16 | EXAM 1 | | |
| Week 6 | Enzymes – catalysis – covalent modification | Chap. 7 | |
| Week 6 | Enzyme regulation - zymogens | Chap. 7 | |
| Week 7 | Carbohydrates | Chap. 11 | |
| Week 7 | Lipids and membranes | Chap. 12 | |
| Week 7 | Phospholipids, glycolipids | Chap. 13 | |
| Week 8 | Membrane proteins, fluidity | Chap. 13 | |
| Week 8 | Membrane channels and pumps | Chapter 13 | |
| | End of Exam 2 material | | |
| Week 8 | Metabolism, basic concepts | Chap. 15 | |
| 03/13 | EXAM 2 | | |
| Week 9 | Glycolysis | Chap. 16 | |
| Week 9 | Glycolysis and gluconeogenesis | Chap. 16 | |
| Week 9 | Glycogen metabolism | Chap. 21 | |
| Week 10 | Citric Acid Cycle | Chap. 17 | |
| Week 10 | Citric Acid Cycle/Mitochondria/electron trans. | Chap. 17/18 | |
| Week 10 | Electron transport | Chap. 18 | |
| Week 11 | Oxidative phosphorylation | Chapter 18 | |
| Week 11 | Oxidative phosphorylation | Chapter 18 | |
| Week 11 | ATP synthesis | Chapter 18 | |
| | End of Exam 3 material | | |
| Week 12 | Photosynthesis (light reactions) | Chapter 19 | |
| Week 12 | Photosynthesis (CO ₂ fixation) | Chapter 20 | |
| 04/07 | EXAM 3 | | |
| Week 13 | Pentose phosphate pathway | Chap. 20 | |
| Week 13 | Fatty Acid metabolism | Chap. 22 | |
| Week 13 | Amino acid degradation | Chap 23 | |
| Week 14 | Urea cycle | Chap. 23 | |

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|---------------|---------------------------------------|------------|--|
| Week 14 | Amino acid biosynthesis | Chap. 24 | |
| Week 14 | Nucleotide Metabolism | Chapter 25 | |
| FINALS | FINAL EXAM (non-comprehensive) | | |
| | | | |