

BCHM 43400-001
Medical Topics in Biochemistry
CRN: 12998
Course Credit Hours: 3

INSTRUCTIONAL MODALITY: Face-to-Face, Lecture, and Small Group Activity. It is expected that the students will arrive on time, attend all classes, participate in class, and be ready to discuss.

COURSE OBJECTIVES

The overall objective of this course is to apply the fundamental principles of biochemistry and metabolic control to understand the pathophysiology, diagnosis and treatment of human diseases. The course will emphasize biochemistry relevant to diabetes mellitus (type I and type II), liver disease and blood disorders.

LEARNING OUTCOMES ADDRESSED BY THIS COURSE

- Students will develop an understanding of mechanisms that regulate metabolic pathways within individual cells, tissues and organ systems in healthy and disease patients.
- Students will be able to predict biochemical and clinical effects given specific defects in a pathway.
- Students will have an appreciation of ethical issues facing life science professionals who perform research involving humans or human tissues.
- Students will communicate scientific knowledge effectively.

PREREQUISITES

One prior course in biochemistry (e.g. BCHM 361, BCHM 307, BCHM 462, BCHM 561) or cell biology (BIOL 231) is required for this course. Exceptions must be approved by the instructor. *Students without prior knowledge of energy metabolism (fundamental biochemical metabolic pathways) can be successful in this course, but it will be challenging and will require extra work outside of class to keep up with the content and the integration of the material.*

TEXTBOOK

There is no required textbook for the course, but I recommend that you have access to a general biochemistry textbook (e.g. Stryer hard copy or online - [Stryer 5th edition](#)) that covers metabolic pathways. Most course material will be covered in ppt slides and recordings and assigned readings posted on the course website.

- **The Medical Biochemistry Page** is one free textbook option: <http://themedicalbiochemistrypage.org>. This website is maintained by Michael King, PhD, an Instructor for the Molecules to Cells and Tissues course at Indiana University School of Medicine, Terre Haute.
- **Biochemistry Free For All** is another free text written by Oregon State University professors. I am not familiar with it, but it has solid peer reviews. It can be found here: [Biochemistry Free For All \(Ahern Rajagopal and Tan\)](#)
- **StatPearls** contains chapters on glycolysis, the citric acid cycle and other biochemical topics. The articles contain basic biochemistry and clinical information, but mostly with text and few pictures: <https://www.ncbi.nlm.nih.gov/books/NBK430685/>

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>. It is not the responsibility of the instructor if the lectures are not clear or are not available for technical reasons. This is not a substitute for class and all students are expected to come to class.

TECHNOLOGY REQUIREMENTS (in-class computer)

In-class quizzes for the Team-Based Learning session will be taken in Brightspace. You must **bring a laptop or tablet computer to class** capable of using Brightspace for these sessions. It may also be

possible to take the quizzes on a smart phone, but less convenient. Access to the internet will 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

Three Exams and 6 in-class quizzes will be used to assess student performance and will be graded using the standard grading scale: A (93-100%), B (83-89%), C (73-79%), D (60-69%), and F (below 60%)

Exams will be a combination of multiple choice and short answer questions. **Missing an exam will result in a grade of 0 being recorded unless documented justification for the absence is presented.** If you are unable to attend the exam for any reason, **the instructor must be contacted in advance via email, or a zero grade will be given.** If the absence is not managed by the Dean of Students office (e.g., bereavement), documentation explaining the reason for the absence will be requested and the makeup exam will be at the instructor's discretion. **Any makeup exam for an excused notified absence must be scheduled in a timely manner and in consultation with the instructor.**

Final Exam and Grade Improvement

The final will be comprehensive. It will count for 100 points unless the Final Exam score is greater than your score on Exam I or Exam II, in which case the Final Exam score will be doubled, and your lowest semester Exam score will be dropped.

QUIZZES AND ASSIGNMENTS

Team Based Learning (TBL): Team based learning will require reading an assignment or listening to a power point presentation prior to class. A list of learning objectives will be provided for each TBL. At the beginning of class each student will take an individual quiz; after it is submitted, they will take the same quiz with a small group of other students. The group will decide on answers collectively then use Immediate Feedback Assessment Cards (scratch-off cards) to check their answers. Points will be assigned for both the individual quiz and group quiz. Most TBLs will include additional application questions that will require written responses but are not graded. **Six** TBL quizzes will be scored in the course, the top **five** TBL quiz scores will count toward the final grade. As a result, each student may miss one quiz without penalty; consequently, no make-up quizzes will be offered, regardless of whether the absence is excused or unexcused. Although a student may miss one quiz without penalty. Any additional missed quiz must be the result of an excused absence and may be made up within one week of the original quiz date to receive credit.

If you have any disagreements with the way your exam or assignment has been graded, you may submit a written explanation for why the score should be changed. Requests for re-grades must be submitted no later than one week after the graded test or assignment has been returned. There are no late assignments accepted in this class. Final assignments are due on Brightspace on the specified due date and time. **Late assignments will receive no points.**

EXTRA CREDIT

This will be up to the discretion of the instructor.

OBTAINING HELP

The instructor will be available to answer your questions after class or by appointment (best arranged via e-mail). Alternatively, you can submit questions by e-mail. However, depending on the question a response may be required in person or at the next class session. TA's will be available during office hours or by appointment (see above). In addition, the Helen Bass Williams [Academic Success Center](#),

provides a variety of proactive, practical and approachable academic support services for undergraduate students

CLASS ATTENDANCE

This course follows Purdue's academic regulations regarding attendance, which states that students are expected to be present for every meeting of the classes in which they are enrolled. Attendance will not count directly towards student grades, but BCHM 434 includes small group activities, problem solving and group quizzes 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 will not capture all the information (e.g. group discussions). If you have a valid reason for missing class such as a University-sponsored activity, religious observances, illness, or family emergency, military duty, then please inform the instructor as soon as possible by email, through Brightspace, or by phone. For any anticipated or unanticipated missed lectures, assignments will be available on Brightspace, and the student should continue to engage with the course content even if they are unable to attend due to illness. The instructor or teaching assistants will not replicate the information missed in class (lecture or small group activities) but will address questions if needed. The official university policy can be found here: [university regulations on class attendance](#).

GRIEF ABSENCE POLICY FOR STUDENTS

In cases of bereavement, serious medical issues, 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 also includes a link to the Dean of Students under 'University Policies and Statements. Purdue University recognizes that a time of bereavement is very difficult for a student. The University therefore provides the following rights to students facing the loss of a family member through the Grief Absence Policy for Students (GAPS). GAPS Policy: Students will be excused for funeral leave and given the opportunity to earn equivalent credit and to demonstrate evidence of meeting the learning outcomes for missed assignments or assessments in the event of the death of a member of the student's family.

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 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 in the Brightspace University Policies and Statements content folder and is called "Purdue's Student Guide for Academic Integrity" that links to the [Office of Student Rights and Responsibilities Academic Integrity webpage](#) and a link named "Use of Copyrighted Materials" that links to a [University Policy Office webpage](#). Note the [Guidance on the Use of AI in Teaching and Learning](#) posted on Brightspace and the Office of the Provost website (see below for the responsible uses of AI).

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).

"Purdue prohibits "dishonesty in connection with any University activity. Cheating, plagiarism, or knowingly furnishing false information to the University are examples of dishonesty." 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
- 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

COPYRIGHT

We use many materials (e.g. figures, patient cases) that are derived from published sources. As such, they cannot be sold or bartered without expressed written permission from the authors. **Please do not provide these materials to shared websites outside of Brightspace.** This is especially true for patient cases. Posting these materials will jeopardize the opportunity to use these materials. A hyperlink to Purdue's use of copyrighted material is included in Brightspace under University Policies and Statements.

RESPONSIBLE USE OF AI

Objectives:

- Uphold academic honesty and personal integrity.
- Ensure equitable access and opportunities for all students.
- Develop skills for critical thinking and independent reasoning.
- Understand the strengths and limitations of AI tools.

Guidelines for Responsible Use:

- **Original Work:** Students should ensure that assignments submitted are original and based on their understanding. While AI can assist in research or provide general guidance, **AI should not produce work on behalf of the student.**
- **Citation:** Any content, ideas, or assistance obtained through AI tools must be appropriately cited, similar to any other reference or source. You will need to go and find the relevant citations from the primary literature (journal articles)!
- **Collaboration:** If a student collaborates with AI tools, they must specify the nature and extent of this collaboration in their submission. This includes providing details of the prompts used to generate the AI responses.
- **Prohibited Uses:** AI should not be used to complete quizzes, exams, or any other assessments unless explicitly permitted by the instructor.
- **Data Privacy:** 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 in this syllabus, which may include grade penalties, course failure, or more severe disciplinary actions.

NON-DISCRIMINATION STATEMENT

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 in the [Nondiscrimination Policy Statement](#) link which provides specific contractual rights and remedies. A hyperlink to Purdue's full Nondiscrimination Policy Statement is also included in our course Brightspace under University Policies and Statements.

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: <http://www.purdue.edu/policies/ethics/iic1.html>

Violent Behavior Policy -- Purdue University 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 and is prohibited in or on any University Facility or while participating in any University activity. A hyperlink to Purdue's policy on Violent Behavior is also included in our course Brightspace under University Policies and Statements.

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 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 hyperlink to Purdue's Emergency Preparedness and Planning is also included in our course Brightspace under University Policies and Statements.

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 both 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
 - Building evaluation when and how
 - Shelter in place procedures and locations

MORE EMERGENCY INFORMATION

Reference the Emergency Preparedness web site for additional information:
https://www.purdue.edu/ehps/emergency_preparedness/

ACCESSIBILITY

Ensuring that Purdue students have access to equitable learning experiences is a university-level commitment and is the responsibility of all members of the Purdue community. The Disability Resource Center (DRC. [DRC website](#)) is a key partner in this work and is a resource for students and instructors to ensure access it met.

The Student Services widget links to the DRC. You are also encouraged to contact the Disability Resource Center at: [DRC website, drc@purdue.edu](#) or by phone: 765-494-1247.

MENTAL HEALTH and WELLNESS

If you find yourself beginning to feel some stress, anxiety and/or feeling slightly overwhelmed, try the [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 am- 5 pm.

If you find yourself struggling to find a healthy balance between academics, social life, stress, 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. Students in Indianapolis will find support services curated on the [Vice Provost for Student Life website](#).

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.

Topics Covered
Glucose, Overview of metabolism and intro to diabetes
Fatty acid catabolism/ketone bodies/adaptation to starvation
Blood pH/ketoacidosis acidosis/Type I diabetes
Glycogen synthesis and breakdown, diseases
Insulin and glucagon
Fructose and Galactose metabolism
Lipid metabolism overview
Type 2 diabetes, insulin resistance
Complications and treatment of diabetes
Ethanol metabolism
Patient case
Liver disease (biochemistry of symptoms, bilirubin)
Hemolytic anemia and reactive oxygen species
Human Gene Therapy
Biochemistry of blood (macrocytic anemias, folate and Vit B12)
Biochemistry of blood (sickle cell anemia)
Biochemistry of blood (heme synthesis, porphyria, and iron deficiency anemia)
Biochemistry of blood (hemostasis, blood clotting)
Patient case