

Course Syllabus – Spring 2025

Course Information

BIOL/CHEM 3461 section 001

Biochemistry 1

MW, 11:30- 12:45 PM SLC 2.303

Professor Contact Information

Dr. Sandhya Gavva Office: SLC 3.501 Email: sgavva@utdallas.edu

Office Hours: **MR 2:00 -3:00 PM**

TA: [Wicherts, Dylan](#); Dylan.Wicherts@UTDallas.edu

Course Pre-requisites, Co-requisites, and/or Other Restrictions

CHEM 2323 (or equivalent); CHEM 2325 (or equivalent).

Concurrent registration in Biochemistry Workshop I (BIOL 3461, Sections 201 and 203) is required for both BIOL and CHEM 3461 students.

Course Description

Structures and chemical properties of amino acids; protein purification and characterization; protein structure and thermodynamics of polypeptide chain folding; catalytic mechanisms, kinetics and regulation of enzymes; energetics of biochemical reactions; metabolism; roles of coenzymes and prosthetic groups in redox reactions; pathways for carbohydrate oxidation; glycogen metabolism; glucose synthesis; electron transport and oxidative phosphorylation.

Student Learning Objectives/Outcomes

This undergraduate core course is the first of a two-course sequence that provides students with a working knowledge of the macromolecules and fundamental metabolic pathways of prokaryotes and eukaryotes, with emphasis on human systems. Biochemistry I is devoted to mastering: 1) the structure and function of amino acids and proteins, and 2) central metabolism and energy conservation, as a means of understanding biological processes in general and developing problem-solving skills in biochemistry. Fundamental thermodynamic principles that drive life processes and the regulatory mechanisms that fine-tune them are stressed to provide the rationale and framework for students to master the necessary molecular structure and pathways. Relevance to human physiology, medicine, and genetics is used to

stimulate students to begin the integration of biochemistry with other disciplines.

At the end of the course, students will be able to:

1. Explain the basic thermodynamics governing biochemical reactions and use this information to solve problems involving biochemical thermodynamics.
2. Recognize the molecular structures and describe the chemical properties of proteins, their amino acid residues, and carbohydrates; and solve related pH problems.
3. Explain enzyme catalysis and regulation and apply enzyme kinetics in problem solving.
4. Describe the central pathways for the catabolism of glucose and complex carbohydrates, and gluconeogenesis, and apply them in problem solving.
5. Understand the organization of electron transport chains and the different mechanisms for ATP synthesis, and apply them in problem solving.

Required Textbooks and Materials

R.H. Garrett and C.M. Grisham: Biochemistry, 6th edition, from Cengage Learning.

eBook Purchasing Options:

1. Direct purchase through Blackboard

Click on the “eBook” link on the left navigation of your course homepage on eLearning/BbCollaborate. You will not need an ISBN when you purchase the Cengage eBook directly through Blackboard.

OR

2. Purchase through Bookstore

When you purchase through the bookstore, you will buy Cengage Unlimited eTextbooks ISBN 9780357693933.

The text is available either alone or bundled with OWLv2.

OWLv2 is an online set of study materials for each of the 15 chapters covered in the course, which you may wish to use. To register and log in, go to login.cengagebrain.com. If you need an ID, use your UTD net ID. **The OWLv2 questions will NOT be graded by UTD staff, and OWLv2 is NOT required for the course. However, buying the text with OWLv2 may be cheaper than the text alone.**

Assignments & Academic Calendar

DATE	TOPIC/S	Book Chapter	Instructor
Wed Jan 22	Lecture 1: Introduction, Weak Interactions	Chap 1	Gavva
Mon Jan 27	Lecture 2: Water and Acid/Base Properties	Chap 2	Gavva
Wed Jan 29	Lecture 3: Thermodynamics of Biological Systems	Handout on eLearning as substitute for Chap 3	Gavva
Mon Feb 3	Lecture 4: Thermodynamics of Biological Systems cont'd	Handout cont'd	Gavva
Weds Feb 5	Lecture 5: Amino Acids	Chap 4	Gavva
Mon Feb 10	Lecture 6: Protein Structure/Function Overview Protein Purification and Characterization	Chap 4.7 & 5.1-5.2, 5.7-5.8	Gavva
Wed Feb 12	Lecture 7: Protein Purification and Characterization cont'd	Chap 5.1-5.2,	Gavva
Mon Feb 17	Exam 1	Chaps 1- 4 & 5.1, 5.2, 5.7, 5.8	
Wed Feb 19	Lecture 8: Proteins: Primary Structure and Sequencing and MS	Chap 4.7 & 5.3-5.6 Chap 6	Gavva
Mon Feb 24	Lecture 9: Protein Secondary, Tertiary and Quaternary Structure. Intro to Protein Denaturants, Protein Folding, and Chaperones	Chap 6 cont'd Chap 31.1 on pp 1132-1140	Gavva
Wed Feb 26	Lecture 10: Enzyme Kinetics	Chapter 13	Gavva
Mon Mar 3	Lecture 11: Inhibition Kinetics, Irreversible Inhibition, Bisubstrate Kinetics	Chap 13 cont'd	Gavva
Wed Mar 5	Lecture 12: Inhibition Kinetics; Enzyme Mechanisms	Chapter 13 & 14	Gavva
Mon Mar10	Lecture 13: Enzyme Mechanisms	Chap 14	Gavva

Wed Mar 12	Exam 2	4.7, 5.3-5.6, 6, 13, 14, Chap 31.1 pp 1132-1140	Gavva
Mon Mar 24	Lecture 14: Enzyme Regulation; Mechanisms of Allostery	Chap 15	Gavva
Weds Mar 26	Lecture 15: Allostery in Hemoglobin	Chap 15	Gavva
Mon Mar 31	Lecture 16: Overview of Metabolism: Catabolism, Anabolism and Carbohydrates	Chap 17	Gavva
Wed Apr 2	Lecture 17: Glycolysis Phase I	Chap 7	Gavva
Mon Apr 7	Lecture 18: Glycolysis: Phase I and II	Chap 18	Gavva
Wed Apr 9	Lecture 19: Glycolysis: Phase II and Gluconeogenesis	Chap 18	Gavva
Mon Apr 14	Lecture 20: Gluconeogenesis Glycogen Metabolism	Chap 22 (part 1)	Gavva
Wed Apr 16	Exam 3	Chaps 7, 15, 17, 18, 22 (part 1)	
Mon Apr 21	Lecture 21: Pentose Phosphate Pathway and The Tricarboxylic Acid Cycle	Chap 22 (part 2) Chapter 19	Gavva
Wed Apr 23	Lecture 22: The Tricarboxylic Acid Cycle	Chap 19	Gavva
Mon Apr 28	Lecture 23: Electron Transport	Chap 19 cont'd	Gavva
Wed Apr 30	Lecture 24: Electron Transport and ATP Synthesis	Chap 20	Gavva
Mon May 5	Lecture 25: ATP Synthesis	Chap 20 cont'd	Gavva
Wed May 7	Exam 4	Chap 22 part 2, 19 and 20	

Workshop Schedule:

Section	Day	Time	Room
201	Tue	9:00 am	GR 4.301
203	Tue	10:00am	GR 4.301

Workshops are specific to each lecture section. Attendance will be recorded for the one for which each student is registered. Please attend the workshop section that you are enrolled in.

Workshops are an essential component of the course. You will work through applied examples of the material with the Professor and the TAs. Workshop participation will ensure you can answer the problem set questions that assess your understanding of fundamental biochemical principles. Problem set due dates are listed below.

Workshop Schedule

Week	Dates	Topic	PS Due Date
1	Jan 21	No Workshops	
2	Jan 28	pH calculations, HH equation	Feb 4
3	Feb 4	Thermodynamics	Feb 11
4	Feb 11	Amino Acids and Protein Purification	Feb 18
5	Feb 18	Exam week – No workshops	
6	Feb 25	Protein Structure and Sequencing; MS	Mar 4
7	Mar 4	Enzyme Kinetics and Mechanisms	Mar11
8	Mar 11	Exam week – No workshops	
9	Mar 25	Enzyme Regulation, Carbohydrates	Apr 1
10	Apr 1	Glycolysis, Gluconeogenesis, Glycogen Metabolism	Apr 8
11	Apr 8	Gluconeogenesis, Glycogen Metabolism	Apr 15
12	Apr 15	Exam Week No Workshops	
13	Apr 22	TCA cycle and electron transport	Apr 29
14	Apr 29	Electron Transport ATP Synthesis	May 6

Supplemental Instruction (SI) and Peer Tutoring: There may be Supplemental Instruction (SI) is offered for this course. SI sessions are collaborative group study sessions, scheduled two times per week. Sessions are facilitated by an SI Leader, who has taken the course and received a high final grade. Attendance is voluntary. For information about the days, times, and locations for SI sessions, refer to <http://www.utdallas.edu/studentsuccess/help-with-courses/supplemental-instruction/>

Biochemistry CLINIC: Need additional help with Biochemistry? Tutoring is now available for Biochemistry in our newly established Chemistry Clinic in **BE 2.410 M-R 9:30 am- 5:30 pm; F 11:30 -5:30 pm**

TA-lead Exam Review – format and time will be announced closer to the date

Exam 1 Review

Exam 2 Review

Exam 3 Review

[Exam 4 Review](#)

Grading Policy

Problem Sets: 15%

Workshop attendance 5%

Exam 1: 20%

Exam 2: 20%

Exam 3: 20%

Exam 4: 20%

Workshop Problem Sets: There will be weekly problem sets that will be graded for completion. The problem sets for a given unit will be posted on e-Learning. Each week, the concepts and problem solving will be covered in workshop. The completed problems will be due the following Tuesday by 5 PM in eLearning. **For full credit, all steps to the solution of problems must be shown.** Answer keys to problems will be posted on e-Learning following the due date.

Exams: All exams will be online or in-person and will be taken during the class period.

Grades: At the end of the semester, an average of the four exam scores plus the problem-set score will be computed and scaled between 0 and 100 points. Your final letter grade will be no worse than that based on the following scale:

Letter Grade	Score Range
A- to A+	90-100
B- to B+	80-89
C- to C+	70-79
D- to D+	60-69
F	< 60

Scores with ≥ 0.5 or more will be rounded up, while those less than 0.5 will be rounded down.

Course & Instructor Policies

Make-up exams

No make-up exams or quizzes will be offered except in the most extreme documented circumstances or for religious holidays, as described under the University Policy below. If you miss an exam or quiz, your score will be recorded as 0.

Late Work

Problem sets will not be accepted after the due dates. If you do miss a due date, the score will be recorded as 0.

Class Participation

Notes and slides used in lectures, problem sets, class announcements, scores, and practice exams will be posted on eLearning, accessible through UT Dallas Homepage.

Classroom Citizenship

Please avoid using cellphones and other behaviors that distract students around you.

Class Materials

The instructor may provide class materials that will be made available to all students registered for this class as they are intended to supplement the classroom experience. These materials may be downloaded during the course, however, these materials are for registered students' use only. Classroom materials may not be reproduced or shared with those not in class, or uploaded

to other online environments except to implement an approved Office of Student AccessAbility accommodation. Failure to comply with these University requirements is a violation of the [Student Code of Conduct](#).

Classroom Conduct Requirements Related to Public Health Measures

UT Dallas will follow the public health and safety guidelines put forth by the Centers for Disease Control and Prevention (CDC), the Texas Department of State Health Services (DSHS), and local public health agencies that are in effect at that time during the Spring 2022 semester to the extent allowed by state governance. Texas Governor Greg Abbott's Executive Order [GA-38](#) prohibits us from mandating vaccines and face coverings for UT Dallas employees, students, and members of the public on campus. However, we strongly encourage all Comets to get vaccinated and wear face coverings as recommended by the CDC. Check the [Comets United: Latest Updates webpage](#) for the latest guidance on the University's public health measures. Comets are expected to carry out [Student Safety](#) protocols in adherence to the Comet Commitment. Unvaccinated Comets will be expected to complete the [Required Daily Health Screening](#). Those students who do not comply will be referred to the Office of Community Standards and Conduct for disciplinary action under the [Student Code of Conduct – UTSP5003](#).

Class Attendance

The University's attendance policy requirement is that individual faculty set their course attendance requirements. Regular and punctual class attendance is expected. Students who fail to attend class regularly are inviting scholastic difficulty. In some courses, instructors may have special attendance requirements; these should be made known to students during the first week of classes. Faculty have the discretion to set an attendance policy for their in-person meetings, but the absences due to COVID-19 cannot be counted against a quarantined student.

Class Recordings

Students are expected to follow appropriate University policies and maintain the security of passwords used to access recorded lectures. Unless the Office of Student AccessAbility has approved the student to record the instruction, students are expressly prohibited from recording any part of this course. Recordings may not be published, reproduced, or shared with those not in the

class, or uploaded to other online environments except to implement an approved Office of Student AccessAbility accommodation. Failure to comply with these University requirements is a violation of the [Student Code of Conduct](#).

The instructor may record meetings of this course. These recordings will be made available to all students registered for this class if the intent is to supplement the classroom experience. If the instructor or a UTD school/department/office plans any other uses for the recordings, consent of the students identifiable in the recordings is required prior to such use unless an exception is allowed by law.

Comet Creed

This creed was voted on by the UT Dallas student body in 2014. It is a standard that Comets choose to live by and encourage others to do the same:

“As a Comet, I pledge honesty, integrity, and service in all that I do.”

Academic Support Resources

The information contained in the following link lists the University’s academic support resources for all students.

Please see <http://go.utdallas.edu/academic-support-resources>.

UT Dallas Syllabus Policies and Procedures

The information contained in the following link constitutes the University’s policies and procedures segment of the course syllabus. Please review the catalog sections regarding the [credit/no credit](#) or [pass/fail](#) grading option and withdrawal from class.

Please go to <http://go.utdallas.edu/syllabus-policies> for these policies.

The descriptions and timelines contained in this syllabus are subject to change at the discretion of the Professor.