Course Syllabus – Fall 2024

Course Information
BIOL/CHEM 3461 section 003
Biochemistry 1
Fall 2024
T/Th, 2:30–3:45 PM, SLC 1.102,
Workshops will be held on Wednesdays from 7:00-7:50 PM in SCI 1.220

Professor Contact Information
Dr. Stefanie Boyd, FO 3.610, stefanie.boyd@utdallas.edu

Office Hours
Monday and Wednesday, 10:30 AM-12:30 PM or by appointment

Course Pre-requisites, Co-requisites, and/or Other Restrictions
CHEM 2323 (or equivalent); CHEM 2325 (or equivalent).
Concurrent registration in Biochemistry Workshop I (BIOL 3161, Sections 001 – 009) is required for both BIOL and CHEM 3361 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, 6h 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. When you purchase the Cengage eBook directly through Blackboard, you will not need an ISBN.

OR

2. Purchase through Bookstore
When you purchase through the bookstore, you will purchase 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. But, it may be cheaper to buy the text with OWLv2, rather than the text alone.**

Textbooks and some other bookstore materials can be ordered online or purchased at the UT Dallas Bookstore.

Assignments & Academic Calendar

DATE	TOPIC(S)	Book Chapter
Aug 20	**Lecture 1:** Introduction	Chap 1
Aug 20	**Lecture 2:** Weak interactions / Water	Chap 1 & Chap 2
Aug 22	**Lecture 3:** Acid/Base Properties	Chap 2
Aug 22	**Lecture 4:** Thermodynamics of Biological Systems I	Chapter 3
Aug 27	**Lecture 5:** Thermodynamics of Biological Systems II	Chapter 3
Aug 27	**Lecture 6:** Thermodynamics of Biological Systems III / Hydrophobic interactions	Chap 3
Aug 29	**Lecture 7:** Amino Acids I	Chap 4
Aug 29	**Lecture 8:** Amino Acids II	Chap 4

Sept 3	**Exam 1**	
Sept 5	**Lecture 9:** Protein Purification and Characterization I	Chap 4.7 & 5.1-5.2, 5.7-5.8
Sept 5	**Lecture 10:** Protein Purification and Characterization II	Chap 4.7 & 5.1-5.2, 5.7-5.8
Sept 10	**Lecture 11:** Proteins: Primary structure, Sequencing and Mass spectrometry I	Chap 4.7 & 5.3-5.6; Chap 6
Sept 10	**Lecture 12:** Proteins: Mass spectrometry II, Sequence Alignments and Structures	Chap 4.7 & 5.3-5.6 Chap 6
Sept 12	**Lecture 13:** Protein Structure and Protein Folding	Chap 6 and Chap 31.1 on pp 1132-1140
Sept 12	**Lecture 14:** Enzyme kinetics I	Chap 13
Sept 17	**Lecture 15:** Enzyme kinetics II and Inhibition kinetics I	Chap 13
Sept 17	**Lecture 16**: Inhibition kinetics II	Chap 13
Sept 19	**Lecture 17:** Bisubstrate Reactions	Chap 14
Sept 24	**Exam 2**	
Sept 26	**Lecture 18:** Enzyme mechanisms I	Chap 14
Sept 26	**Lecture 19:** Enzyme mechanisms II	Chap 14
Oct 1	**Lecture 20:** Enzyme regulation	Chap 15
Oct 1	**Lecture 21:** Enzyme regulation II	Chap 15
Oct 3	**Lecture 22:** Allostery in hemoglobin	Chap 15
Oct 8	**Lecture 23:** Overview of metabolism	Chap 17
Oct 10	**Lecture 24:** Carbohydrates	Chap 7
Oct 15	**Exam 3**	
Oct 17	**Lecture 25:** Glycolysis I	Chap 18
Oct 17	**Lecture 26:** Glycolysis II	Chap 18
Oct 22	**Lecture 27:** Glycolysis III	Chap 18
Oct 24	**Lecture 28:** Gluconeogenesis	Chap 22 (part 1)
Oct 29	**Lecture 29:** Gluconeogenesis/Glycogen metabolism	Chap 22 (part 1)
Oct 31	**Lecture 30:** Glycogen metabolism	Chap 22 (part 2)
Nov 5	**Lecture 31:** Pentose phosphate pathway	Chap 22 (part 2)
Nov 7	**Lecture 32:** TCA cycle I	Chap 19
Nov 7	**Lecture 33:** TCA cycle II	Chap 19
Nov 12	**Exam 4**	
Nov 14	**Lecture 34:** TCA cycle III	Chap 19
Nov 14	**Lecture 35:** Electron transport I	Chap 20
Nov 19	**Lecture 36:** Electron transport II	Chap 20
Nov 19	**Lecture 37:** Electron transport III	Chap 20
Nov 21	**Lecture 38:** ATP synthesis I	Chap 20
Nov 21	**Lecture 39:** ATP synthesis II	Chap 20
Tues Dec 3	**Exam 5**	

Undergraduate Teaching Assistants

Jiji, Shobel	xsj200053@utdallas.edu
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Supplemental Instruction (SI) and Peer Tutoring

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/

Workshop Schedule

Teaching assistants will organize workshop sections, hold office hours, conduct exam review ebsessions, post materials, and send e-mails.

Week	Topic
1	No Workshop
2	pH calculations, HH equation
3	pH calculations, Thermodynamics
4	Thermodynamics, Protein purification
5	
6	Enzyme kinetics
7	Enzyme mechanisms, protein structure
8	
9	Spring break – No workshops
10	Enzyme Regulation, Carbohydrates
11	Glycolysis, Gluconeogenesis, Glycogen Metabolism
12	Gluconeogenesis, Glycogen Metabolism
13	
14	TCA cycle and electron transport
15	Electron Transport ATP Synthesis
16	Exam week-Final review session

Exam Review Schedule – format and time will be announced

Grading Policy
Exam 1: 25%
Exam 2: 25%
Exam 3: 25%
Exam 4: 25%
Exam 5: 25%

Exams: All exams will be in person during the class period on scantrons. **There are absolutely no make-up exams.** One exam will be dropped (the lowest grade) except exam 5. Exam 5 must be taken.

Grades: At the end of the semester an average of the four exam scores plus the problem-set score and problem-set exam 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

You will receive the same letter grade in both BIOL/CHEM 3361 and BIOL 3161

Course & Instructor Policies
Make-up exams
There will be no make-up exams. If you do miss an exam, the score will be recorded as a 0.

Class Participation
Notes and slides used in lecture, class announcements, scores, and supplemental information will be posted on eLearning, which is accessible through Orion on the 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.

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.

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.