湖北工業大學
HUBEI UNIVERSITY OF TECHNOLOGY

Course Title	Protein Structure and Function
Course Code	BIOC 3161
Semester	Summer 2025
Course Length	5 Weeks, 60 Contact Hours
Credits	4
Instructor	TBA
Office	TBA
Email	TBA
Prerequisite	BIOL 2411 Principles of Genetics and Molecular Biology CHEM 2021 Organic Chemistry I

Course Description:

This course introduces the chemical principles that govern the structure and function of proteins, providing the molecular foundation for more advanced studies in biochemistry and structural biology. Emphasis is placed on the physicochemical properties of amino acids and polypeptides, protein folding, stability, enzymatic function, and molecular recognition. The course also examines key experimental techniques for analyzing proteins and introduces the fundamentals of enzyme kinetics and regulation.

Course Goals:

Students who successfully complete this course will demonstrate competency in the following general education core goals:

- **Critical Thinking Skills** – Students will engage in analytical thinking, demonstrating the ability to critically evaluate, synthesize, and apply knowledge to complex problems, and construct well-reasoned solutions and arguments.
- **Independent Research and Inquiry** – Students will conduct independent research, utilizing academic resources to explore relevant topics, formulating research questions, analyzing data, and presenting findings in a coherent, scholarly manner.
- **Problem-Solving and Application** – Students will apply theoretical concepts and methodologies learned in the course to real-world problems, demonstrating the ability to develop practical solutions informed by academic inquiry.
- **Global and Cultural Awareness** – Students will gain awareness of the global and cultural contexts relevant to the course, appreciating diverse perspectives and considering the implications of their studies in a broader, international context.

Student Learning Outcomes:

Upon completion of this course, students will be able to:

- Describe the hierarchical organization of protein structure from primary sequence to quaternary complexes;
- Explain the chemical forces that stabilize protein structures and influence folding pathways;
- Interpret enzyme kinetic data and apply models of catalytic mechanisms;
- Compare different types of protein-ligand and protein-protein interactions;
- Evaluate basic experimental techniques used in protein purification and structure determination.

Textbooks:

Kessel & Ben-Tal, *Introduction to Proteins: Structure, Function, and Motion,* Second Edition. Routledge.

Course Requirements:

Problem Sets (30%)
Regular assignments will reinforce conceptual understanding and require students to solve structural problems, analyze kinetic data, and interpret protein interaction case studies. These promote foundational proficiency in protein chemistry.

Reports from Literature (10%)
Students will complete 5 short written reports on selected research articles related to proteins covered in the course. Each report will focus on a structural or mechanistic theme and summarize key findings, significance, and methodology in one concise page, encouraging engagement with primary literature and critical reading skills.

Midterm Exam (20%)
Covers Lectures 1–12. Focuses on protein structure, folding, forces, and enzymology. Includes multiple-choice, short-answer, and mechanistic analysis questions.

Oral Presentations (10%)
Each student will deliver a 15-minute oral presentation on a protein or protein-related topic selected from a list provided mid-semester. Presentations are designed to develop scientific communication skills and help students synthesize core concepts from the course while making structural and functional connections.

Final Exam (30%)
Cumulative exam covering the entire course, with emphasis on enzyme mechanisms, structural techniques, and integrated problem-solving.

Assessments: Activity	**Percent Contribution**
Problem Sets	30%
Reports from Literature (5)	10%
Midterm Exam	20%
Oral Presentations	10%
Final Exam	30%

Grading:

Final grades will be based on the sum of all possible course points as noted above.

Grade	Percentage of available points
A	94-100
A-	90-93
B+	87-89
B	84-86
B-	80-83
C+	77-79
C	74-76
C-	70-73
D	64-69
D-	60-63
F	0-59

Course Schedule:
The schedule of activities is subject to change at the reasonable discretion of the instructor. Minor changes will be announced in class, major ones provided in writing.

BIOC 3161 Schedule

Lecture	Topic	Readings
L1	Introduction to Protein Biochemistry	Chapter 1
L2	Chemical Properties of Amino Acids	Chapter 2
L3	The Peptide Bond and Primary Structure	Chapter 2
L4	Secondary Structures: Alpha Helices and Beta Sheets	Chapter 2
L5	Protein Motifs, Loops, and Structural Supersecondary Elements	Chapter 2
L6	Tertiary Structure and Protein Folding Forces	Chapter 4 Report #1 due
L7	Quaternary Structure and Oligomeric Complexes	Chapter 2
L8	Protein Folding Pathways and Misfolding Diseases	Chapter 4
L9	Protein Stability, Denaturation, and Chaperones	Chapter 4
L10	Post-Translational Modifications	Chapter 2
L11	Protein Purification Techniques: Chromatography	Chapter 3 Report #2 due
L12	Protein Characterization: SDS-PAGE and Western Blot	Chapter 3
L13	Structural Techniques I: X-ray Crystallography	Chapter 3
/	**Midterm Exam**	L1-12
L14	Structural Techniques II: NMR and Cryo-EM	Chapter 3 Report #3 due
L15	Bioinformatics Tools for Protein Structure Prediction	Chapter 3
L16	Protein-Ligand Binding and Thermodynamics	Chapter 8
L17	Allostery and Cooperative Binding	Chapter 8
L18	Protein-Protein and Protein-Nucleic Acid Interactions	Chapter 8
L19	Enzyme Structure and Catalytic Mechanisms	Chapter 9
L20	Enzyme Kinetics: Michaelis-Menten and Inhibition	Chapter 9
L21	Regulation of Enzyme Activity	Chapter 9 Report #4 due
L22	Coenzymes and Active Site Chemistry	Chapter 9
L23	Protein Engineering and Mutagenesis	Chapter 5, 9
L24	Proteins in Biotechnology and Therapeutics	Chapter 6, 7

L25	Oral Presentations	Report #5 due
/	**Final Exam**	L1-25

Accommodation Statement:

Academic accommodations may be made for any student who notifies the instructor of the need for an accommodation. It is imperative that you take the initiative to bring such needs to the instructor's attention, as he/she is not legally permitted to inquire. Students who may require assistance in emergency evacuations should contact the instructor as to the most appropriate procedures to follow.

Academic Integrity Statement

Each student is expected to maintain the highest standards of honesty and integrity in academic and professional matters. The University reserves the right to take disciplinary action, up to and including dismissal, against any student who is found guilty of academic dishonesty or otherwise fails to meet the standards. Any student judged to have engaged in academic dishonesty in coursework may receive a reduced or failing grade for the work in question and/or for the course.

Academic dishonesty includes, but is not limited to, dishonesty in quizzes, tests, or assignments; claiming credit for work not done or done by others; hindering the academic work of other students; misrepresenting academic or professional qualifications within or without the University; and nondisclosure or misrepresentation in filling out applications or other University records.

Other Items:

Attendance and Expectations

All students are required to attend every class, except in cases of illness, serious family concerns, or other major problems. We expect that students will arrive on time, be prepared to listen and participate as appropriate, and stay for the duration of a meeting rather than drift in or out casually. In short, we anticipate that students will show professors and fellow students maximum consideration by minimizing the disturbances that cause interruptions in the learning process. This means that punctuality is a must, that cellular phones be turned off, and that courtesy is the guiding principle in all exchanges among students and faculty. You will be responsible for the materials and ideas presented in the lecture.

Assignment Due Dates

All written assignments must be turned in at the time specified. Late assignments will not be accepted unless prior information has been obtained from the instructor. If you believe you have extenuating circumstances, please contact the instructor as soon as possible.

Make-Up Work

The instructor will not provide students with class information or make-up assignments/quizzes/exams missed due to an unexcused absence. Absences will be excused and assignments/quizzes/exams may be made up only with written

documentation of an authorized absence. Every effort should be made to avoid scheduling appointments during class. An excused student is responsible for requesting any missed information from the instructor and setting up any necessary appointments outside of class.

Access, Special Needs, and Disabilities

Please notify the instructor at the start of the semester if you have any documented disabilities, a medical issue, or any special circumstances that require attention, and the school will be happy to assist.