



CMB 703 Metabolic Enzymology

Course Description: The online course offers a study of the functional and structural characteristics of metabolic pathway enzymes at the molecular level exploring fundamental protein chemistry that is relevant to understanding enzyme function within those pathways. Using molecular graphics software, students will examine high resolution structures of enzymes and explore changes in structure that occur with classical enzyme mechanisms. Analysis of pre-steady state and steady state enzyme activity as well as enzyme inhibition will be important aspects of the course.

Credit Hours: 2 hrs

Course Prerequisites: CMB 705, CMB 706 or by permission of instructor.

Course Dates: TBA

Course Times: asynchronous, online

Course Location: online

Instructor:

Dr. Bettye Sue Hennington

Professor, Cell and Molecular Biology

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Phone: 601-984-1630

Office Hours: Tuesday 12pm-3pm

Wednesday 12pm-3pm

Thursday 12pm-3pm

Dr. Maryam Syed

Assistant Professor, Cell and Molecular Biology

Email: msyed@umc.edu

Phone 601-984-5502

Office Hours: Monday 9am-12pm

Friday 9am-12pm

Required text and other learning resources: Fundamentals of Molecular Enzymology: The Cell and Molecular Biology of Catalytic Proteins, Price and Stevens, 3rd Edition, ISBN-10: 019850229X

Course Overview: The course will include examination of

1. High resolution structures of metabolic enzymes using molecular graphics software.
2. Fundamental protein chemistry relevant to understanding enzyme function

3. Classical enzyme mechanisms
4. Enzymes as nano-machines and pumps
5. Analysis of steady state enzyme activity
6. Reversible enzyme inhibition within metabolic pathways
7. Analysis of pre-steady state enzyme activity
8. Enzyme isolation

Course Objectives: Upon completion of the course, students will be able to:

1. Utilize molecular graphics software to analyze protein structure.
2. Explain basic geometry, structure and function of amino acid side chains and prosthetic groups, both in general and within the cellular milieu.
3. State and recognize the different types of classical enzyme mechanisms
4. Describe electron and proton transfer in proteins.
5. Describe the mechanisms of electron transfer-driven charge separation across membranes.
6. Analyze pre-steady state and steady state enzyme activity.
7. Explain the types of reversible enzyme inhibition in metabolic pathways.
8. Describe several types of methods used to isolate enzymes from cells.
9. Summarize research literature about an enzyme in a report regarding its chemical and kinetic mechanism of catalysis and enzyme-substrate interactions
10. Develop critical thinking skills and analytical skills through data analysis
11. Identify Interrelatedness between Biology and Chemistry in Biochemistry

Selected Topics

1. Non-covalent Bonds in Enzymes
2. Enzyme Catalysis
3. Electron Transfer
4. Redox Reactions
5. Basics of Enzyme Kinetics
6. Enzyme Inhibition
7. Assays of Mitochondrial Complexes
8. Electron Transport Chain
9. Echinocandins

Grading Policy and Rubric:

Quizzes and Exams	30%
Problem Sets	25%
Projects	25%
Journal Club	15%
Attendance	5%

Grading Scale:

90-100	A
80-89	B
70-79	C
Below 70	F

Course Policies:

Attendance is based on assignment due dates, quiz dates and exam dates. The student must turn in assignments on the designated date and time and quizzes and exams are to be taken on designated days. Students must follow the calendar a minimum of 90% for assignments/quizzes/exams. **You will be assessed 1% of the assignment grade for each day the assignment is late.** Late assignments, missed quizzes or tests will be considered absences.

You will be using Lockdown Browser and Respondus Monitor for each of the 4 exams. *There are no make-up exams unless otherwise granted by the Program Director PRIOR to an examination date. Failure to take an EXAM (mid-term and/or final) without prior permission from the Program Director will be recorded as 0.*

Course communication

- a. Electronic mail (email) services are provided to the UMMC community in support of the missions and administrative functions of the university. Users of the email system are expected to comply with the Email Policy, Information Policy, and all other UMMC policies.
- b. The email system may not be used for illegal or unlawful activities. Email users are expected to use the services in a professional and respectful manner.
- c. Students will receive information from instructors via email and their UMMC email account. **Therefore, students are expected to check their UMMC email accounts daily.** Students are responsible for contacting the UMMC Helpdesk (601-984-1145) if there are problems with email log in.

Submission of assignments

All assignments will be submitted through CANVAS learning management platform at UMMC.

Grading of assignments

All assignment grades and feedback will be posted in Canvas. Instructor will have up to 48 hours after the due date to provide grades/feedback on daily/weekly HW assignments. For writing assignments and projects, Instructor will have up to 5 business days after the due date to provide feedback on assignment. Students may work ahead and turn in assignments prior to the due date, however, the Instructor will be grading according to the due date schedule.

Learning Platform:

The School of Graduate Studies in the Health Sciences uses CANVAS Learning Management System (LMS) software to deliver course content. Once you are enrolled in a course by the faculty you can go to <http://umc.instructure.com> to login and retrieve course material. You will receive an email notifying you of enrollment in a course using CANVAS. **A headset with a microphone or webcam with integrated microphone is required.**

University Policies:

Students with disabilities (ADA) statement	Refer to UMMC policy
Academic honesty statement	Refere to UMMC policy

Sample Syllabus