

MCB 5025

Structure and Function of Biological Membranes

Spring semester 2021

A. Course Description

This class covers the fundamentals of biological membranes, integrating biochemical, biophysical, genetic, and physiological concepts. Course content includes the structure, function and biogenesis of lipids and membrane proteins; membrane-level processes including transport, energy transformation and signal transduction; technological developments in research with biomembranes and artificial membrane systems; and the role of membranes in human health and disease.

B. Course Instructor

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C. Course Format

1. Course content. MCB 5025 is a distance learning (DL) course. The **MCB 5025 Husky CT site** is the primary repository and access point for all course content, assessment and activity. This site is available to registered students through the NetID and password authentication process. All lectures and supplemental reading material will be delivered remotely and asynchronously through the HuskyCT site. All course materials are organized into learning modules, for which there will be multiple subsections. Each learning module will contain lecture videos of varying lengths along with other posted content and will be available through the duration of the course once uploaded. All weekly learning objectives will be clearly posted as weekly announcements posted on the HuskyCT site and distributed to students.

2. Textbook. The required textbook for this course is *Membrane Structural Biology with Biochemical and Biophysical Foundations*, 2nd Edition, Luckey, M. 2008, Cambridge University Press, New York. This text is available through the UConn Bookstore (hardcopy or digital) for rent or purchase at a price range of \$60-\$85.

3. Assessments. Each learning module will contain formative assessments, designed to gauge student understanding of the material and to guide instructor feedback. These assessments will include written, quantitative, and problem-solving questions that are based on lecture content and primary literature. Assignments will be posted on the HuskyCT site along with explicit instructions on completing them and due dates. Depending on length, each assignment will take one to two weeks to complete.

4. Student Projects. Each student will prepare an original research proposal that is focused on a relevant and timely issue involving biological membranes. This will be written in the style of an NIH R01 research proposal (12 pages, including *Specific Aims, Introduction, Methods, Research Plan, and Future Directions*). Each student will design and prepare these proposals throughout the semester with continued input and guidance from the instructor. In the final two weeks of the semester, a peer review will be organized in which each proposal is critically reviewed by two students in the course. The culmination of the research project will be a student-led 20 minute online presentation of the research plan that includes feedback and responses from peer review. This slide presentation will be delivered *via* HuskyCT as an online seminar with all students participating.

5. Exams. There will be one midterm exam (Friday, March 5, 2021 from 3-5 PM) and one final exam (Tuesday, May 4, 2021 from 3-5 PM). Both exams will be taken through the course HuskyCT site.

D. Grading. Course grades will be determined by the following:

1. Learning module assessments (30%)
2. Midterm exam (20%)
3. Written original research proposal and presentation (30%)
4. Final exam (20%)

E. Schedule of Course Content

Learning Module 1: Lipid Structure, Function and Biogenesis

<u>Section</u>	<u>Topic</u>	<u>Text Chapter</u>	<u>Assessments</u>
Part 1	Introduction to Biomembranes	Chapter 1	Learning Module 1 assignment, Parts 1-2
Part 2	Lipid Structure and Diversity	Chapter 2	
Part 3	The Lipid Bilayer Matrix	Chapter 2	Learning Module 1 assignment, Parts 3-4
Part 4	Lipid Bilayer Biophysics	Chapter 2	

Learning Module 2: Membrane Protein Structure, Function and Biogenesis

<u>Section</u>	<u>Topic</u>	<u>Text Chapter</u>	<u>Assessments</u>
Part 1	Membrane Proteins	Chapter 4	Learning Module 2 assignment, Parts 1-2
Part 2	Membrane Protein Structure	Chapter 5	
Part 3	Membrane Protein Function	Chapter 6	Learning Module 2 assignment, Parts 3-4
Part 4	Membrane Protein Biogenesis	Chapter 7	
Part 5	Enzymes, Transport and Transducers	Chapter 9	Learning Module 2 assignment, Part 5

Learning Module 3: Biomembrane Functions

<u>Section</u>	<u>Topic</u>	<u>Text Chapter</u>	<u>Assessments</u>
Part 1	Membrane Transport	Chapter 11	Learning Module 3 assignment, Parts 1-2
Part 2	Membrane Bioenergetics	Chapter 13	
Part 3	Membrane Protein Assemblies	Chapter 9	Learning Module 2 assignment, Parts 3-4

Learning Module 4: Techniques, Tools and Current Topics

<u>Section</u>	<u>Topic</u>	<u>Text Chapter</u>	<u>Assessments</u>
Part 1	Techniques in Biomembrane Research	Chapters 3 and 8	Learning Module 4 assignment, Part 1
Part 2	Membranes in Human Health and Disease	Chapters 3 and 8	Learning Module 4 assignment, Part 2

F. Student Authentication and Academic Integrity

1. Student Authentication. The University of Connecticut is required to verify the identity of students who participate in distance learning or online courses and to establish that students who register in these courses are the same students who participate in and complete the course activities and assessments and receive academic credit. Verification and authentication of student identity in this course will include:

- The use of HuskyCT as the sole access point of all course material and assessments,
- Routine instructor interactions (via e-mail and/or teleconference) to discuss course content as well as progress and understanding of assignments, and
- Student-created projects that are delivered as online presentations.

2. Academic Integrity. Breaches of academic honesty and misconduct, including plagiarism, will be treated following university rules and regulations. For complete information, please consult:

<https://community.uconn.edu/academic-misconduct/>