

# **Membrane and Cellular Biochemistry**

**MBIO3460: A01 Fall 2020: 3 credit hours**

## **SYLLABUS**

<b>INSTRUCTORS:</b>	Dr. Gerd Prehna 414E Buller Email: <a href="mailto:gerd.prehna@umanitoba.ca">gerd.prehna@umanitoba.ca</a>
<b>TIME/LOCATION:</b>	Monday/Wednesday/Friday 9:30-10:20 a.m. Zoom meeting – posted in UM learn
<b>OFFICE HOURS:</b>	Dr. Prehna: Tues: 12-1 PM and Thurs: 1-2 PM

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### **COURSE OBJECTIVE AND DESCRIPTION:**

This course is a detailed overview of biological membranes, both their lipid and protein components, and their roles in various biological functions including transport, secretion, and signaling. The perspective of these systems will be from a biochemical, biophysical, and structural biology focused view.

After completing this course, students will have:

1. A firm understanding of lipid biochemistry and biological membranes
2. In depth knowledge of membrane protein structure and function
3. A broad toolbox of biochemical and biophysical techniques used to study membrane proteins

**\*\*In order to register for this course, a grade of C or higher is required in Biochemistry II (CHEM/MBIO2370).**

### **TEXTBOOKS:**

Membrane Structural Biology, 2<sup>nd</sup> Edition (Mary Luckey).

### **MULTIMEDIA REQUIREMENTS**

All lectures will be synchronous. You are expected to attend class virtually and exams will be invigilated virtually. Lecture notes will be available on UMLearn the night before we start each section and will remain on the server for your use. All lectures will be recorded live and will be uploaded to UMLearn for your use. They will only be available for 1 week, at which point they will be deleted. Based on this, for this course you are required to have:

- A computer capable of running web-browsers, the Zoom application, and play large video files
- A computer capable of creating and editing documents
- An internet connection capable of streaming videos and downloading software
- A microphone for your computer to participate in class and answer questions
- A webcam for your computer for class and for invigilation purposes
- Zoom application (zoom.us)

## EVALUATION:

The course evaluation will include a mid-term exam, a laboratory component, an assignment, and a final exam. The dates and value of these components are as follows:

**Mid-term:** Friday October 30, 2020, In class .....20%

**Laboratory:** .....20%

A laboratory outline with a grade break down will be available on UMLearn prior to "lab #1".

**Assignment:** Due December 11, 2020.....20%

**Final Exam:** TBD, 2.0 hours .....40%

Letter grades will be assigned as follows based on the above criteria:

Letter	Percentage
A+	$\geq 90$
A	$\geq 80 < 90$
B+	$\geq 75 < 80$
B	$\geq 70 < 75$
C+	$\geq 65 < 70$
C	$\geq 60 < 65$
D	$\geq 50 < 60$
F	$< 50$

Note: The percentage bins may change based on class performance in favor of the student.

Examinations will be given on UMLearn and will be a mixture of multiple choice, short-answer and long-answer. Detailed directions will be given on UMLearn before each exam.

### Examinations will be open notes

It is strongly suggested to still study! You will not have time to look up the answer for every question, and many questions will be conceptual and build on your basic knowledge.

#### Open notes means that you MAY:

Use your personal class notes and the lecture material provided during the course

#### Open notes means that you MAY NOT:

Use the textbook during the exams

Use the internet during the exams

Work in groups or ask your classmates questions during the exams

### Assignment

The assignment will consist of a set of written questions pertaining to the biochemistry of membrane proteins and their structure. The questions will be assigned after the midterm on UMLearn on November 2nd and will be due on the last day of classes. You must upload them to UMLearn before midnight on December 11th 2020. You **are expected to work individually** but you may use your lecture notes, the textbook, the internet, and scientific publications. There will be no extensions given for the assignment. If it is not turned in on time you will receive a 0%.

## OTHER IMPORTANT DATES:

**September 16<sup>th</sup>, 2020 -2:30pm:** Labs begin

a zoom link will be available on UMLearn prior to lab # 1

**Monday November 23<sup>rd</sup>, 2020:** Last Day for Voluntary Withdrawal

**Friday December 11<sup>th</sup>, 2020:** Last Day of Classes

## ACADEMIC INTEGRITY:

Academic integrity is taking responsibility for and being honest with your work and respecting the work of others. Since you are a member of the university community, we want you to learn what that responsibility and honesty entails and how we respect the work of others.

The Faculty of Science continues to uphold high standards of academic integrity. We know that our students support us in this endeavour and we count on each and every one of you to do your part.

Same academic standards apply online, remote learning, and in class education. We expect all students to strictly adhere to instructions from their professors regarding what resources can and cannot be used during exams, to follow all rules professors decide to set.

To aid professors in ensuring that all forms of assessments have been administered fairly, the University will be electronically monitoring tests, quizzes and examinations, included, but not limited to overseeing chat-rooms, relevant predatory web-sites and, in so doing, we will analyze scholastic evidence of individual exams. **E-monitoring tools will include one of the following: Respondus Lockdown Browser & Respondus Monitor; WebEx; Zoom or Microsoft Teams.**

Academic Integrity Message from Associate Dean Krystyna Koczanski : <https://youtu.be/Ok-lilm4SeE>

UM Respondus Student Guide

<https://universityofmanitoba.desire2learn.com/d2l/le/content/6606/viewContent/1463719/View>

## REGISTRATION RESTRICTIONS

PLEASE ENSURE THAT YOU **THE STUDENT** ARE ENTITLED TO BE REGISTERED IN THIS COURSE:

THIS MEANS THAT YOU **THE STUDENT** HAVE:

-the appropriate prerequisites, as noted by the calendar description, or have permission from the instructor to waive these prerequisites

-not previously taken, or are concurrently registered in this course and another that has been identified as “not to be held with”

The registration system may have allowed the student to register but it is up to the student to ensure that they have met all the requirements. Consequences may be the student being withdrawn from the course part way through the term, or the course not used in the degree program. There will be no fee adjustment. This is not appealable.

## DEFERRED EXAMINATIONS:

Deferred exams will not be administered. If you miss the midterm, the value of the exam will be added to the weight of the final exam. No medical certificate is required. However, please notify the instructor 24hrs before the midterm. If you miss the final exam, you must notify the instructor within 48hrs. Please send an email including name, student number, and course. Failure to do so will result in an F for the course.

## **COURSE OUTLINE:**

### **Part One: Lipid and Membrane Protein Fundamentals**

Chapter 1: Introduction

Chapter 2: The Diversity of Membrane Lipids

Chapter 4: Proteins in or at the Bilayer

Chapter 5: Bundles and Barrels

Chapter 6: Functions and Families (ending at p. 145)

### **Part Two: Tools and Techniques**

Chapter 3: Tools for Studying Membrane Components

Chapter 6: Bioinformatics and proteomics (starting at p. 146)

Chapter 8: Diffraction and Simulation

Extra material: Primer in Structural Biology

## **MIDTERM EXAM**

### **Part Three: Membrane Biogenesis**

Chapter 7: Protein Folding and Biogenesis

Extra material: Topics from current state of the field

### **Part Four: An in-depth look at the biochemistry of selected membrane proteins**

Mitochondrial membrane and membrane proteins

Dr. Deborah Court, Department of Microbiology

Receptor Tyrosine Kinases

Dr. Spencer Gibson, Department of Biochemistry and Medical Genetics

Membrane Gated Ion Channels

Dr. Geoff Hicks, Department of Biochemistry and Medical Genetics

Secretion Systems in Bacteria: T3SS, T5SS, and T6SS

Dr. Gerd Prehna, Department of Microbiology