UNIVERSITY OF THE FRASER VALLEY

ORIGINAL COURSE IMPLEMENTATION DATE: September 2016
REVISED COURSE IMPLEMENTATION DATE: September 2026
COURSE TO BE REVIEWED (six years after UEC approval)**:** April 2032
Course outline form version: 29/08/2024

OFFICIAL UNDERGRADUATE COURSE OUTLINE FORM

Note: The University reserves the right to amend course outlines as needed without notice.

Course Code and Number: BIOC 404	**Number of Credits:** 3 Course credit policy (105)
Course Full Title: Biomembranes **Course Short Title:** Biomembranes	
Faculty: Faculty of Science	**Department/School:** Chemistry

Calendar Description:

Focuses on the structure and functions of biological membranes and their protein and lipid components. Emphasis is placed on techniques used to study membranes, the use of model systems, and biomedical applications of lipid nanoparticle systems based on membrane structure.

Note: This course is offered as BIOC 404 and CHEM 404. Students may take only one of these for credit.

Note: Students with credit for CHEM 412F cannot take this course for further credit.

Prerequisites (or NONE):	BIO 320/BIOC 320 or BIOC 350/CHEM 350.
Corequisites (if applicable, or NONE):	None.
Pre/corequisites (if applicable, or NONE):	None.

Antirequisite Courses *(Cannot be taken for additional credit.)*

Former course code/number:

Cross-listed with: **CHEM 404 (formerly CHEM 412F)**

Equivalent course(s):

(If offered in the previous five years, antirequisite course(s) will be included in the calendar description as a note that students with credit for the antirequisite course(s) cannot take this course for further credit.)

Typical Structure of Instructional Hours

Lecture/seminar	45
Total hours	**45**

Scheduled Laboratory Hours

Labs to be scheduled independent of lecture hours: **No**

Course Details

Special Topics course: **No**
(If yes, the course will be offered under different letter designations representing different topics.)

Directed Study course: **No**
(See policy 207 for more information.)

Grading System: **Letter grades**

Delivery Mode: **Face-to-face only**

Expected frequency: **Every other year**

Maximum enrolment (for information only)**: 24**

Prior Learning Assessment and Recognition (PLAR)

PLAR is available for this course.

Transfer Credit *(See bctransferguide.ca.)*

Transfer credit already exists: **No**

Submit outline for (re)articulation: **No**
(If yes, fill in transfer credit form.)

Department approval	**Date of meeting:**	December 11, 2025
Faculty Council approval	**Date of meeting:**	February 6, 2026
Undergraduate Education Committee (UEC) approval	**Date of meeting:**	April 24, 2026

Learning Outcomes *(These should contribute to students' ability to meet program outcomes and thus Institutional Learning Outcomes.)*

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

1. Describe the structure and chemical properties of lipid bilayers and biological membranes.
2. Critically discuss how lipids can self-assemble to form a variety of structural phases and the biological roles for these properties.
3. Explain how spectroscopic methods can be used to characterize lipid bilayers.
4. Describe the basic theory behind magnetic resonance and other spectroscopy methods.
5. Apply basic NMR theory to calculate several properties of lipid or membrane systems (correlation times, order parameters, NMR linewidths)
6. Explain the roles of membrane proteins in cellular metabolism.
7. Relate the structure of membrane proteins and lipids to their biological functions.
8. Critically analyze recent membrane science research literature.
9. Integrate data from several literature sources in a term paper and/or class presentation.

Recommended Evaluation Methods and Weighting *(Evaluation should align to learning outcomes.)*

Final exam:	30%	Assignments:	35%	Project:	20%
Quizzes/tests/midterm:	15%		%		%

Details:

Assignments (problem sets): 35%
Project and presentation: 20%

NOTE: The following sections may vary by instructor. Please see course syllabus available from the instructor.

Typical Instructional Methods *(Guest lecturers, presentations, online instruction, field trips, etc.)*

Lecture course, student presentations.

Texts and Resource Materials *(Include online resources and Indigenous knowledge sources. Open Educational Resources (OER) should be included whenever possible. If more space is required, use the Supplemental Texts and Resource Materials form.)*

	Type	Author or description	Title and publication/access details	Year
1.	Textbook	Lehninger, A.L., et a	Principles of Biochemistry, USA	Current
2.	Textbook	Luckey, M.	Membrane Structural Biology with Biochemical and Biophysical Foundations, UK	Current
3.	Textbook	Gennis, Robert B.	Biomembranes: Molecular Structure and Function. Springer Science+Business Media, LLC	Current
4.				
5.				

Required Additional Supplies and Materials *(Software, hardware, tools, specialized clothing, etc.)*

Course Content and Topics

- Membrane morphology
- Structure and properties of membrane lipids
- Membrane self-Assembly: the hydrophobic effect
- Liposomes: structure and use as model systems
- Lipid polymorphism
- Lipid membranes: phase diagrams and cholesterol
- Characterization of membranes using physical techniques: diffraction, magnetic resonance (NMR/ESR), infrared spectroscopy
- Membrane asymmetry and lipid microdomains (RAFTS)
- Membrane potential
- Transport energetics
- Membrane proteins: ion channels, receptors, transporters, and proton pumps
- Liposomes: biomedical applications
- Student presentations