

Department of Biology Course Outline

Course Number 4151, Course Name Membrane Transport Fall Term

Course Description

Official Calendar Course Description

Fundamental molecular and biophysics of membrane transport. Areas that will be stressed include molecular structural-function and biophysical mechanisms critical for membrane transport. Two lectures per week. One term. Three credits.

Prerequisites

Prerequisites from Calendar Course Description

Prerequisites: SC/BIOL 2020 3.00, SC/BIOL 2021 3.00. SC/BIOL 3010 3.00 and SC/BIOL 3110 3.00 strongly recommended as prerequisites or corequisites. It is strongly advised that students have a sound understanding of the fundamental chemistry. Familiarity of the principles of thermodynamics and concepts in chemical kinetics would be extremely helpful.

Course Instructors and Contact Information

Name and contact information of course director, lab director and other important people associated with course administration. Office hours, any other related information.

Course Director: Peter Backx

Office: Room 354 Farquaharson

Phone: x33858

Email: pbackx@yorku.ca

Online/remote by appointment via email

Schedule

A mixture of synchronous and asynchronous lectures will be provided.

Asynchronous lectures will be provided as a Zoom link on Moodle and be available for 1 week

Synchronous lectures will not be recorded although this decision might change.

In the event that synchronous lectures are recorded they will also be posted on Moodle for 1 week.

Technology Requirements

Lectures will be prerecorded (asynchronous), with the live (Synchronous) class time focused on student questions and expansion on material presented in the prerecorded lectures.

Synchronous sessions will be recorded for students unable to attend and made available within 48-hours on Moodle (see below for additional information about Zoom sessions).

Lectures will be available for a maximum of 7 days after being posting

Recommended (but not required); *high speed internet, audio capability (microphone), ability to stream online lectures, ability to support video conferencing software* (i.e., for synchronous sessions, office hours), *Proctortrack requirements* (see <https://registrar.yorku.ca/proctortrack-faq> and Moodle)

Evaluation

Grading:

Homework Assignments (4): 30%

Literature review: 10%

In class quizzes (4) during synchronous class (dates to be determined): 20%

Midterm (Oct. 20th) during synchronous class: 20%

Final exam: 20%

Total = 100%

Literature reviews must be submitted as a hard copy (for grading) **and** an e-copy for verifying originality (turnitin.com). Submissions that do not meet these requirements will receive a grade of zero.

Literature reviews can be from a broad range of topics:

Group 1 topics: Discuss/summarize mutations of transport proteins that cause a known disease

Group 2 topics: Discuss current understanding of permeation mechanisms

Group 3 topics: Current understanding of molecular structures and their relationship to function

Group 4 topics: Mechanisms of gating

Group 5 topics: Mechanisms of regulation of activity/function of a specific channel or class of channels

Assignments must be submitted 2 weeks after distribution.

Notes: Course website: <http://moodle.yorku.ca>

NOTE: Final course grades may be adjusted to conform to Faculty grade distribution profiles.

Important Dates

Midterm Test (Oct.20th 2020) 1.5 hour

Home assignments must be submitted 2 weeks after being available

Literature review is due on December 4, 2020. They can be submitted in an electronic format.

Drop Deadline: Fri. Nov. 6, 2020 (last day to drop without course on transcript)

Course Withdrawal: Sat. Nov. 7 to Dec. 4, 2018 (course still appears on transcript with 'W')

****NOTE:** for additional important dates such as holidays and reading days please refer to the "Important Dates" section of the Registrar's Website at <http://registrar.yorku.ca/enrol/dates>

Resources

Required Texts: none

Recommended textbooks:

Channels, Carriers, and Pumps: An introduction to membrane transport, 2nd Edition, W.D. Stein, T. Litman

Membrane structural biology_ with biochemical and biophysical foundations, Mary Luckey -
Ion channels in excitable membranes, 3rd Edition, B Hille

Cellular Biophysics vols. 1 and 2, T.F. Weiss

Other reading materials (papers) will be added via the moodle website

Website: Moodle

Please check the BIOL 4551 Moodle website (www.yorku.ca/moodle) on a regular basis for course updates and postings. Course announcements from the Moodle site may be associated email; **please regularly check your email account.**

Moodle Discussion Boards

The Discussion Board will be an important component of the online learning environment of the course. All questions related to course/lecture materials will be posted (anonymously) on the Discussion Board, with the expectation that students in the course can have the opportunity to respond and discuss.

Be sure to read the other threads before you post a question to see if your question has already been answered.

When posting, be clear specific and professional (see Netiquette guidelines posted on Moodle).

Discussions are monitored. Messages containing personal attacks, inappropriate language, or other disrespectful contents will be removed. Irrelevant material will also be removed. Follow the York University Student Code of Conduct <http://www.yorku.ca/oscr/codeofrr.html>

If you notice any inappropriate threads please contact the Course Director.

Disclaimer: While Moodle moderators / instructors will attempt to remove (or edit) objectionable/inappropriate material as quickly as possible, it is not always possible to review every post. All posts made on the forums express the views and opinions of the author and not the moderators / instructors (except for posts by these people) and they cannot be held liable.

Learning Outcomes

- Understand the molecular and biophysical basis of the mechanisms underlying transport
- Become familiar with the scientific language and concepts used to understand membrane transport
- Be competent in reading literature describing transport mechanisms

Course Content**TENTATIVE LECTURE SCHEDULE/PLAN**

- General Structure and Biochemical Composition of Membranes
- Biophysical Consequences of Membrane Biochemistry
- The need for specialized transport systems
- Biophysical Concepts in membrane transport:
 - role of energetics (electrostatic interactions, hydrophobicity)
 - Concepts of mass and charge diffusion in transport
 - the ubiquitous use of state diagrams based on chemical kinetic theory
 - introduction to ideas of transport coupling
- Water Transport: Aquaporins
- Ion channels: voltage-gated, ligand gated, strain-gated, photon gated
- Ion exchangers and coupled transport
- ATP-powered pumps
- ABC Transporters

Experiential Education and E-Learning

A good deal of information related to the topics discussed in class is available on the web. Students are encouraged to find course-related material on the web.

Other Information

Links for websites illustrating the concepts in class will often be provided in the lectures and in the notes.

Course Policies

- There will be zero tolerance for missed/late assignments and/or midterm tests. Students who are absent will receive a grade of zero for that component of the course.
- Only medical-related absences from midterm will be considered and must be supported with York University approved documentation requirements. If documentation is accepted, grades will be made up in a format at the discretion of the course director. Any medical documentation must be submitted using the departmental online document submission system:
<http://science.apps01.yorku.ca/machform/view.php?id=84113>
- Email and discussion forum etiquette/policies: Use only your my.yorku.ca email for all course correspondence. Emails received from non-yorku email addresses will not receive a response.
- Be sure to include your full name and student number in all email communications, etc.
- For those missing the midterm (for appropriate reasons such as illness) students will have their final exam mark represent 65% of the final grade. Supplemental final exams will be provided for students missing the exam for appropriate and documented medical reasons.
- Synchronous lectures may be recorded.

University Policies

Academic Honesty and Integrity

York students are required to maintain the highest standards of academic honesty and they are subject to the Senate Policy on Academic Honesty (<http://secretariat-policies.info.yorku.ca/policies/academic-honesty-senate-policy-on/>). The Policy affirms the responsibility of faculty members to foster acceptable standards of academic conduct and of the student to abide by such standards. There is also an academic integrity website with comprehensive information about academic honesty and how to find resources at York to help improve students' research and writing skills, and cope with University life. Students are expected to review the materials on the Academic Integrity website at - <http://www.yorku.ca/academicintegrity/>

Access/Disability

York University is committed to principles of respect, inclusion and equality of all persons with disabilities across campus. The University provides services for students with disabilities (including physical, medical, learning and psychiatric disabilities) needing accommodation related to teaching and

evaluation methods/materials. These services are made available to students in all Faculties and programs at York University.

Students in need of these services are asked to register with disability services as early as possible to ensure that appropriate academic accommodation can be provided with advance notice. You are encouraged to schedule a time early in the term to meet with each professor to discuss your accommodation needs. Please note that registering with disabilities services and discussing your needs with your professors is necessary to avoid any impediment to receiving the necessary academic accommodations to meet your needs.

Additional information is available at the following websites:

Counselling & Disability Services - <http://cds.info.yorku.ca/>

Counselling & Disability Services at Glendon - <http://www.glendon.yorku.ca/counselling/personal.html>

York Accessibility Hub - <http://accessibilityhub.info.yorku.ca/>

Ethics Review Process

York students are subject to the York University *Policy for the Ethics Review Process for Research Involving Human Participants*. In particular, students proposing to undertake research involving human participants (e.g., interviewing the director of a company or government agency, having students complete a questionnaire, etc.) are required to submit an *Application for Ethical Approval of Research Involving Human Participants* at least one month before you plan to begin the research. If you are in doubt as to whether this requirement applies to you, contact your Course Director immediately.

Religious Observance Accommodation

York University is committed to respecting the religious beliefs and practices of all members of the community, and making accommodations for observances of special significance to adherents. Should any of the dates specified in this syllabus for an in-class test or examination pose such a conflict for you, contact the Course Director within the first three weeks of class. Similarly, should an assignment to be completed in a lab, practicum placement, workshop, etc., scheduled later in the term pose such a conflict, contact the Course director immediately. Please note that to arrange an alternative date or time for an examination scheduled in the formal examination periods (December and April/May), students must complete an Examination Accommodation Form, which can be obtained from Student Client Services, Student Services Centre or online at

http://www.registrar.yorku.ca/pdf/exam_accommodation.pdf (PDF)

Student Conduct in Academic Situations

Students and instructors are expected to maintain a professional relationship characterized by courtesy and mutual respect. Moreover, it is the responsibility of the instructor to maintain an appropriate academic atmosphere in the classroom and other academic settings, and the responsibility of the student to cooperate in that endeavour. Further, the instructor is the best person to decide, in the first instance, whether such an atmosphere is present in the class. The policy and procedures governing disruptive and/or harassing behaviour by students in academic situations is available at - <http://secretariat-policies.info.yorku.ca/policies/disruptive-and-or-harassing-behaviour-in-academic-situations-senate-policy/>