

FACULTY of SCIENCE and ENGINEERING

Department of Biology

Course: SC/BIOL 4151 3.0 (crosslist: SC/BCHM 4141 3.0) – **Membrane Transport**

Course Webpage: <http://www.yorku.ca/planters/transport/>

Term: Fall Term 2014

Prerequisite / Co-requisite: SC/BIOL 2020 4.0; SC/BIOL 2021 4.0; SC/BIOL 3010 3.0 and SC/BIOL 3110 3.0 strongly recommended as prerequisites or corequisites.

Course Instructor

Roger R. Lew

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Farquharson 229 (lab)

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Course consultation hours: I am usually in my lab, feel free to drop by.

Time and Location

Lectures TR 8:30—10:00 LSB – 101

Expanded Course Description

The mechanisms of transport, the biochemical properties of the transporters and their primary structure are very similar in higher plants and fungi, bacteria and animals. So, examples of well-studied transporters will be drawn from all kingdoms. Some possible topics: arsenic transporters, various active pumps, water channels, light-gated and various other ion channels. Please be aware that the study of membrane transport is *intrinsically* mathematical in nature. The mathematics is crucial for understanding the energetics and kinetics of transport mechanisms. Regulation of the intracellular environment, the a priori role of cellular transport, will be emphasized.

Organization of the Course - The course involves formal lectures by the lecturer. The lectures will be supplemented by films and videos. Lectures are central to the course —lecture notes will be made available after a particular topic is completed. Lectures will serve to enrich, clarify, and illustrate crucial issues from the case studies used to reveal the mechanisms of transport by biological organisms.

Course Objectives

Please note that a detailed syllabus and past tests and assignments on the course website provide a highly detailed and practical presentation of the Learning Objectives

(1) Brief statement of the purpose:

The purpose of this course is to assist students in developing a critical overview of the relevance and nature of biological transport mechanisms. Please be aware that the study of membrane transport is *intrinsically* mathematical in nature. The mathematics is crucial for understanding energetics and kinetics of transport mechanisms. Past term tests, final exams and assignments provided on the course website should give you an idea of the mathematical nature of the course.

(2) Brief list of specific learning outcomes of the course:

The specific objectives of the course are that students will be able to:

- critically examine the physical mechanisms underlying transport
- be able to assess mechanisms on the basis of analytical constructs drawn from biochemistry and biophysics
- develop the flexibility required to apply and integrate fundamental principles and mechanisms in case studies to other transport processes.
- Become familiar with the scientific language used to describe transport mechanisms
- develop their ability to analyze transport mechanisms.

Course Text / Readings

(Additional readings may be assigned or recommended during the course.)

Berg, H.C., *Random Walks in Biology*. Princeton University Press.

Berg presents the physical basis of random walks: the movements of molecules. Random walks are the foundation of diffusive fluxes, and are the starting point for a rigorous exploration of molecular transport at membranes. The presentation is physics-oriented.

Byrne, J.H. and S.G. Schultz. *Membrane Transport. An Introduction to Membrane Transport and Bioelectricity*. (Course Kit)

Byrne and Schultz are writing for a medical student audience. So, the presentation is not very rigorous. It is a *gentler* introduction to all aspects of transport, including action potentials. It should be helpful to students as an overview.

Lecture notes and readings will be provided to supplement lectures and class discussion.

Evaluation

Below is the assignments and grading scheme decided by students in **2014**.

- Take Home Assignments (highest scoring 15%, middle scoring 10%, lowest scoring 5%) (30% total)
- Two term tests and the final exam (highest scoring 40%, middle scoring 20%, lowest scoring 10%) (70% total)

(Term Test Dates will be 16 October, and 18 November).

In the event of a documented absence from a term test, the weight (10%) will be transferred to the final exam

“Final course grades may be adjusted to conform to Program or Faculty grades distribution profiles.”

Grading, Assignment Submission, Lateness Penalties and Missed Tests

Grading: The grading scheme for the course conforms to the 9-point grading system used in undergraduate programs at York (e.g., A+ = 9, A = 8, B+ = 7, C+ = 5, etc.). Assignments and tests* will bear either a letter grade designation or a corresponding number grade (e.g. A+ = 90 to 100, A = 80 to 90, B+ = 75 to 79, etc.)

(For a full description of York grading system see the York University Undergraduate Calendar - <http://calendars.registrar.yorku.ca/2010-2011/academic/index.htm>)

Students may take a limited number of courses for degree credit on an ungraded (pass/fail) basis. For full information on this option see Alternative Grading Option in the (*Faculty of Science*) section of the Undergraduate Calendar: (<http://ugbio.apps01.yorku.ca/>)

Assignment Submission: Proper academic performance depends on students doing their work not only well, but on time.

Accordingly, assignments for this course must be received on the due date specified for the assignment. Assignments are to be handed in at Room 229 Farquharson before the time specified when they are assigned.

Lateness Penalty: Assignments received later than the due date will be penalized (A late penalty will apply: 10% after the specified time (meaning that I find it under my door the next day or on the weekend), 20% for monday, 40% for tuesday *ad infinitum*. Please do hand it in on time!). Exceptions to the lateness penalty for valid reasons such as illness, compassionate grounds, etc., may be entertained by the Course Instructor but will require supporting documentation (e.g., a doctor's letter).

Missed Tests: Students with a documented reason for missing a course test, such as illness, compassionate grounds, etc., which is confirmed by supporting documentation (e.g., doctor's letter) may request accommodation from the Course Instructor. (The weight of the missed material will be transferred to the final exam.) Further extensions or accommodation will require students to submit a formal petition to the Faculty.

IMPORTANT COURSE INFORMATION FOR STUDENTS

All students are expected to familiarize themselves with the following information, available on the Senate Committee on Academic Standards, Curriculum & Pedagogy webpage (see Reports, Initiatives, Documents) -

<http://www.yorku.ca/secretariat/senate/committees/ascp/documents/CourseInformationForStudentsAugust2012.pdf>

- Senate Policy on Academic Honesty and the Academic Integrity Website
- Ethics Review Process for research involving human participants
- Course requirement accommodation for students with disabilities, including physical, medical, systemic, learning and psychiatric disabilities
- Student Conduct Standards
- Religious Observance Accommodation

September 2014