

BIOLOGY 447 Ion Channels and Disease Course Outline

Spring 2024

Department of Biology, University of Victoria

Course Description:

Electrical signals in neurons are produced by voltage-gated and ligand-gated ion channels. Any disturbance in the function of ion channels can lead to major neurological disorders. This course will give the opportunity for students to learn the structure and function of some of the major voltage- and ligand-gated ion channels and their relationship to channel related diseases. Mechanisms of ligand binding, gating and ion selectivity will be covered. The structure of the course will be based on lectures overviewing a topic, presentation and critical discussions of primary research papers. The course will also cover electrophysiological, fluorescence and crystallography techniques used to study structure-function of ion channels. We will also examine how alterations in ion channel function can contribute to specific nervous system disorders such as nicotine addiction and epilepsy.

Course Instructor:

Dr. Raad Nashmi raad@uvic.ca “BIOL 447” in the subject line

Time: Jan 8 - Apr 8, 2024; Mon, Thur 2:30 pm – 3:50 pm;

Place: Lectures will be in-person in Engineering and Computer Science Building 123.

Office hours: by appointment

Reading Material: There is NO required textbook for the course. Reading material will be based on primary research papers.

Assigned papers to specific classes can be found in a more detailed course schedule available online on bright.uvic.ca.

Intended Learning Outcomes:

1. Understand the structure and function of a variety of ion channels on specific aspects of neurotransmitter binding, gating and ion selectivity.
2. Understand how ion channel activity controls neuronal excitability and how their dysfunction results in a variety of disorders.
3. Learn how to read the primary research literature; understand how to read and interpret the results; and critically analyze the paper.
4. Learn about a variety of techniques to study the structure and function of ion channels.

Students are expected to read ahead of time the assigned paper and participate in discussions of the paper in class.

Reading material, course outlines, lecture notes and other material relevant to the course can be found at bright.uvic.ca. NO recorded lectures will be posted.

All course content and materials are made available by instructors for educational purposes and for the exclusive use of students registered in their class. The material is protected under copyright law, even if not marked with a ©. Any further use or distribution of materials to others requires the written permission of the instructor, except under fair dealing or another exception in the Copyright Act. Violations may result in disciplinary action under the Resolution of Non-Academic Misconduct Allegations policy (AC1300).

Prerequisites: All students in Biology 447 must have successfully completed BIOL 365 or 367 as a prerequisite.

Evaluation:

First midterm exam 30% (February 8, 2024)

Second midterm exam 30% (March 11, 2024)

Final exam 40% (scheduled by Records)

Completion Requirements:

You must write the first midterm, second midterm and final exam to fulfill the requirements of the course.

Midterm and Final Exams:

Midterms and final exam will be performed in-person for all students.

Exams will be based on information covered in lectures and reading material.

Students are responsible for any material discussed in class, drawn on board, etc.

The final exam will be cumulative.

Failure to write a midterm test will result in a grade of 0% for the exam. If you miss the midterm test for a valid reason (illness, accident, family affliction, or sporting commitments as a UVic athlete), please contact the instructor as soon as possible (no later than 48 hrs from the date of the exam). No documentation is required for illness but provide suitable documentation for any other reasons. If you qualify for a missed midterm test, you will be accommodated so that you will not incur any penalty.

The final exam can be deferred in cases of documented illness, accident, family affliction, or sporting commitments as a UVic athlete. If you miss or expect to miss the exam for any of these reasons, please notify the instructor. No documentation is required for illness but supporting documentation is required for other mentioned reasons. You must also fill out a Request for Academic Concession form, available from the Records office, as soon as possible in order to have your request for deferral considered. Travel plans are not a valid reason for missing the midterm test or the final exam.

No supplemental final exam will be given in this course as per Biology Dept. policy.

Grading:

The final grade for the course, will be submitted as a percentage grade (rounded to the nearest whole percent by our spreadsheet program).

Please do not ask me to raise your grade and please do not ask us for extra-credit work to raise your grade; no such work is available.

The University's grading policy can be found here:

<https://www.uvic.ca/calendar/future/undergrad/index.php#/policy/S1AAgoGuV?bc=true&bcCurrent=14%20-%20Grading&bcGroup=Undergraduate%20Academic%20Regulations&bcItemType=policies>

Academic regulations and policies:

Please read the appropriate section of the current UVic Academic Calendar regarding your rights and obligations. In particular students are to attend to ADD/DROP dates published in the Calendar and posted on the Undergraduate Records website. **Students must not assume they will be dropped automatically from any course they do not attend.**

UVic's Policy on Academic Integrity:

Students are encouraged to read the University's policy on academic integrity:

https://www.uvic.ca/calendar/undergrad/index.php#/policy/Sk_0xsM_V

We reserve the right to use plagiarism detection software or other platforms to assess the integrity of student work.

Student conduct:

The University of Victoria is committed to promoting critical academic discourse while providing a respectful and supportive learning environment. All members of the university community have the right to this experience and the responsibility to help create such an environment. The University will not tolerate racism, sexualized violence, or any form of discrimination, bullying or harassment. Please be advised that, by logging into UVic's learning systems or interacting with online resources, and course-related communication platforms, you are engaging in a university activity. All interactions within this environment are subject to the university expectations and policies. Students are encouraged to read the University's code of professional conduct for students:

<https://www.uvic.ca/services/advising/advice-support/academic-units/student-code-of-conduct/index.php>

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*We acknowledge and respect the lək̓ʷəŋən peoples on whose traditional territory the university stands and the Songhees, Esquimalt and WSÁNEĆ peoples whose historical relationships with the land continue to this day.*