DALHOUSIE UNIVERSITY

Molecular Neuroscience
PSYO/NESC 3970.01, Fall 2026
Faculty of Science Course Syllabus
Department of Psychology & Neuroscience
September 8th - December 9th

Dalhousie University acknowledges that we are in Mi'kma'ki, the ancestral and unceded territory of the Mi'kmaq People and pays respect to the Indigenous knowledges held by the Mi'kmaq People, and to the wisdom of their Elders past and present. The Mi'kmaq People signed Peace and Friendship Treaties with the Crown, and section 35 of the Constitution Act, 1982 recognizes and affirms Aboriginal and Treaty rights. We are all Treaty people.
Dalhousie University also acknowledges the histories, contributions, and legacies of African Nova Scotians, who have been here for over 400 years.

Instructor: Dr. Lucia Caceres lucia.caceres@dal.ca

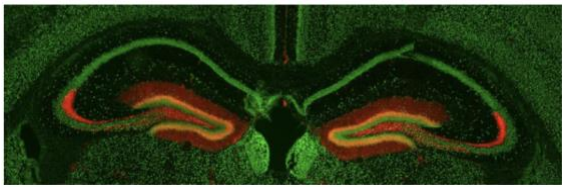
Class Schedule: Held in person
Location: Chemistry 223
Lectures: Wednesdays and Fridays: 1:05 pm – 2:25 pm.
Pdf lectures posted on Brightspace 24hrs before next class.

Test Schedule:
Unit tests: September 23rd, October 14th, November 4th, November 25th, December 9th.
Final Exam: **No Final Exam**

Office Location: LSC2321
Office Hours: Tuesdays and Thursday 1:00 pm – 2:00 pm (In person or *via teams*)
Teams link for office hours will be provided on the class calendar on Brightspace.

Dalhousie University is located in Mi'kma'ki, the ancestral and unceded territory of the Mi'kmaq. We are all Treaty people.

LECTURE HOURS PER WEEK: 3 hrs.



Course Description

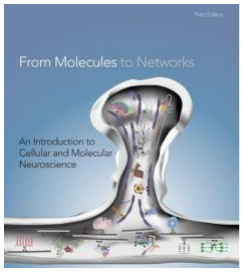
This course examines the development, function, and pathology of the brain at the molecular level. Model systems are examined from the perspective of ion channels, messengers, receptors, intracellular signaling cascades, memory and development. The concepts underlying basic cellular and molecular neuroscience tools are emphasized.
Course Prerequisites: NESC/PSYO 2570 or BIOL 2020 or BIOL 2030.

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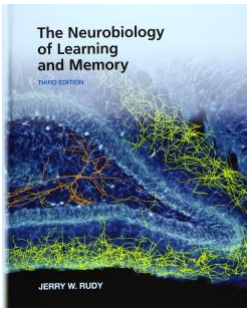
Course Materials

Exams will test knowledge based on the information taught in class.
Suggested popular textbooks and web links posted online on Brightspace are only to provide context and help fill in any gaps in background knowledge.

Recommended textbook (but not required)



From Molecules to Networks: An Introduction to Cellular and Molecular Neuroscience,
3rd Edition, H., Byrne,, J. et al. ,
Publication Year: 2014 | 663 pp.
Elsevier S & T.



The Neurobiology of Learning and Memory,
3rd Edition, Jerry W. Rudy,
ISBN-13: 978-1605359342
Publication Year: 2020 | 456 pp.

Other Resources:
Neuroscience, 7th Edition, Purves, Augustine, Groth, Huettel, LaMantia, White, Publication Year: 2023 | 1008 pp. Oxford Univeristy Press

Essential Cell Biology (4thedition). Alberts, B., Bray, D., Hopkin, K., Johnson, A.D., Lewis, J., Raff, M., Robert, K., and Walter, P. Publisher: Garland Science. ISBN 0815345259.

All course material (videos, pdfs, ppt, etc.) will be posted on Brightspace

Course Assessment

Lecture Component: Tested material includes 1) lectures. Grades are based on **Assessment questions** (0.5% per lecture: 10%), and **4 Exams (***Multiple choice, multi- select, interpreting images, short answer format. Content is cumulative*).

Marking Scheme	**Weight**	**Evaluation dates/length**
Marking Scheme	**Weight**	**Due/Evaluation dates**
Midterm I	20 %	September 23rd, 2026
Midterm II	20 %	October 14th, 2026
Midterm III	20 %	November 4th, 2026
Midterm IV	20 %	November 25th, 2026
Midterm V	20 %	December 9th, 2026
Assessment Lectures	*bonus 5 %*	*Wednesday assignments due 5pm on Friday* *Friday assignments due 5pm on Sunday*

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Other course requirements

1. Timing and schedule

You will need time to work on course material. You will have opportunities to complete some course components on your own schedule. The due dates for each component will be clearly marked on Brightspace.

2. Computer and Internet for submitting Assessment Questions on Brightspace.

Assignments will have a due date plus a "window of opportunity" (48 hrs) to give you enough time to complete them on time even if you have temporary technical problems. *For example*, an assignment due on Monday at 5pm will have a window of opportunity of 48hrs (2-days) to submit without penalty. However, **after this window of opportunity is missed a grade of zero will be assigned and not late assignments will be accepted.**

Postponing a test or assignment until the end of the availability window is risky, so it is better to submit early.

3. Office hours: in-person or on Teams.

There are two ways to attend office hours. Either via teams or come drop by my office during the schedule time.

You can join office hours on Microsoft Teams. This software is available using your subscription to Office 365. Sign into login.microsoftonline.com with your @dal.ca email address and password. Once inside *Microsoft Office Home* you'll see an installer icon for Teams.

I will post the teams link for this course on the course calendar on Brightspace.

Course Objectives

This course will provide students with a general understanding of the molecular mechanism involved in neuronal signaling and brain development. It will examine the cellular and molecular mechanisms of gene expression, and brain changes after acute and prolonged exposure to the drug(s). This course will also explore the molecular and cellular of neurodegenerative disorders.

The main objectives are covered within four themes:
1) Organization of the nervous system (lectures 1-4).
2) Energy metabolism of the brain (lectures 5-8).
3) Signal transduction (lectures 9-11).
4) Molecular basis of Memory (lectures 12-19).

Learning outcomes:

By the end of the course, students should be able to:

1. List and define the molecular basis of gene regulation on the nervous system.
2. Describe the cellular and molecular mechanism of neuronal signal transduction.
3. Describe the cellular and molecular basis of learning and memory.

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Course Content: Tentative lecture topic guide

Week of...		Lecture	Lecture topic
Sept.	9-11	1 -2	• Subcellular Organization of the Nervous System – (Part I and II)
	16-18	3-4	• Subcellular Organization of the Nervous System – (Part III and IV)
	23	-	**Midterm I (Lectures 1 - 4) 60min.**
	25	5	• Energy Metabolism in the Brain (Part I)
	30	-	*National Day for Truth and Reconciliation*
Oct.	2	6	• Energy Metabolism in the Brain (Part II)
	7-9	7-8	• Energy Metabolism in the Brain (Part III and IV)
	14	-	**Midterm II (Lectures 5 - 8) 60min.**
	16	9	• Regulation of Neuronal Gene Expression and Protein Synthesis (Transcriptional and translational control)
	21-23	10-11	• Pharmacology and Biochemistry of Synaptic Transmission (Part I-II)
	28	12	• Synaptic Basis of Memory Part I
	30	13	• Synaptic Basis of Memory Part II
Nov.	4	-	**Midterm III (Lectures 9 - 12) 60min.**
	6	14	• Synaptic Basis of Memory Part III
	9 - 13	-	**Fall Break**
	18-20	15-16	• Molecules & Memory Part I • Molecules & Memory Part II
	25	-	**Midterm IV (Lectures 13 - 16) 60min.**
	27	17	• Molecules & Memory Part III
Dec.	2-4	18-19	• Neural Systems and Memory - Part I • Neural Systems and Memory - Part II
	9	-	**Midterm V (Lectures 17 - 19) 60min.**
	11 - 20	-	**Make-up midterm(s): Date set by the Registrar's Office**

Conversion of numerical grades to final letter grades follows the Dalhousie Grade Scale

A+ (90-100)	B+ (77-79)	C+ (65-69)	D (50-54)
A (85-89)	B (73-76)	C (60-64)	F (0-49)
A- (80-84)	B- (70-72)	C- (55-59)	

NOTE: Grades are final at the end of term and cannot be "bumped up" with extra work.

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Course Policies

1. Email

When sending an email please make sure of the following:

1. Read the syllabus and check the Brightspace page to determine if the information you seek is already available.
2. If you have multiple questions regarding lecture material, it is best to attend office hours.
3. Enter the course number in the subject line (PSYO 3970 or NESC 3970).
4. Please enter your B# in your email signature.

2. Quizzes Due dates.

Each lecture ends with assessment questions. All Brightspace material will be available for viewing throughout the length of the course, but the quizzes **must be completed at their assigned due dates.**

Lecture Assessment questions **are due at 5 pm 2-days after it is assigned.**

- A **Wednesday assessment questions** opens at 8 am and are **due** at 5:00 pm **on Friday**.
- A **Friday assessment questions** opens at 8 am and are **due** at 5:00 pm **on Sunday**.

Need more time? Assignments have a no-penalty "late" submission window of 48 hrs after their due date. However, they will permanently close on their end date (48 hrs afters their due date). No assignments will be accepted after this end date has been reached.

- **Wednesday assessment questions** can be submitted with **no penalty** for up to **2 days** (48 hrs) **after its due date**, with an **End date/time: Sunday 5:00 pm.**
- **Friday assessment questions** can be submitted with **no penalty** for up to **2 days** (48 hrs) **after its due date**, with an **End date/time: Tuesday 5:00 pm.**
- All assessment questions, whether they open on a Tuesday or Thursday, will **PERMANENTLY close for marks** on their **5:00 pm end date**. **SDAs will not be accepted –** *SDAs are only allowed for short term absences of 3-consecutive days or less.*

Please don't leave assignments until the window is closing. There are no late submission options and no marks after 5:00 pm of their **end time**. Remember that assignments were due 2 days before the closing date. This closing date is just an automatic extension for unexpected problems.

Extended window of opportunity is meant to take care of temporary issues with a busy schedule, technology, internet, electricity, weather, and other minor issues.

3. Exams must be taken at the scheduled time

- Students writing at the accessibility center are responsible to schedule their exams. It is recommended to book all midterms the first week of classes.
- Students who fail to book a room at the accessibility center must write the midterm(s) with the entire class.
- It is the responsibility of the student to check the course schedule and tell me of any religious holy days, required court appearances, or scheduled surgeries within the first week of the course.

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4. STUDENT DECLARATION OF ABSENCE (SDA):

⇒ SDA forms are intended for short-term absences only.
⇒ **A maximum of two (2) SDAs will be accepted per term.**
⇒ Students missing more than two midterm exams must schedule an appointment with Dr. Patricia Laws (assistant dean of student affair) at scieasst@dal.ca

Missed exams due to illness or exceptional circumstances **must** be communicated to the instructor **immediately** by completing the first three steps:

1. **Emailed to** lucia.caceres@dal.ca
2. Submit a **signed and dated SDA to Brightspace** only (please do not email SDAs or hand-deliver SDAs in person).
3. Submit the SDA within **72 hours (3 days)** of the missed exam.
4. A **signed and dated SDA is required for each missed midterm.** A maximum of **two (2) SDAs** will be accepted per term.
5. Due to the large number of students, the instructor will not contact students who missed an exam and do not submit an SDA. It is the responsibility of the student to complete steps 1-4.
6. **ONLY student who have submitted an SDA** will be permitted to write a make-up exam at the end of the term.
7. **If SDA is approved**, your make-up exam will be scheduled during the registrar's official examination period (**Dec.11-20**).

Note: Student Declaration of Absence forms should normally be submitted before missing a test. In circumstances when this is not possible submit your form as soon as it is safe and logical to do so.

5. AI usage

Online quizzes are intended to help you assess your understanding of the course material and identify areas that may require further review. Using AI tools to answer quiz questions undermine this purpose, as it does not provide an accurate representation of your own understanding and may negatively impact your learning and preparedness for in-person assessments, such as midterms and the final exam, where AI tools are not available. It can also reduce opportunities to practice independently recalling, applying, and explaining the material, which may leave students less prepared for closed-book, in-person assessments. Therefore, students are strongly discouraged from using AI tools during online quizzes.

Definitions:

A. Short-term Absence refers to absences of three (3) consecutive days or fewer due to minor physical or mental health conditions, or other extenuating circumstances such as caregiving duties; immediate family illness, injury or death; involvement in an accident; legal proceedings or being a victim of a crime, domestic or intimate partner violence.

Students experiencing short-term absences must:

- Contact their instructor by email prior to the academic requirement deadline or scheduled time and;
- Complete a **Student Declaration of Absence** form or provide alternate verification of the absence to their instructor or to the instructor's designate in-person, on-line through Brightspace, or via instructor e-mail within three (3) calendar days following the last day of absence.

In cases of recurring short-term absences, and/or who exceed two SDAs submissions per course during a term and a requesting to submit a third SDA will first need to meet with the dean of student affair, Dr. Patricia Laws.

B. Long-term Absence refers to absences of more than three (3) consecutive days due to major or chronic physical or mental health conditions, or other extenuating circumstances such as caregiving duties; immediate family illness, injury or death; involvement in an accident; legal proceedings; being a victim of a crime, domestic or intimate partner violence.

For long-term absences, students should contact their course instructor(s) or the instructor's designate within five (5) calendar days following the last day of absence. **The Student Declaration of Absence form will not be accepted for long-term absences.**

Students experiencing recurring long-term absences are strongly encouraged to meet with the dean of student affair Dr. Patricia Laws and refer to the University's Student Accommodation Policy. In such a case, instructors may request documentation to demonstrate a student has met with an Advisor or Coordinator and arrived at a course of action to manage the recurring absences before considering alternate academic requirement arrangements.

C. Academic requirement refers to class attendance, coursework, tests, exams, and Faculty- specific program requirements **excluding** final coursework (as defined by each Faculty, College or School) or exams (written, verbal or simulated), fieldwork (including work-integrated learning for credit), and skill labs (as defined by each Faculty, College or School).

University Policies and Statements

Recognition of Mi'kmaq Territory

Dalhousie University would like to acknowledge that the University is on Traditional Mi'kmaq Territory. The Elders in Residence program provides students with access to First Nations elders for guidance, counsel, and support. Visit or e-mail the Indigenous Student Centre at 1321 Edward St or elders@dal.ca. Additional information regarding the Indigenous Student Centre can be found at: https://www.dal.ca/about/mission-vision-values/mikmaq-indigenous-relations.html

Internationalization

At Dalhousie, 'thinking and acting globally' enhances the quality and impact of education, supporting learning that is "interdisciplinary, cross-cultural, global in reach, and orientated toward solving problems that extend across national borders." Additional internationalization information can be found at: https://www.dal.ca/about/mission-vision-values/global-relations.html

Academic Integrity

At Dalhousie University, we are guided in all our work by the values of academic integrity: honesty, trust, fairness, responsibility, and respect. As a student, you are required to demonstrate these values in all the work you do. The University provides policies and procedures that every member of the university community is required to follow to ensure academic integrity. Additional academic integrity information can be found at: https://www.dal.ca/dept/university_secretariat/academic-integrity.html

Accessibility

The Student Accessibility Centre is Dalhousie's centre of expertise for matters related to student accessibility and accommodation. If there are aspects of the design, instruction, and/or experiences within this course (online or in-person) that result in barriers to your inclusion, please contact the Student Accessibility Centre (https://www.dal.ca/campus_life/academic-support/accessibility.html) for all courses offered by Dalhousie with the exception of Truro. For courses offered by the Faculty of Agriculture, please contact the Student Success Centre in Truro (https://www.dal.ca/campus_life/ssc.html).

Conduct in the Classroom – Culture of Respect

Substantial and constructive dialogue on challenging issues is an important part of academic inquiry and exchange. It requires willingness to listen and tolerance of opposing points of view. Consideration of individual differences and alternative viewpoints is required of all class members, towards each other, towards instructors, and towards guest speakers. While expressions of differing perspectives are welcome and encouraged, the words and language used should remain within acceptable bounds of civility and respect.

Diversity and Inclusion – Culture of Respect

Every person at Dalhousie has a right to be respected and safe. We believe inclusiveness is fundamental to education. We stand for equality. Dalhousie is strengthened in our diversity. We are a respectful and inclusive community. We are committed to being a place where everyone feels welcome and supported, which is why our Strategic Direction prioritizes fostering a culture of diversity and inclusiveness (Strategic Priority 5.2). Additional diversity and inclusion information can be found at: https://www.dal.ca/about/mission-vision-values/equity-diversity-inclusion-and-accessibility/about-office-equity-inclusion.html

Student Code of Conduct

Everyone at Dalhousie is expected to treat others with dignity and respect. The Code of Student Conduct allows Dalhousie to take disciplinary action if students don't follow this community expectation. When appropriate, violations of the code can be resolved in a reasonable and informal manner - perhaps through a restorative justice process. If an informal resolution can't be reached, or would be inappropriate, procedures exist for formal dispute resolution. The full Code of Student Conduct can be found at: https://www.dal.ca/content/dam/www/about/leadership-and-governance/governing-bodies/code-student-conduct.pdf

Fair Dealing Policy

The Dalhousie University Fair Dealing Policy provides guidance for the limited use of copyright protected material without the risk of infringement and without having to seek the permission of copyright owners. It is intended to provide a balance between the rights of creators and the rights of users at Dalhousie. Additional information regarding the Fair Dealing Policy can be found at: https://www.dal.ca/content/dam/www/about/leadership-and-governance/university-policies/fair-dealing-policy.pdf

Student Use of Course Materials

Course materials are designed for use as part of this course at Dalhousie University and are the property of the instructor unless otherwise stated. Third party copyrighted materials (such as books, journal articles, music, videos, etc.) have either been licensed for use in this course or fall under an exception or limitation in Canadian Copyright law. Copying this course material for distribution (e.g. uploading to a commercial third-party website) may lead to a violation of Copyright law.

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Student Resources and Support

University Policies and Programs

- **Important Dates in the Academic Year (including add/drop dates):** http://www.dal.ca/academics/important_dates.html
- **Classroom Recording Protocol:** https://www.dal.ca/content/dam/www/about/leadership-and-governance/university-policies/class-recording-protocol.pdf
- **Dalhousie Grading Practices Policies:** https://www.dal.ca/content/dam/www/about/leadership-and-governance/university-policies/grading-practices-policy.pdf
- **Grade Appeal Process:** https://www.dal.ca/campus_life/academic-support/grades-and-student-records/appealing-a-grade.html
- **Sexualized Violence Policy:** https://www.dal.ca/content/dam/www/about/leadership-and-governance/university-policies/sexualized-violence-policy.pdf
- **Scent-Free Program:** https://www.dal.ca/dept/safety/programs-services/occupational-safety/scent-free.html

Learning and Support Resources

- **General Academic Support – Advising (Halifax):** https://www.dal.ca/campus_life/academic-support/advising.html
- **General Academic Support – Advising (Truro):** https://www.dal.ca/campus_life/ssc.html
- **Student Health & Wellness Centre:** https://www.dal.ca/campus_life/health-and-wellness.html
- **On Track** (helps you transition into university, and supports you through your first year at Dalhousie and beyond): https://www.dal.ca/campus_life/academic-support/On-track.html
- **Indigenous Student Centre:** https://www.dal.ca/campus_life/communities/indigenous.html
- **Mi'kmaq and Indigenous Relations:** https://www.dal.ca/about/mission-vision-values/mikmaq-indigenous-relations.html
- **Elders-in-Residence** (The Elders in Residence program provides students with access to First Nations elders for guidance, counsel, and support. Visit the office in the Indigenous Student Centre or contact the program at elders@dal.ca or 902-494-6803: https://www.dal.ca/about/mission-vision-values/mikmaq-indigenous-relations/elders-in-residence-and-traditional-knowledge-keepers.html
- **Black Student Advising Centre:** https://www.dal.ca/campus_life/communities/black-student-advising.html
- **International Centre:** https://www.dal.ca/campus_life/international-centre.html

- **LGBTQ2SIA+ Collaborative:** https://www.dal.ca/about/mission-vision-values/equity-diversity-inclusion-and-accessibility/about-office-equity-inclusion/community-specific-groups/lgbtq2sia-collaborative.html
- **Dalhousie Libraries:** http://libraries.dal.ca/
- **Copyright Office:** https://libraries.dal.ca/services/copyright-office.html
- **Dalhousie Student Advocacy Services:** https://www.dsu.ca/dsas?rq=student%20advocacy
- **Dalhousie Ombudsperson:** https://www.dal.ca/campus_life/safety-respect/ombudsperson.html
- **Human Rights and Equity Services:** https://www.dal.ca/about/mission-vision-values/equity-diversity-inclusion-and-accessibility/about-office-equity-inclusion/human-rights-and-equity-services.html
- **Writing Centre:** https://www.dal.ca/campus_life/academic-support/writing-and-study-skills.html
- **Study Skills/Tutoring:** http://www.dal.ca/campus_life/academic-support/study-skills-and-tutoring.html
- **Faculty of Science Advising Support:** https://www.dal.ca/faculty/science/current-students/undergrad-students/degree-planning.html

Safety

- **Biosafety:** http://www.dal.ca/dept/safety/programs-services/biosafety.html
- **Chemical Safety:** https://www.dal.ca/dept/safety/programs-services/chemical-safety.html
- **Radiation Safety:** http://www.dal.ca/dept/safety/programs-services/radiation-safety.html
- **Laser Safety:** https://www.dal.ca/dept/safety/programs-services/radiation-safety/laser-safety.html