

Topics in Neuroscience
NESC 4008.01, Winter 2024
Faculty of Science Course Syllabus
Department of Psychology & Neuroscience
January 8th - April 9th

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

Class Schedule: In person.
Location: LSC-C206
Lectures: Wednesdays: 12:35pm – 2:25 pm.
Pdf lectures posted on Brightspace 24hrs before next class.

Test Schedule:
Unit tests: N/A
Final Exam: April 3rd, 2024.

Office Location: LSC-C206

Office Hours: By appointment.

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: 2 hrs.

Course Prerequisites: NESC Honours student, Instructor permission required.

Course Description:

This seminar course examines the primary scientific literature on topics related to neuronal circuitry specific to physiological and behavior functions. The course will encompass the development, cellular, molecular, and pharmacology basis of the nervous system. The function of astrocytes in regulating behavior will be explored. The seminar includes topics in (but not exclusively):

- Circadian rhythms, sleep, and memory
- Energy homeostasis and eating disorders
- Fear and Anxiety
- Neurodegenerative disorders

The course will be organized in lecture format, with student-led presentations of primary articles. Evaluation will be based on presentation(s), discussions, and participation.

Course Materials

All required material will be provided in Brightspace.

Reading list: Changes may be made at the instructor's discretion.

Theme 1: Learning and Memory

1. Zhao, F., Zhang, T., Shen, Q., Yin, K., Wang, Y., Zhang, G. Tak1 in the astrocytes of mediobasal hypothalamus regulates anxiety-like behavior in mice. *Glia* 2021; **69**:609-618.
2. Bourhy, L. et al., Silencing of amygdala circuits during sepsis prevents the development of anxiety-related behaviours. *Brain* 2022; May 24; **145**(4): 1391-1409.
3. Barchiesi, R. et al., An epigenetic mechanism for over-consolidation of fear memories. *Molecular Psychiatry* (2022)._doi: 10.1038/s41380-022-01758-6. Online ahead of print.
4. Owens-French, J., et al. Lateral hypothalamic galanin neurons are activated by stress and blunt anxiety-like behavior in mice. *Behav Brain Res.* 2022; Apr 9; **423**: 113773. doi: 10.1016/j.bbr.2022.113773.
5. Zhang, Q., et al. The Slack Channel Regulates Anxiety-Like Behaviors via Basolateral Amygdala Glutamatergic Projections to Ventral Hippocampus. *J Neurosci.* 2022; **42**(14):3049-3064.
6. Stojanovic, T., et al., Age-Dependent and Pathway-Specific Bimodal Action of Nicotine on Synaptic Plasticity in the Hippocampus of Mice Lacking the miR-132/212 Genes. *Cells.* 2022; **11**(2): 261. doi: 10.3390/cells11020261.
7. Liang, M., et al., Methamphetamine Exposure in Adolescent Impairs Memory of Mice in Adulthood Accompanied by Changes in Neuroplasticity in the Dorsal Hippocampus. *Front Cell Neurosci.* 2022; **16**:892757. doi: 10.3389/fncel.2022.892757.

Theme 2: Energy Homeostasis and Eating Disorders

1. Cai, X., *et al.* AD2 to AD1 shift in dopaminergic inputs to midbrain 5-HT neurons causes anorexia in mice. *Nature Genetics* 2022; **25**:646-658.
2. Furukawa, M., *et al.* Molar loss induces hypothalamic and hippocampal astrogliosis in aged mice. *Nature* 2022; **12**:6409.
3. Furlan, A., et al., Neurotensin neurons in the extended amygdala control dietary choice and energy homeostasis. *Nat Neurosci.* 2022 Nov; **25**(11):1470-1480.
4. Kubrak, O., et al., The gut hormone Allatostatin C/Somatostatin regulates food intake and metabolic homeostasis under nutrient stress. *Nat Commun.* 2022 Feb 4;**13**(1):692.
5. Antoni, F.A., The Case for Clinical Trials with Novel GABAergic Drugs in Diabetes Mellitus and Obesity. *Life (Basel).* Feb 21; **12**(2):322.
6. Domingos AI, Leptin regulates the reward value of nutrient. *Nature Neuroscience* **14**, 1562–1568 (2011).

Theme 3: Circadian Rhythms and Sleep.

1. Hines DJ, Schmitt LI, Hines RM, Moss SJ, Haydon PG. Antidepressant effects of sleep deprivation require astrocyte-dependent adenosine mediated signaling. *Transl Psychiatry*. 2013; **3**:e212.
2. Rabinowitz, J.A., et. al., Associations of circadian rest/activity rhythms with cognition in middle-aged and older adults: Demographic and genetic interactions. *Front Neurosci*. 2022; **16**:952204.
3. Gabay, L., Miller, P., Alia-Klein, N., Lewin, M., Circadian Effects on Attention and Working Memory in College Students With Attention Deficit and Hyperactivity Symptoms. *Front Psychol*. 2022; **13**:851502. doi: 10.3389/fpsyg.2022.851502
4. Faraut, B., et al., Immune disruptions and night shift work in hospital healthcare professionals: The intricate effects of social jet-lag and sleep debt. *Front Immunol*. 2022; **13**:939829. doi: 10.3389/fimmu.2022.939829.
5. Gentry, N.W., et al., Microglia are involved in the protection of memories formed during sleep deprivation. *Neurobiol Sleep Circadian Rhythms*. 2021; **12**:100073. doi: 10.1016/j.nbscr.2021.100073.
6. Niu, L., et la., Chronic sleep deprivation altered the expression of circadian clock genes and aggravated Alzheimer's disease neuropathology. *Brain Pathol*. 2022 May;**32**(3):e13028. doi: 10.1111/bpa.13028.

Course Objectives/Learning Outcomes

This seminar series consists of student presentations of recent original research articles that have had an impact on our understanding of neuroscience.

By the end of the seminar series the student should:

- Demonstrate general understanding on how primary scientific literature uses genetic techniques to study the molecular & cellular bases of behaviour.
- Identify the structure of peer-reviewed scientific neuroscience articles.
- Critically evaluate the validity of scientific studies.
- Show the difference between data analysis and data interpretation.

Course Assessment

This seminar emphasizes student presentations and group discussion. During most meetings, students will present and discuss primary scientific literature. Grades will be based on the instructor's assessment of elements listed below.

Marking Scheme	Weight	Due/Evaluation dates
Presentation	40 %	Dates will be assigned.
In class participation	10 %	End of every class.
Article Summary	20 %	Beginning of every class.
Info-find	5 %	Tuesday at 5pm.
Graphical Abstract	5 %	Due end of class – March 27 th .
Quizzes	10 %	Beginning of every class.
Final Exam	10 %	Due end of class – April 3 rd , 2024.



1. Presentations of Scientific Papers (40%):

Depending on class size, each student will have 2 or 3 opportunities to lead the discussion of an assigned research article. Students will be assessed on their ability to present the main objectives of the study and the major results, the thoroughness of their evaluation of the paper, and discussion of how the findings extend previous work clearly and succinctly. Students are encouraged to seek out review and methodology papers to help them prepare for each presentation. PowerPoint is preferred for presentations.

2. Participation (10%):

A. The open format of class presentations relies on an informed and interested audience. Although it is easier to passively listen to each presentation, one of the goals of the class is for students to develop their critical thinking skills and ability to debate issues arising from scientific research. Herein, non-presenting students will complete a presentation rating form on the: i) paper topic and selection relevancy; ii) delivery; iii) clarity and organisation; iii) visuals; iv) overall impression as well as provide general advice to presenter. The rating student submits their completed assessment to the instructor who awards a “participation point”. The presenter student is then given the anonymous feedback by the instructor in the next class. Therefore, class participation will be qualitatively monitored throughout the course.

B. All students will submit 5 questions per article.

3. One-Page Article Summary (20%):

Rather than have one large term paper due at the end of the course, student audience members will review and edit their in-class notes on each presentation so that they can be used as “article-summaries”. Rough notes should start with initial impressions from reading each paper before class and be updated with ideas arising from discussion of the article. These notes will then be edited to create a cohesive one-page article summary for each paper. Article summaries for the previous week’s presentations will be handed in at the beginning of each class (**25% penalty/day for late summaries**).

4. Graphical Abstract (5%): A graphical abstract is a single image that summarizes the main findings of the article. This single image may have multiple panels, but the goal is to be as concise as possible. An example, along with some tips, is on Brightspace. Your graphical abstract will be marked out of 10: correctness (7 marks), overall design and clarity (3 marks).

5. Info-Find (5%): Resources to help you understand journal club papers (5 %). Generate a document highlighting the additional resources (not provided already in course materials) that you used to read and understand the assigned reading. For example, you will likely have to look up some unfamiliar terms and methods. Collaborate on an “Important Terms and Methods” list with the information you found. You may have found media reports on the paper which helped you to understand it better (careful because not all scientific media is 100% correct). Perhaps there are other papers or reviews which helped your understanding of the assigned reading. What relevant information did you find? Collate this information into the provided Discussion section in Brightspace. Make sure to briefly describe the images/text/videos that you have found and how they were helpful for you to better understand the paper.

The aim of this exercise is to help you and your classmates better understand the papers prior to the journal clubs. These documents are due on the Wednesdays 5pm before each journal club to give everyone a chance to view the material.

6. Quizzes (10%):

A 10-question quiz testing the student's understanding of the assigned articles reading will be taken at the beginning of each session. Since all quiz answers are discussed in class, there is no opportunity for make-up quizzes and missed quizzes will result in a score of zero (except in emergent situations). Quiz scores will be posted to the grade book in Brightspace.

7. Take Home Final Exam (10%):

Due at the **end of Thursday April 3rd Class: Due at 2:25pm**. Students will select one of several research scenarios and use the knowledge gained in the course to design experiments to resolve the question posed. Students will not use computers; thus, there will be no access to resources, other than the student's own knowledge.

Conversion of numerical grades to Final Letter Grades follows the Dalhousie Common Grade Scale

A + (90-100)	B+ (77-79)	C+ (65-69)	D	(50-54)
A (85-89)	B (73-76)	C (60-64)	F	(<50)
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.

Course Content: Tentative lecture topic guide

Week of...	Lecture	Lecture topic	What's Due	
Jan.	10	1	Introduction to the course and Construction of Transgenic and Gene Knock-out/Knock-in Mouse Models of Human Disease.	
	17	2	• Method's presentations of the work done in your lab (NESC6102).	
	24	3	Theme 1: Quiz and Presentations	Info-Find, Peer-review, questions.
	31	4	Theme 1: Quiz and Presentations	Article summary, Info-Find, Peer-review, and questions
Feb.	7	5	Theme 2: Quiz and Presentations	Article summary, Info-Find, Peer-review, and questions
	14	6	Theme 2: Quiz and Presentations	Article summary, Info-Find, Peer-review, and questions
	21	-	Winter Break	
	28	7	Theme 3: Quiz and Presentations	Article summary, Info-Find, Peer-review, and questions
Mar	6	8	Theme 3: Quiz and Presentations	Article summary, Info-Find, Peer-review, and questions
	13	9	Articles chosen by students: Quiz and Presentations	Article summary, Info-Find, Peer-review, and questions
	20	10	Articles chosen by students: Quiz and Presentations	Article summary, Info-Find, Peer-review, and questions
	27	11	Graphical abstract.	Due at end of class
Apr.	3	12	Final Exam due at end of class.	

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. 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 Policies

Missed In-Class Assignments: Quizzes, Participation, News and Views, and Presentations must be given at the scheduled class times. Missed in-class assignments due to illness or exceptional circumstances **must** be communicated to the instructor immediately and a **DECLARATION OF ABSENCE, completed, signed, and**

1. emailed to lucia.caceres@dal.ca AND

2. must also be uploaded to Brightspace with the reasons for absence written in the comment section within 3 days of the missed exam.

Failure to do both will result in invalid SDA and an automatic zero.

Please note: No SDAs will be considered if no explanation is given.

If the SDA has been approved, the weight of missed quiz and presentations will be transferred onto the final exam. **Only one SDA can be used per term.** Students who miss more than one exam will be given a zero on the second exam missed.

- **No extensions for participation or make-up quizzes are offered in this course. The weight of these assignments will be transferred to the final exam.**
- **Missed presentation, will be postponed for second last and last day of classes.**

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. Enter the course number in the subject line (NESC 4008).

Due dates.

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.

Short-term Absence

Students experiencing short-term absences of three (3) consecutive days or fewer resulting in missed or late academic requirements must:

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

A student may submit a maximum of **one (1)** separate Student Declaration of Absence forms **per course during a term**. Faculty, College, School, instructor or course-specific guidelines may set a lower maximum.

Students who have recurring short-term absences and who exceed one (1) submission per course during a term are strongly encouraged to meet with a Faculty or Declared Major Advisor, or Faculty Program Coordinator. In cases of recurring short-term absences, 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.

UNIVERSITY POLICIES AND STATEMENTS

This course is governed by the academic rules and regulations set forth in the University Calendar and by Senate

Academic Integrity

At Dalhousie University, we are guided in all of our work by the values of academic integrity: honesty, trust, fairness, responsibility and respect (The Center for Academic Integrity, Duke University, 1999). As a student, you are required to demonstrate these values in all of 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.

Information: https://www.dal.ca/dept/university_secretariat/academic-integrity.html

Accessibility

The Advising and Access Services Centre is Dalhousie's centre of expertise for student accessibility and accommodation. The advising team works with students who request accommodation as a result of a disability, religious obligation, or any barrier related to any other characteristic protected under Human Rights legislation (Canada and Nova Scotia).

Information: https://www.dal.ca/campus_life/academic-support/accessibility.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.

Code: https://www.dal.ca/dept/university_secretariat/policies/student-life/code-of-student-conduct.html

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

Statement: <http://www.dal.ca/cultureofrespect.html>

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 (1321 Edward St) (elders@dal.ca).

Information: https://www.dal.ca/campus_life/communities/indigenous.html

Important Dates in the Academic Year (including add/drop dates)

https://www.dal.ca/academics/important_dates.html

University Grading Practices

https://www.dal.ca/dept/university_secretariat/policies/academic/grading-practices-policy.html

STUDENT RESOURCES AND SUPPORT**Advising**

General Advising https://www.dal.ca/campus_life/academic-support/advising.html

Science Program Advisors: <https://www.dal.ca/faculty/science/current-students/academic-advising.html>

Indigenous Student Centre: https://www.dal.ca/campus_life/communities/indigenous.html

Black Students Advising Centre: https://www.dal.ca/campus_life/communities/black-student-advising.html

International Centre: https://www.dal.ca/campus_life/international-centre/current-students.html

Academic supports

Library: <https://libraries.dal.ca/>

Writing Centre: https://www.dal.ca/campus_life/academic-support/writing-and-study-skills.html

Studying for Success: https://www.dal.ca/campus_life/academic-support/study-skills-and-tutoring.html

Copyright Office: <https://libraries.dal.ca/services/copyright-office.html>

Fair Dealing Guidelines <https://libraries.dal.ca/services/copyright-office/fair-dealing.html>

Other supports and services

Student Health & Wellness Centre: https://www.dal.ca/campus_life/health-and-wellness/services-support/student-health-and-wellness.html

Student Advocacy: <https://dsu.ca/dsas>

Ombudsperson: https://www.dal.ca/campus_life/safety-respect/student-rights-and-responsibilities/where-to-get-help/ombudsperson.html

Safety

Biosafety: <https://www.dal.ca/dept/safety/programs-services/biosafety.html>

Chemical Safety: <https://www.dal.ca/dept/safety/programs-services/chemical-safety.html>

Radiation Safety: <https://www.dal.ca/dept/safety/programs-services/radiation-safety.html>

Scent-Free Program: <https://www.dal.ca/dept/safety/programs-services/occupational-safety/scent-free.html>

Dalhousie COVID-19 information and updates: <https://www.dal.ca/covid-19-information-and-updates.html>