Genes, Brain and Behaviour Syllabus

Department of Psychology & Neuroscience

PSYO/NESC 3670.03 Fall 2026

Dalhousie University operates in the unceded territories of the Mi'kmaw, Wolastoqey, and Peskotomuhkati Peoples. These sovereign nations hold inherent rights as the original peoples of these lands, and we each carry collective obligations under the Peace and Friendship Treaties. Section 35 of the Constitution Act, 1982, recognizes and affirms Aboriginal and Treaty rights in Canada.

We recognize that African Nova Scotians are a distinct people whose histories, legacies, and contributions have enriched the part of Mi'kma'ki known as Nova Scotia for over 400 years.

Course Instructor(s)

Name	Email	Office Hours
Ian Weaver (Instructor)	ian.weaver@dal.ca	Tuesdays, 11:00 - 13:00, LSC 3340 and online
Namya Mahendru (Marker)	namya@dal.ca	

Course Description

CREDIT HOURS: 3

The application of genetic, cellular and behavioural techniques in molecular and systems neuroscience to examine social, emotional and cognitive capacities and further understand critical molecular and cellular pathways that underlie the emergence of common metabolic diseases (e.g., diabetes, cancer), and the neuropathology of anxiety disorders (e.g., social phobia, panic disorder, post–traumatic stress disorder [PTSD]), learning and attention disabilities (e.g., Autism, ADHD), addiction (e.g., alcoholism, drug abuse) and major psychosis (bipolar disorder, schizophrenia, major depression). The role of epigenetic mechanisms as well as methods used to study gene-environment interactions are explored.

FORMAT: Lecture

LECTURE HOURS PER WEEK: 3

Course Prerequisites

PSYO 2470.03/NESC 2470.03 or PSYO 2770.03, and BIOL 1010.03 or BIOL 1020.03 and BIOL 1011.03 or BIOL 1021.03, or SCIE 1505X/Y.18, SCIE 1515.X/Y36, SCIE 1520X/Y.30, or SCIE 1540X/Y.27 (with a grade of B- or better); BIOL 2020.03 and BIOL 2030.03 are useful.

CROSS-LISTING: PYSO 3670.03, NESC 3670.03

Course Exclusions

PSYO/NESC 2670.03

Student Resources

Office Hours: **Tuesdays, 11:00– 13:00**; Room 3340, Life Sciences Centre (Psychology Wing) and online (https://outlook.office365.com/owa/calendar/OfficeHours4@dalu.onmicrosoft.com/bookings/)

See end of document for additional resources available to students (resource centers, etc.).

Course Structure

Course Delivery

In-person, lectures will also be recorded and posted on Brightspace. Students connecting to online resources from outside Canada that they are responsible for ensuring awareness and compliance with any applicable laws in the country from which they are connecting.

Lectures

Tuesdays, 08:35 – 09:55; Room C238, Life Sciences Centre (Studley Campus)

Thursdays, 08:35 – 09:55; Room C238, Life Sciences Centre (Studley Campus)

Course Materials

The required readings for the course will be presented in class and posted online on Brightspace. These readings have been selected instead of a course textbook. Exams will test knowledge based on the information taught in class and required readings posted online on Brightspace. Suggested popular textbooks and web links posted online on Brightspace are only to provide context and help fill in any gaps in background knowledge.

Learning Objectives

This course will provide students with an introduction to how genetic, epigenetic, stochastic (i.e., random) and environmental factors interact with each other in determining gene expression in mammals during early development, which shapes life-long emotional, behavioural and cognitive functioning. Landmark and up-to-date research articles have been selected across major themes in neuroscience to trace how new data has transformed our understanding of brain gene expression, brain development and the adult neurobehavioural function. We will also discuss the possible implications of genetic and epigenetic research for the development of novel pharmacological interventions, diagnostic procedures and preventive measures in mental health disorders. The main objectives are covered within four themes: 1)

Genes and Heredity; 2) Fetal origins of the adult disease; 3) Early life experiences & adult behaviour; 4) Neurobiology of learning and memory; and 5) Aging and vulnerability to psychiatric disorders. At the end of the course students should be able to list and define major genetic, epigenetic and endocrine processes in neurobiology. Name and discuss important neural and developmental pathways that are regulated by genetic, epigenetic and hormonal factors. Gain an understanding of how misregulation of genetic and epigenetic mechanisms can lead to disease states. Recognize how transcriptional, translational and posttranslational machinery can be targets for therapeutic agents. Read, comprehend, critically analyze and integrate knowledge from a primary research article. Explain commonly used molecular, cellular and behavioural techniques and design experiments using these techniques to address a biological question.

Assessment

Lecture Component: Tested material includes 1) readings, 2) lecture recordings, and 3) Guest lectures. Grades are based on **four Quizzes** and **two Exams (***multiple choice, multi- select, interpreting images, short answer format. Content is* ***not*** *cumulative*), and **one Article Summary**

Component	Weight (% of final grade)	Date
Tests/quizzes	i) 5% total, 15 min	Thursday 24th September, 2026
	ii) 5% total, 15 min	Tuesday 13th October, 2026
	iii) 5% total, 15 min	Thursday 5th November, 2026
	iv) 5% total, 15 min	Thursday 26th November, 2026
Midterm exam	30% total, 1 hour 20 min	Tuesday 20th October, 2026
Final exam	40% total, 2 hour	(Scheduled by Registrar)

Assignments Students must complete **ONE** of the following, each weighted at 10%:

1) Article Summary: An article summary provides a clear and concise overview of a research paper, highlighting its key objectives, methods, findings, and conclusions. 16 articles selected by the instructor will be posted on Brightspace. Students will select **one article** to summarize. Students will begin by preparing rough notes that document their initial impressions and observations from the selected paper. Notes should be supplemented with relevant insights arising from class discussion. These notes will then be revised into a **cohesive, one-page summary** of the article.

   Deadlines:

   a. **Rough Draft**: Friday, October 30, 2026, by **11:59 pm**. Submit by email to **ian.weaver@dal.ca** in **.pdf or .doc format**.
   b. **Final Article Summary**: Wednesday, December 9, 2026, by **11:59 pm**. Submit by email to **ian.weaver@dal.ca** in **.pdf or .doc format**.
   c. **Late submissions**: A penalty of **1% per day** will be applied.

2) Graphical Abstract: A graphical abstract provides a **concise visual representation** of an article, enabling readers to understand its key content at a glance. 16 articles selected by the instructor will be posted on Brightspace. Students will select **one article** to develop into a graphical abstract. Students will begin by preparing rough notes and diagrams based on their reading of the selected paper. These materials should incorporate relevant insights from class discussion and will then be refined into a **clear, cohesive graphical abstract** that communicates the key concepts, findings, and conclusions of the article.

Deadlines:

a. **Rough Draft**: Friday, October 30, 2026, by **11:59 pm**. Submit by email to **ian.weaver@dal.ca** in **.pdf or .doc format**.
b. **Final Graphical Abstract**: Wednesday, December 9, 2026, by **11:59 pm**. Submit by email to **ian.weaver@dal.ca** in **.pdf or .ppt format**.
c. **Late submissions**: A penalty of **1% per day** will be applied.

Other course requirements

None

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)	

Course Policies on Missed or Late Academic Requirements

Exams must be taken at the scheduled time. Missed exams due to illness or exceptional circumstances **must** be communicated to the instructor immediately. An alternative make-up will only be considered with a DECLARATION OF ABSENCE, completed, signed, and emailed to ian.weaver@dal.ca within 24 hours of the missed exam. There will be a 1% penalty/day for late 'article summaries'.

Course Policies related to Academic Integrity

For the 1- Page Article Summary and Graphical Abstract, students are allowed to discuss general concepts with each other, but each assignment submitted **must** be 'individual work'. Plagiarism detection tools will assist in detecting textual similarities between compared works as well as generative AI and large language models (Copilot, Claude, ChatGPT etc).

Course Content

Class	Date	Lesson Topic(s)	Assessment/Deadline
1	Tuesday 8th Sept, 26	Welcome!	
2	Thursday 10th Sept, 26	Genes and heredity	
3	Tuesday 15th Sept, 26	The Bases of Genetics – DNA, RNA, Chromosomes and Genes	

4	Thursday 17th Sept, 26	Chromatin and Control of Gene Expression	
5	Tuesday 22nd Sept, 26	Epigenetic Mechanisms of Gene Regulation - Histone Modification	
6	Thursday 24th Sept, 26	Epigenetic Mechanisms of Gene Regulation - DNA Methylation (Part 1)	Mini Quiz #1
7	Tuesday 29th Sept, 26	Epigenetic Mechanisms of Gene Regulation - DNA Methylation (Part 2), DNA Demethylation and RNA Interference (RNAi)	
8	Thursday 1st Oct, 26	Early Brain Development	
9	Tuesday 6th Oct, 26	The Neuron and Neural Transmission within a Cell	
10	Thursday 8th Oct, 26	Synaptic Transmission between Cells	
11	Tuesday 13th Oct, 26	Cognition, Learning and Memory I - Basic Distinctions	Mini Quiz #2
12	Thursday 15th Oct, 26	Cognition, Learning and Memory II - Neural Mechanisms	
13	Tuesday 20th Oct, 26	Material Covered in Classes 2-10	Midterm Exam
14	Thursday 22nd Oct, 26	Cognition, Learning and Memory III & Executive Functions of the Frontal Lobe	
15	Tuesday 27th Oct, 26	Hormones and Brain Function	
16	Thursday 29th Oct, 26	The Neurobiology of Emotion and Stress	
17	Tuesday 3rd Nov, 26	The Neurobiology of Stress and Anxiety (Part 1)	
18	Thursday 5th Nov, 26	The Neurobiology of Stress and Anxiety (Part 2)	Mini Quiz #3
Mon 9th - Fri 13th Nov, 26		**FALL STUDY BREAK**	
19	Tuesday 17th Nov, 26	The Neurobiology of Stress and Anxiety (Part 3)	
20	Thursday 19th Nov, 26	Genes, Brain and Mental Illness (Dr. Rudolf Uher)	
21	Tuesday 24th Nov, 26	Fear and Anxiety Disorders and Drugs (Part 1)	
22	Thursday 26th Nov, 26	Fear and Anxiety Disorders and Drugs (Part 2)	Mini Quiz #4

23	Tuesday 1st Dec, 26	The Neurobiology of Love	
24	Thursday 3rd Dec, 26	Course Review	
	Wednesday 9th Dec, 26	Select Article from List Online	1-Page Article Summary
	Scheduled by Registrar	Material Covered in Classes 11-20	Final Exam

Syllabus Appendix

The resources and policies are now hosted on a website and will remain up-to-date as policies, statements, resources, and guidelines change or are amended.

Syllabus Appendix: Student Supports & University Statements, Policies, and Guidelines