

**Faculty of Science Course Syllabus  
Department of Psychology & Neuroscience  
PSYO/NESC 3670.03  
Genes, Brain and Behaviour  
Fall Term, 2019 (September 2<sup>nd</sup>-December 5<sup>th</sup>)**

**Instructor(s):** Ian Weaver; Phone: (902) 494-1133; Email: [ian.weaver@dal.ca](mailto:ian.weaver@dal.ca)

**Office Hours:** Tuesdays, 11:00– 12:00, or by appointment. Office: 3340, LSC (Psychology Wing)

**Lectures:** Tuesdays, 08:35 – 09:55; Room 135, Sir James Dunn Building (Studley Campus)

Thursdays, 08:35 – 09:55; Room C338, Life Sciences Centre (Studley Campus)

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### **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: NESC 3670.03

EXCLUSIONS: PSYO/NESC 2670.03

### **Course Objectives/Learning Outcomes**

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 analyse 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.

### 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.

### Course Assessment

Component	Weight (% of final grade)	Date
<b>Tests/quizzes</b>	i) 5%	Thursday 19 <sup>th</sup> September, 2019
	ii) 5%	Thursday 3 <sup>rd</sup> October, 2019
	iii) 5%	Thursday 31 <sup>st</sup> October, 2019
	iv) 5%	Tuesday 26 <sup>th</sup> November, 2019
<b>Midterm exam</b>	30%	Thursday 17 <sup>th</sup> October, 2019
<b>Final exam</b>	40%	(Scheduled by Registrar)

**Assignments** Article Summary: weighted at 10%: 16 articles selected by the instructor will be posted on Brightspace. Each student will then select one article to summarize. Rough notes should start with initial impressions from reading the selected paper, and be updated with ideas arising from discussion in class. These notes will then be edited to create a cohesive one-page article summary for the paper. Article summaries will be emailed to me by 11:59pm on Thursday 5<sup>th</sup> December, 2019 (1% penalty/day for late summaries).

### Other course requirements

None

### 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)		

### Course Policies

Exams must be taken at the scheduled time. ONLY under extraordinary circumstances (including a doctor's note) will a make-up exam be provided. The note needs to be handed to me within 3 days of the scheduled

test and the make-up exam will be rescheduled at my convenience and may take an alternate format. There will be a 1% penalty/day for late 'article summaries'.

### **Course Content**

190903 Lecture #1 - Introduction to Neuroscience  
190905 Lecture #2 - Genes and heredity  
190910 Lecture #3 - DNA and chromatin  
190912 Lecture #4 - Epigenetics - Histone Modification  
190917 Lecture #5 - Epigenetics - DNA Methylation (Part 1)  
190919 Lecture #6 - Epigenetics - DNA Methylation (Part 2)  
190924 Lecture #7 - DNA demethylation and RNA interference (RNAi)  
190926 Lecture #8 - Early Brain Development  
191001 Lecture #9 - The Neuron and Neural Transmission within a Cell  
191004 Lecture #10 - Synaptic Transmission between Cells  
191008 Lecture #11 - Cognition, Learning and Memory I - Basic Distinctions  
191010 Lecture #12 - Cognition, Learning and Memory II - Neural Mechanisms  
191015 Lecture #13 - Cognition, Learning and Memory III & Executive Functions of the Frontal Lobe  
191017 Lecture #14 - Midterm  
191022 Lecture #15 - Hormones and Brain Function  
191024 Lecture #16 - The Neurobiology of Emotion and Stress  
191029 Lecture #17 - The Neurobiology of Stress and Anxiety (Part 1)  
191031 Lecture #18 - The Neurobiology of Stress and Anxiety (Part 2)  
191105 Lecture #19 - The Neurobiology of Stress and Anxiety (Part 3)  
191107 Guest Lecture #20 - Genes, Brain and Mental Illness (Dr. Rudolf Uher)  
191119 Lecture #21 - Fear and Anxiety Disorders and Drugs (Part 1)  
191121 Guest Lecture #22 - Psychiatric Genetics (Dr. Martin Alda)  
191126 Lecture #23 - Fear and Anxiety Disorders and Drugs (Part 2)  
191128 Lecture #24 - The Neurobiology of Love

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## **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](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](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](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](mailto:elders@dal.ca)).

**Information:** [https://www.dal.ca/campus\\_life/communities/indigenous.html](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](https://www.dal.ca/academics/important_dates.html)

### **University Grading Practices**

[https://www.dal.ca/dept/university\\_secretariat/policies/academic/grading-practices-policy.html](https://www.dal.ca/dept/university_secretariat/policies/academic/grading-practices-policy.html)

### **Missed or Late Academic Requirements due to Student Absence (policy)**

[https://www.dal.ca/dept/university\\_secretariat/policies/academic/missed-or-late-academic-requirements-due-to-student-absence.html](https://www.dal.ca/dept/university_secretariat/policies/academic/missed-or-late-academic-requirements-due-to-student-absence.html)

## **Student Resources and Support**

### **Advising**

**General Advising** [https://www.dal.ca/campus\\_life/academic-support/advising.html](https://www.dal.ca/campus_life/academic-support/advising.html)

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

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**International Centre:** [https://www.dal.ca/campus\\_life/international-centre/current-students.html](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](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](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](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](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>

**Faculty of Science Course Syllabus (Section B)**  
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