

**Developmental Neuroscience**  
**NESC 3270.01, Winter 2025**  
**Faculty of Science Course Syllabus**  
**Department of Psychology & Neuroscience**  
**January 6<sup>th</sup> - April 7<sup>th</sup>**

**Instructor:** Dr. Lucia Caceres [lucia.caceres@dal.ca](mailto:lucia.caceres@dal.ca)  
**Teaching Assistant:** Celia Glenham [cc778248@dal.ca](mailto:cc778248@dal.ca)

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**Class Schedule:** In person.  
**Location:** LSC-Common Area C206  
**Lectures:** Mondays, Wednesdays, and Fridays: 9:35am – 10:25 am.  
Pdf lectures posted on Brightspace 24hrs before next class.

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**Test Schedule:**  
**Unit tests:** January 27<sup>th</sup>, February 24<sup>th</sup>, March 17<sup>th</sup>.  
**Final Exam:** [Scheduled by Registrar between April 9<sup>th</sup> – 26<sup>th</sup>.](#)

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**Office Location:** LSC2321

**Office Hours:**

**TA:** Mondays, 11:30am – 12:30pm (*via teams*)

**Instructor:** Fridays 10:30 am – 11:30 am (*via teams or in-person*)

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**

Developmental neuroscience explores the fundamental principles of neural development. The course will aim in immersing the student into a journey of developmental biology with emphasis on the development of the nervous system. The course starts with the basic question of how a single fertilized egg, the zygote, goes on to develop an organism with plethora of different cell types that differ in form and function as to give rise to multiple different organs.

The course looks at signalling molecules already present in the egg and sperm and how this already gives the zygote a starting point for asymmetry. Then, we will look at the molecules that play a role in cell division, migration, cell fate specification, morphogenesis to finally form our organ of interest, the brain. From here, we will look at brain development until birth, which will bring us to the end of the course.

### **Course Prerequisites**

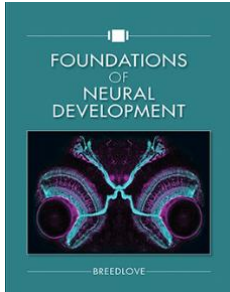
PSYO 2000 or NESC2007, PSYO/NESC 2470 and NESC/PSYO2570

### **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)



Foundations of Neural Development  
S. Marc Breedlove  
ISBN-13: 978-1605355795  
Publication Year: 2017 | 370 pp.

### Other Resources:

*Development of the Nervous System (4<sup>th</sup> edition)*. Sanes, D.H., Reh, T.A., Harris, W.A., Landgraf, M.  
Publisher: Academic Press. ISBN-13 978-0128039960

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

## Course Assessment

Lecture Component: Tested material includes 1) lectures and **3 Exams** (*Multiple choice, multi-select, interpreting images, short answer format*).

Marking Scheme	Weight	Due/Evaluation dates
Midterm I	25 %	January 27 <sup>th</sup> , 2025
Midterm II	25 %	February 24 <sup>th</sup> , 2025
Midterm III	25 %	March 17 <sup>th</sup> , 2025
Final	25 %	TBD by Registrar

## 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: Via Teams.

You can join office hours on Microsoft Teams. This software is available using your subscription to Office 365. Sign into [login.microsoftonline.com](https://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 an introduction to behavior in the genetic, and cellular context.

The main objectives are covered within five themes:

1. Nervous system patterning and specification.
2. Neural stem cell and glia.
3. Axon guidance, neuronal survival, synapse, and circuit formation.
4. Activity-dependent effects of circuit refinement.
5. Microbial influences on neural development.

## Learning outcomes:

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

- 1) Gain an understanding of mechanisms underlying nervous system development, including similarities and differences between different animal taxa.
- 2) Explore how alterations in some aspects of neural development can result in human neurodevelopmental disorders and the importance of animal research for elucidating underlying mechanisms.
- 3) Describe basic principles of developmental neurobiology emphasizing the cellular and molecular events that regulate formation of the nervous system.
- 4) Describe how molecular, physiological, and behavioral studies have contributed to our understanding of nervous system development and function.
- 5) Summarize key contributions of historical scientific papers to our current understanding of developmental neurobiology.
- 6) Describe the experimental tools used by neuroscientists to study nervous system development.
- 7) Critique experimental approaches used, and data interpretation presented in scientific literature.
- 8) Design experimental approaches to resolve neuroscience problems in feasible ways.

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

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

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

## Course Policies

### Email Etiquette.

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 3270).**

**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.

**Missed exams** due to illness or exceptional circumstances **must** be communicated to the instructor **immediately** by

1. **emailed to [lucia.caceres@dal.ca](mailto:lucia.caceres@dal.ca). DO NOT EMAIL SDA.**
2. Student must submit an **SDA to Brightspace** only (do not email SDAs or drop SDAs off in person).

**A completed SDA MUST include the following:**

- a. The reason for the absence in the comment section (do not submit proper documentation).
- b. The exam that you missed. Ex. Midterm #1
- c. Signed and dated.
- d. **SDA needs to be submitted within 3 days (72hrs) of the missed exam** for the SDA to be valid.

**Please note: If SDA is approved**, no alternative make-up exams will be given, instead the weight of the missed exam will be transferred to the cumulative final.

⇒ SDA forms are only valid for short-term absences.

### 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 within three (3) calendar days following the last day of absence.

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.

### Exam 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.

**Course Content: Tentative lecture topic guide**

Week of...	Lecture	Lecture topic	
<b>Jan.</b>	<b>6 - 13</b>	Chapter 1 <ul style="list-style-type: none"> <li>Cell Differentiation and Neuronal Induction</li> </ul>	
	<b>15-17</b>	Chapter 2 <ul style="list-style-type: none"> <li>Establishing a Body Plan</li> </ul>	
	<b>20-22</b>	Chapter 2 <ul style="list-style-type: none"> <li>Establishing a Body Plan</li> <li>- <i>cut off for midterm #1</i> -</li> </ul>	
	<b>24</b>	Chapter 3 <ul style="list-style-type: none"> <li>Neurogenesis and Cell Migration</li> </ul>	
	<b>27</b>	-	<b>Midterm I (Chapters 1 - 2)</b>
	<b>29-31</b>	Chapter 3 <ul style="list-style-type: none"> <li>Neurogenesis and Cell Migration</li> </ul>	
<b>Feb.</b>	<b>3</b>	Chapter 4 <ul style="list-style-type: none"> <li>Neural Differentiation</li> </ul>	
	<b>5</b>	-	<b>In office midterm #1 review</b>
	<b>7</b>	-	<b>Munro day – University Closed</b>
	<b>10-12</b>	Chapter 4 <ul style="list-style-type: none"> <li>Neural Differentiation</li> </ul>	
	<b>14</b>	Chapter 5 <ul style="list-style-type: none"> <li>Axonal Pathfinding</li> <li>- <i>cut off for midterm #2</i> -</li> </ul>	
	<b>17-21</b>	-	<b>Winter Break</b>
	<b>24</b>	-	<b>Midterm II (Chapters 3 - 5)</b>
	<b>26-28</b>	Chapter 5 <ul style="list-style-type: none"> <li>Axonal Pathfinding</li> </ul>	
<b>Mar.</b>	<b>3</b>	Chapter 6 <ul style="list-style-type: none"> <li>Synapse Formation and Maturation</li> </ul>	
	<b>5</b>	-	<b>In office midterm #2 review</b>
	<b>7-10</b>	Chapter 6 <ul style="list-style-type: none"> <li>Synapse Formation and Maturation</li> </ul>	
	<b>12-14</b>	Chapter 7 <ul style="list-style-type: none"> <li>Apoptosis</li> <li>- <i>cut off for midterm #3</i> -</li> </ul>	
	<b>17</b>	-	<b>Midterm III (Chapters 5 - 7)</b>
	<b>19-21</b>	Chapter 7 <ul style="list-style-type: none"> <li>Apoptosis</li> </ul>	
	<b>24-26</b>	Chapter 8 <ul style="list-style-type: none"> <li>Activity-guided Neural Development.</li> </ul>	
	<b>28</b>	-	<b>In office midterm #3 review</b>
	<b>31</b>	Chapter 9 <ul style="list-style-type: none"> <li>Experience-guided Neural Development.</li> </ul>	
<b>Apr.</b>	<b>2-4</b>	Chapters 9-10 <ul style="list-style-type: none"> <li>Experience-guided Neural Development.</li> <li>Social-guided Neural Development.</li> </ul>	
	<b>7</b>	-	Office hours in lieu of a class.
	<b>9-26</b>	-	<b>Final Exam Period (2-hrs Cumulative: Chapters 1-11)</b>

## 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](mailto:elders@dal.ca). Additional information regarding the Indigenous Student Centre can be found at: [https://www.dal.ca/campus\\_life/communities/indigenous.html](https://www.dal.ca/campus_life/communities/indigenous.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-dal/internationalization.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](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](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/about-dal/agricultural-campus/student-success-centre.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: <http://www.dal.ca/cultureofrespect.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/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)

### **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/dept/university\\_secretariat/policies/academic/fair-dealing-policy-.html](https://www.dal.ca/dept/university_secretariat/policies/academic/fair-dealing-policy-.html)

### **Originality Checking Software**

The course instructor may use Dalhousie's approved originality checking software and Google to check the originality of any work submitted for credit, in accordance with the Student Submission of Assignments and Use of Originality Checking Software Policy. Students are free, without penalty of grade, to choose an alternative method of attesting to the authenticity of their work and must inform the instructor no later than the last day to add/drop classes of their intent to choose an alternate method. Additional information regarding Originality Checking Software can be found at: [https://www.dal.ca/dept/university\\_secretariat/policies/academic/student-submission-of-assignments-and-use-of-originality-checking-software-policy-.html](https://www.dal.ca/dept/university_secretariat/policies/academic/student-submission-of-assignments-and-use-of-originality-checking-software-policy-.html)

### **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.

## Student Resources and Support

### University Policies and Programs

1. Important Dates in the Academic Year (including add/drop dates): [http://www.dal.ca/academics/important\\_dates.html](http://www.dal.ca/academics/important_dates.html)
2. Classroom Recording Protocol: [https://www.dal.ca/dept/university\\_secretariat/policies/academic/classroom-recording-protocol.html](https://www.dal.ca/dept/university_secretariat/policies/academic/classroom-recording-protocol.html)
3. Dalhousie Grading Practices Policies: [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)
4. Grade Appeal Process: [https://www.dal.ca/campus\\_life/academic-support/grades-and-student-records/appealing-a-grade.html](https://www.dal.ca/campus_life/academic-support/grades-and-student-records/appealing-a-grade.html)
5. Sexualized Violence Policy: [https://www.dal.ca/dept/university\\_secretariat/policies/health-and-safety/sexualized-violence-policy.html](https://www.dal.ca/dept/university_secretariat/policies/health-and-safety/sexualized-violence-policy.html)
6. Scent-Free Program: <https://www.dal.ca/dept/safety/programs-services/occupational-safety/scent-free.html>

### Learning and Support Resources

1. General Academic Support – Advising (Halifax): [https://www.dal.ca/campus\\_life/academic-support/advising.html](https://www.dal.ca/campus_life/academic-support/advising.html)
2. General Academic Support – Advising (Truro): <https://www.dal.ca/about-dal/agricultural-campus/ssc/academic-support/advising.html>
3. Student Health & Wellness Centre: [https://www.dal.ca/campus\\_life/health-and-wellness.html](https://www.dal.ca/campus_life/health-and-wellness.html)
4. 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](https://www.dal.ca/campus_life/academic-support/On-track.html)
5. Indigenous Student Centre: [https://www.dal.ca/campus\\_life/communities/indigenous.html](https://www.dal.ca/campus_life/communities/indigenous.html)
6. Indigenous Connection: <https://www.dal.ca/about-dal/indigenous-connection.html>
7. 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](mailto:elders@dal.ca) or 902-494-6803: <https://cdn.dal.ca/content/dam/dalhousie/pdf/academics/UG/indigenous-studies/Elder-Protocol-July2018.pdf>
8. Black Student Advising Centre: [https://www.dal.ca/campus\\_life/communities/black-student-advising.html](https://www.dal.ca/campus_life/communities/black-student-advising.html)
9. International Centre: [https://www.dal.ca/campus\\_life/international-centre.html](https://www.dal.ca/campus_life/international-centre.html)
10. South House Sexual and Gender Resource Centre: <https://southhousehalifax.ca/about/>





# DALHOUSIE UNIVERSITY

11. LGBTQ2SIA+ Collaborative: <https://www.dal.ca/dept/vpei/edia/education/community-specific-spaces/LGBTQ2SIA-collaborative.html>
12. Dalhousie Libraries: <http://libraries.dal.ca/>
13. Copyright Office: <https://libraries.dal.ca/services/copyright-office.html>
14. Dalhousie Student Advocacy Services: <https://www.dsu.ca/dsas?rq=student%20advocacy>
15. Dalhousie 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)
16. Human Rights and Equity Services: <https://www.dal.ca/dept/hres.html>
17. 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)
18. Study Skills/Tutoring: [http://www.dal.ca/campus\\_life/academic-support/study-skills-and-tutoring.html](http://www.dal.ca/campus_life/academic-support/study-skills-and-tutoring.html)
19. Faculty of Science Advising Support: <https://www.dal.ca/faculty/science/current-students/undergrad-students/degree-planning.html>

## **Safety**

1. Biosafety: <http://www.dal.ca/dept/safety/programs-services/biosafety.html>
2. Chemical Safety: <https://www.dal.ca/dept/safety/programs-services/chemical-safety.html>
3. Radiation Safety: <http://www.dal.ca/dept/safety/programs-services/radiation-safety.html>
4. Laser Safety: <https://www.dal.ca/dept/safety/programs-services/radiation-safety/laser-safety.html>