

NEUR*2000*01, Course Outline: Fall 2019

General Information

Course Title: Introduction to Neuroscience

Course Description:

This course offers an introduction to the mammalian nervous system, with emphasis on the structure and function of the human brain. General principles of the function and organization of nervous systems will be discussed, providing both an overview of the subject and a foundation for advanced courses. Topics will include the physical and chemical bases for action potentials, synaptic transmission, and sensory transduction; anatomy; development; sensory and motor pathways; and the neuroscience of brain diseases.

Credit Weight: 0.5

Academic Department (or campus): Psychology

Semester Offering: F19

Class Schedule and Location: Tuesdays 10:00 AM - 11:20 AM, Thursdays 10:00 AM - 11:20 AM;
MCLN 102

Instructor Information

Instructor Name: Dr. Jennifer Murray

Instructor Email: jmurr@uoguelph.ca

Office location: MCKN 4001; ext. 56330

Office hour: Thurs 4-5pm - other meetings by email arrangement only

GTA Information

GTA Name:

GTA Email:

GTA office location:

GTA Name:

GTA Email:

GTA office location:

GTA Name:

GTA Email:

GTA office location:

Other office hours by appointment.

Course Content

Specific Learning Outcomes:

1. LO 1.1 – Depth and Breadth of Understanding (1/2 – introduce/reinforce)
2. LO 1.2 – Inquiry and Analysis (1/2 – introduce/reinforce)
3. LO 2.1 – Information Literacy (2 – reinforce)
4. LO 2.5 – Visual Literacy (1 – introduce)
5. LO 4.2 – Written Communication (1 – introduce)
6. LO 5.3 – Ethical Issues in Research (1/2 – introduce/reinforce)

Lecture Content:

The following outlines the anticipated progression of the course. It will largely be clustered into three themes:

1. *Signals and Synapses*
2. *Sensory and Motor Systems*
3. *Growth and Plasticity*

I reserve the right to revise this schedule of lecture content and suggested readings as I deem necessary based on course progress and lecture preparation. It is your responsibility to take note of any changes that are announced as the semester progresses. Readings should ideally be conducted in advance of the course lectures. Recommended page numbers are based on the print version of the 6th edition.

Date	Topic	Related Readings
Sept 5 and Sept 10	Introduction to the Course – use of animals in research – reading scientific literature Introduction to the Nervous System & Human Neuroanatomy	Chapter 1(1-11, 13-22); (Appendix – content covered in lecture)
Sept 12	Electrical Signals	Chapters 2(33-41,44-48) & 3(49-63)
Sept 17 and Sept 19	Synaptic Transmission	Chapters 4(65-75,77-82) & 5(85-98, 101-111)
Sept 24	Literature Summary 1 Due 24/09 Neurotransmitters & Receptors	Chapter 6(113-128,130-143) & 7(145-158)
Sept 26	Plasticity	Chapter 8(169-175,176-187,189)
Oct 1	Midterm 1	
Oct 3	Sensory Systems – Touch	Chapter 9(193-208)
Oct 8	Sensory Systems – Pain	Chapter 10(213-219,221-226,227-230)

Date	Topic	Related Readings
Oct 10	Sensory Systems – Visual Pathways	Chapter 11(233-234,236-237,238-242) Chapter 12(262-267)
Oct 15	no class	
Oct 17	Motor Systems – Lower Motor Neurons and Upper Motor Neuron	Chapter 16(357-363,364-372) Chapter 17(382-385,386-393,395-397)
Oct 22 and Oct 24	Literature Summary 2 Due 22/10 Motor Systems – Basal Ganglia	Chapter 18(407-410,412-419,421-424)
Oct 29	Midterm 2	
Oct 31	Early Brain Development	Chapter 22(491-493,494-498,503-505,514-515)
Nov 5	Neuronal Growth and Guidance	Chapter 23(521-527,531-536)
Nov 7	Synapse Formation	Chapter 23(538-546)
Nov 12	Plasticity in Development	Chapter 25(571-575, 576-579,580-583,588-590)
Nov 14	Repair and Regeneration	Chapter 26(596-605,607-620,622)
Nov 19	Literature Summary 3 Due 19/11 <i>Presentations</i>	
Nov 21	<i>Presentations</i>	
Nov 26	Midterm 3	
Nov 28	Review Session	

Course Assessments:

Assignment or Test	Date	Contribution to Final Mark (%)	Learning Outcomes Assessed
Midterm 1	Oct 1	20%	1-4
Midterm 2	Oct 29	20%	1-4
Midterm 3	Nov 26	15%	1-4
Literature Summary 1	Sept 24	4%	1-6
Literature Summary 2	Oct 22	4%	1-6
Literature Summary 3	Nov 19	4%	1-6
Final Exam (cumulative)	Dec 6	33%	1-4

Additional Notes:

Graduate students are often aiming for careers in the academic sector, but the bulk of their training revolves around research. In order to facilitate graduate student learning and experience, I always provide each of my TAs the opportunity to prep and/or deliver a lecture during the semester.

The Midterms and Final Exam will be multiple choice. Questions will be derived from lectures and assigned readings, not from the literature summary options. Short segments of scientific literature provided directly within the exams may also be used as a source of questions.

Literature Summaries are to be based on primary research articles provided in the list below. Students must select *one of the two articles from each topical list*:

Summary 1: *Signals and Synapses*
(Adesnik, Nicoll, & England, 2005)
(Dunwiddie & Lynch, 1978)

Summary 2: *Sensory and Motor Systems*
(Carvalho et al., 2017)
(Holemans, Meij, & Meyer, 1966)

Summary 3: *Growth and Plasticity*
(Comishen, Bialystok, & Adler, 2019)
(Paolicelli et al., 2014)

The full citations are listed below in **Course Resources** and **full PDFs are available on [CourseLink](#)**.

Each Literature Summary should be no more than 6 pages (ideally 3-4), double-spaced, plus a title page with your name, student ID, and the citation of the article upon which you are writing. Any other stylistic formatting details are your choice. Your summary should include an overview of the article purpose/justification, methodology, findings, and discussion of those findings. Up to **1% bonus for the overall class grade for each summary (up to 3% total across the three literature summary assignments)** can be earned by proposing an experiment grounded in course content to test something new based on the findings of the article. This is a fun opportunity to think and be creative. Each summary will be marked according to the rubric below.

Up to **18 students (6 on Tuesday Nov 19th; 12 on Thursday Nov 21st)** may do an oral literature summary on a primary research journal article of *their* choosing (must be related to any of the topics covered in the course and approved by me at least three days in advance). This presentation will **replace one written literature summary** and will be assessed according to the same rubric as the written literature summaries, with the mark averaged between the assessments of myself and at least one of the TAs. If you register for one of these oral student presentations, then you do not need to write one literature summary. Sign-up will begin at a well-advertised designated time early in the semester. Further details will be provided in class. If you register for one of these oral student presentations and do not give your presentation for any reason, then you must submit the third literature summary within 72 hours of your scheduled presentation time to earn any marks for that assignment.

Final examination date and time: 7-9pm, Friday Dec 6, Location TBD

Final exam weighting: 33% Cumulative

[Examination Regulations](#)

Course Resources

Required Text:

Neuroscience (6th Edition, 2018) Edited by Dale Purves, George J. Augustine, David Fitzpatrick, William C. Hall, Anthony-Samuel LaMantia, Richard D. Mooney, Michael L. Platt, and Leonard E. White. Published by Sinauer Associates, Oxford University Press.

1 copy on 2-hour reserve.

The following are the articles available for Literature Summaries – these are provided in pdf form in CourseLink.

Adesnik, H., Nicoll, R. A., & England, P. M. (2005). Photoinactivation of native AMPA receptors reveals their real-time trafficking. *Neuron*, 48(6), 977–985.

<https://doi.org/10.1016/j.neuron.2005.11.030>

Carvalho, M. M., Campos, F. L., Marques, M., Soares-Cunha, C., Kokras, N., Dalla, C., ... Salgado, A. J. (2017). Effect of Levodopa on Reward and Impulsivity in a Rat Model of Parkinson's Disease. *Frontiers in Behavioral Neuroscience*, 11, 145.

<https://doi.org/10.3389/fnbeh.2017.00145>

Comishen, K. J., Bialystok, E., & Adler, S. A. (2019). The impact of bilingual environments on selective attention in infancy. *Developmental Science*, (December 2018), 1–11. <https://doi.org/10.1111/desc.12797>

Dunwiddie, T., & Lynch, G. (1978). Long-term potentiation and depression of synaptic responses in the rat hippocampus: localization and frequency dependency. *The Journal of Physiology*, 276(1), 353–367.

<https://doi.org/10.1113/jphysiol.1978.sp012239>

Holemans, K. C., Meij, H. S., & Meyer, B. J. (1966). The Existence the of a Monosynaptic Spinal Reflex Frog Arc in of the. *Experimental Neurology*, 14, 175–186.

Paolicelli, R. C., Paolicelli, R. C., Bolasco, G., Pagani, F., Maggi, L., Scianni, M., ... Gross, C. T. (2014). Synaptic Pruning by Microglia Is Necessary for Normal Brain Development. *Science*, 1456(2011), 10–13.

<https://doi.org/10.1126/science.1202529>

Other Resources:

iClicker software will be incorporated throughout the semester to poll student learning in the class during lectures. Your participation in this is fully voluntary, however, as it is a very useful tool for reinforcing understanding, I will incentivize its use as a form of ***extra credit***. The way this will work is as follows: At the end of the semester, credits earned using iClicker for general participation and answer accuracy can replace up to **2% of the overall course grade**. The number of accurately-answered questions required for full replacement will be based on the

highest number of accurately-answered questions within the class. For instance, if 68 questions are answered accurately by one individual in the class by the end of the semester, then 68 accurately-answered questions are required for replacing a full 2% of the course grade. In this example, if you answered 34 questions correctly, then you can replace up to 1% of your course grade. As this is *not a compulsory activity* in the class, there will be no accommodations made for any missed questions for any purpose.

iClickers can be purchased in the bookstore or an app can be downloaded on your phone. More information about iClicker will be provided in the first lecture.

CourseLink will be used to facilitate discussion amongst students. A Forum under the Discussions tab has been started labelled 'Questions & Answers'. Use this to engage with your peers in the classroom. You are welcome to initiate Threads within that Forum. Often, one student's struggle with a topic can help reveal gaps in the knowledge of others, and an exchange of ideas improves the experience of learning for everyone. Your participation in this is fully voluntary, however, as it is a very useful tool for reinforcing understanding, I will incentivize this peer engagement as a form of ***extra credit***. The way this will work is as follows: the TAs and myself will monitor student engagement. At the end of the semester, engagement in class discussions will be quantified and replace up to **1% of the overall course grade** in a method similar to that described for iClicker. This quantification will depend in large part on the number of Threads and Replies in which you participate (numbers we can see in CourseLink). However, quality of discussion *will* count, and anyone observed to be abusing the system (e.g., repeated copy/pasting or comments with no added content) will forfeit the extra credit solely at my discretion. Again, this is *not compulsory*, but I recommend you 'change your notification settings' in the Subscriptions sub-tab of Discussions in order to be informed of engagement opportunities in which to participate.

Course Policies

Grading Policies

Your final grade is determined by 3 literature summaries, 3 in-class midterms, and 1 final exam. The final exam is cumulative; content from the literature summaries will *not* be assessed on the final exam.

Dates/deadlines and methods of evaluation are not negotiable.

Literature Summaries are to be submitted electronically ***by the start of class on the date they are due***. Beginning 1 min after class start (according to the time-stamp of submission, each 24-hr delay will result in 25% automatic deduction in the overall available grade for the summary. A summary submitted 3 days and 1 minute past the due date **will not be graded**.

Each of the literature summaries will be graded according to the following distribution:
Clarity in demonstrating an understanding of the published research:

Purpose (1% of final grade)
 Methods (1% of final grade)
 Findings (1% of final grade)
 Discussion (1% of final grade)

Creativity in thinking beyond the published research to the next step:

Propose a follow-up experiment (up to 1% bonus)

Each literature summary is worth 4% of the overall grade. An additional **1% of *extra credit*** can be earned by including a unique proposal for a follow-up study within each summary.

The detailed rubric is as follows:

	Excellent 20-25 points (~80-100%)	Good 17.5-19.9 points (~70-79%)	Acceptable 15-17.49 points (~60-69%)	Minimally Acceptable 12.5-14.9 points (~50-59%)	Unacceptable <12.5 points (<50%)
Purpose (1%)	Demonstrates superior understanding of the general idea/purpose for why the study was conducted. Identifies background information, research question and hypothesis and presents it in a logical, organized manner.	General understanding of the meaning behind the research. Identifies the critical information but lacks organization of the details which allows fluent comprehension of the study's rationale.	Acceptable understanding of the study. Identifies overall purpose but lacks critical aspects of the paper which permit a rational understanding for the study. Lacks organization of information.	Slight understanding of the study. Presents one or two details regarding the purpose. Critical aspects such as research question/hypotheses and the rationale missing. Little to no organization of information present.	Unsatisfactory understanding of the study/lacks information relevant to the experimental rationale.
Methods (1%)	Describes methodology with great detail. Section includes: description of subjects/model (e.g., species, sex, age—if applicable); apparatus including technique(s) and what they measure; and lastly, procedure of the study. Demonstrated comprehension for why the techniques were selected to address the research question.	Provides good summary of methods. Some detail missing in description pertaining to the methodology used and the rationale behind using these techniques to answer research question(s). Logical and organized presentation of information.	Acceptable iteration of the methods, but limited level of detailed description. Still shows a reasonable understanding of why the methodology was used. Rough organization of information.	Limited description of the methodology. Little effort given to show comprehension for why and how techniques were used to study the research question. Little to no organization of information.	Unsatisfactory description of the methods, lacking details of the subjects, apparatus/design, and procedure. Information presented shows little to no comprehension of rationale behind the methods chosen by authors.
Findings (1%)	Exceptional understanding and description of the results. In detail, describes key findings of raw results from a statistically/pattern-based approach (e.g., behavior y was greater following test x). Information for each test/experiment is	Describes the results with good detail; some components of the findings are missing. Information is organized in a logical manner.	Acceptable description of results but with two or more key findings missing. Little use of scientific language to describe results. Information presented is not well organized.	Limited description of results, missing major findings, and little to no use of scientific language to describe the data. Information presented has little to no organization.	Unsatisfactory description of results/findings. No use of scientific language to describe data and information is not organized in any logical format.

	Excellent 20-25 points (~80-100%)	Good 17.5-19.9 points (~70-79%)	Acceptable 15-17.49 points (~60-69%)	Minimally Acceptable 12.5-14.9 points (~50-59%)	Unacceptable <12.5 points (<50%)
	organized in a logical manner.				
Discussion (1%)	Excellent understanding of the author's discussion. Provides detailed, logical discussion of the findings and describes the "big picture". Touches on the main points brought forth by the authors and reiterates them in own words in an organized and rational manner. Incorporates creative input grounded in previous research and avoids personal opinion/extreme speculation.	Provides adequate discussion with good detail. Missing some concepts/big picture brought forth by the authors. Organized, but has some errors in logical flow of information. Some extreme speculation and/or personal opinion.	Acceptable description of the discussion. Several errors and missing big picture concepts. Discussion is not very well organized, contains some logical leaps and moderate to heavy use of personal opinion.	Shows little comprehension of discussion provided by the authors. Sentences are largely extracted from the discussion in the article and not completely reiterated in own words. Misses the big picture concepts and contains errors.	Omits key findings and provides no reiteration of the meaning of the results or discussion of their significance within the field. Contains errors.
Follow-up (Bonus 1%)	Addresses a notable limitation from current study that can be studied in follow-up experiment(s). Identifies research question and hypothesis based on that limitation and mentions the expected outcome based on the hypothesis. Provides a few sentences describing modification to the current study or proposes new study which is scientifically sound. Provides a statement of potential significance of the proposed experiment(s)	Addresses a limitation from the current study that will be studied with follow-up experiment(s). Missing elements such as hypothesis or research question. Provides a brief prediction based on hypothesis (if hypothesis provided). Indicates required modifications to the current study or proposes new study which is scientifically sound. Statement of significance of the proposed experiment(s) is missing or does not completely follow rationale of the follow-up experiment(s).	Limitation is not addressed/not very well described. Important elements such as hypothesis or research question is missing. Does not provide brief prediction from hypothesis (if hypothesis is provided). Modifies current study or proposes new study which is moderately sound. No statement of significance of the proposed experiment(s) is provided.	No description of a limitation. Simply states a follow-up experiment without reason. Hypothesis, research question and predictions are missing. Little to no description of how the experiment is going to be performed. No statement of significance of the proposed experiment(s) is provided.	No elements of a study proposal are present.

If a student does not write Midterm 1, Midterm 2, or Midterm 3 *for absolutely **any** reason whatsoever*, its % value will be **automatically added** to the % value of the Final Exam. No Instructor notice or consent is required for this re-distribution of grading. If a student does not write Midterm 1, Midterm 2, or Midterm 3 *for absolutely **any** reason whatsoever*, they will *not* be permitted to view the missed midterm with a TA.

The rules and regulations for writing/grading Midterms described above **do not apply to the Final Exam**. If the Final Exam is not written for any reason, the BA/BSc counselling office should be contacted directly. At the University of Guelph, Instructors cannot change dates or times of final examinations.

[Undergraduate Grading Procedures](#)

Course Policy regarding use of electronic devices and recording of lectures:

Electronic recording of classes is **expressly forbidden** without consent of the instructor. When recordings are permitted they are solely for the use of the authorized student and may not be reproduced, or transmitted to others, without the express written consent of the instructor.

University Policies

Academic Consideration

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons, please advise the course instructor in writing, with your name, id#, and e-mail contact. See the academic calendar for information on regulations and procedures for

Academic Consideration: [Academic Consideration, Appeals and Petitions](#)

Academic Misconduct

The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community, faculty, staff, and students to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring.

University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff and students have the responsibility of supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection. Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

The Academic Misconduct Policy is detailed in the Undergraduate Calendar:
[Academic Misconduct Policy](#)

Accessibility

The University of Guelph is committed to creating a barrier-free environment. Providing services for students is a shared responsibility among students, faculty and administrators. This relationship is based on respect of individual rights, the dignity of the individual and the University community's shared commitment to an open and supportive learning environment. Students requiring service or accommodation, whether due to an identified, ongoing disability or a short-term disability should contact [Student Accessibility Services](#) as soon as possible.

For more information, contact SAS at 519-824-4120 ext. 54335 or email accessibility@uoguelph.ca or the [Student Accessibility Services Website](#)

Course Evaluation Information

Please refer to the [Course and Instructor Evaluation Website](#) .

Drop date

The last date to drop one-semester courses, without academic penalty, is **FRIDAY, November 29st, 2019**. For regulations and procedures for Dropping Courses, see the [Schedule of Dates in the Academic Calendar](#).
[Current Undergraduate Calendar](#)