

PSYC*4470, Course Outline: Fall 2018

General Information

Course Title: PSYC*4470 – Advanced Topics in Behavioural and Cognitive Neuroscience

Course Description:

This course will consider some of the many exciting avenues of research being explored in the field of modern behavioural and cognitive neuroscience, with a strong emphasis on the neurobiological bases of learning and memory. We will take an integrative approach by considering the anatomical, cellular, and molecular substrates of memory acquisition, consolidation, persistence, and retrieval in the context of a variety of “model systems”.

Seminar presentation and discussion format will be emphasized for much of the course. Students will each deliver one PowerPoint presentation based on an assigned reading in the second half of the semester. The first half of the semester will consist of lectures covering basic concepts and findings pertaining to the neurobiology of learning and memory. This will ensure that everyone has a common background in the topics to be considered throughout the remainder of the course.

There will be several student presentations (10 min, plus 5 min questions/discussion each) per seminar in the second half of the course. All students are expected to read the papers being presented (a maximum of two per class) on the day. This will enable you to follow the presentations more easily and contribute to class discussion.

ATTENDANCE AT ALL CLASS MEETINGS IS STRONGLY ENCOURAGED Attendance during the first few weeks of classes is absolutely essential. These are the meetings during which presentation topics and dates will be reviewed and assigned.

The success of this course depends to a large extent on your participation. Your involvement in class discussions will contribute to the quality of the course.

Credit Weight: 0.5

Academic Department (or campus): Psychology

Semester Offering: F18

Class Schedule and Location: Tuesdays and Thursdays, 1:00-2:20 PM; MCKN 311

Instructor Information

Instructor Name: Dr. Boyer Winters

Instructor Email: bwinters@uoguelph.ca

Office location and office hours: MacKinnon Extension, Room 3005; ext. 52163; Meeting by arrangement; e-mail at all times

GTA Information

GTA Name: TBA

GTA Email: TBA

GTA office location and office hours: TBA

Course Content

Specific Learning Outcomes:

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

1. Engage critically with scientific studies in the field of the neurobiology of learning and memory, demonstrating this skill through:
 - a. A student-led seminar in which they clearly present the rationale, methods/results, and interpretations of a published article, providing their own critical evaluation of these components.
 - b. Flexible thinking about the presented article in a 5-min question and answer period following the seminar presentation.
2. Demonstrate critical and creative scientific writing skills by integrating insight acquired from thorough readings of the literature and the above seminar experience to produce a mock grant proposal. Students will design a novel scientific study to address an outstanding question in the field of neurobiology of learning and memory, providing clear experimental design and analysis details, as well as a review of pertinent background literature.
3. Explain, with the use of relevant empirical data, various learning and memory concepts and their putative neurobiological bases (e.g., memory consolidation).
4. Describe and critically evaluate different methodological approaches to the study of the neurobiology of learning and memory.
5. Demonstrate refined presentation skills resulting from observation and administration of PowerPoint seminars.

Lecture Content:

Sept 6 – Introduction and organizational issues

Sept 11 - Making Memories I: Conceptual Issues and Methodologies

Sept 13 - Making Memories II: Conceptual Issues and Methodologies, continued

Sept 18 - Making Memories III: Conceptual Issues and Methodologies, continued

Sept 20 – The Neurobiology of Learning and Memory: Systems Analysis

Sept 25 – The Neurobiology of Learning and Memory: Systems Analysis, cont'd

Sept 27 – The Neurobiology of Learning and Memory: Systems Analysis, cont'd

Oct 2 – Topics and dates will be assigned for presentations (to begin on Oct 30)

- The Neurobiology of Learning and Memory: Cellular and Molecular

Oct 4 – The Neurobiology of Learning and Memory: Cellular and Molecular, cont'd

Oct 9 – NO CLASS; Fall Study Break Day

Oct 11 – Strengthening Synapses: genomic signaling and memory consolidation

Oct 16 – Calcium and plasticity

Oct 18 – Memory Modulation Systems

Oct 23 – Memory Reconsolidation

Oct 25 – Midterm on lecture material

Labs: N/A

Seminars:

All articles are available on CourseLink:

Go to: <https://courselink.uoguelph.ca/shared/login/login.html> and login, then find PSYC*4470 (Advanced Topics in Behavioural and Cognitive Neuroscience) – 'Course material'

Oct 30: First day of student presentations:

Students 1 & 2. Dally et al. (2006) Food-caching Western scrub-jays keep track of who was watching when. *Science* 312, 1662-1665.

Students 3 & 4. Eacott & Norman (2004) Integrated memory for object, place, and context in rats: a possible model of episodic-like memory? *The Journal of Neuroscience* 24, 1948-1953.

Nov 1: Students 1 & 2. Wolff et al (2008) The extended hippocampal-diencephalic memory system: enriched housing promotes recovery of the flexible use of spatial representations after anterior thalamic lesions. *Hippocampus* 18, 996-1007.

Students 3 & 4. Day et al (2003) Glutamate-receptor-mediated encoding and retrieval of paired-associate learning. *Nature* 424, 205-209.

Nov 6: Students 1 & 2. Kesner et al (2008) The CA3 subregion of the hippocampus is critical for episodic memory processing by means of relational encoding in rats. *Behavioral Neuroscience* 122, 1217-1225.

Students 3 & 4. Warburton et al (2003) Cholinergic neurotransmission is essential for perirhinal cortical plasticity and recognition memory. *Neuron* 38, 987-996.

Nov 8: Students 1 & 2 Maren et al (2003) Protein synthesis in the amygdala, but not the auditory thalamus, is required for consolidation of Pavlovian fear conditioning in rats. *European Journal of Neuroscience* 18, 3080-3088.

Students 3 & 4. Maren & Hobin (2007) Hippocampal regulation of context-dependent neuronal activity in the lateral amygdala. *Learning and Memory* 14, 318-324.

Nov 13: Students 1 & 2. Anagnostaras et al (1999) Temporally graded retrograde amnesia of contextual fear after hippocampal damage in rats: within-subjects examination. *Journal of Neuroscience* 19, 1106-1114.

Students 3 & 4. Campolongo et al. (2009) Endocannabinoids in the rat basolateral amygdala enhance memory consolidation and enable glucocorticoid modulation of memory. *PNAS* 106, 4888-4893.

Nov 15: Students 1 & 2. Plath et al. (2006) Arc/Arg3.1 is essential for the consolidation of synaptic plasticity and memories. *Neuron* 52, 437-444.

Students 3 & 4. Kelly et al (2003) Activation of mitogen-activated protein kinase/extracellular signal-regulated kinase in hippocampal circuitry is required for

consolidation and reconsolidation of recognition memory. *Journal of Neuroscience* 23, 5354-5360.

Nov 20: Students 1 & 2. Wan et al. (2010) Delayed intrinsic activation of an NMDA-independent CaM-kinase II in a critical time window is necessary for late consolidation of an associative memory. *Journal of Neuroscience* 30, 56-63.

Students 3 & 4. Lee (2008) Memory reconsolidation mediates the strengthening of memories by additional learning. *Nature Neuroscience* 11, 1264-1266.

Nov 22: Students 1 & 2. Kindt et al. (2009) Beyond extinction: erasing human fear responses and preventing the return of fear. *Nature Neuroscience* 12, 256-258.

Students 3 & 4. Schiller et al. (2010) Preventing the return of fear in humans using reconsolidation update mechanisms. *Nature* 463, 49-53.

Nov 27: Students 1 & 2. Cai et al. (2009) Sleep selectively enhances hippocampus-dependent memory in mice. *Behavioral Neuroscience* 123, 713-719.

Students 3 & 4. Rasch et al (2007) Odor cues during slow-wave sleep prompt declarative memory consolidation. *Science* 315, 1426-1429.

Nov 29: Students 1 & 2. Gais & Born (2004) Low acetylcholine during slow-wave sleep is critical for declarative memory consolidation. *Proceedings of the National Academy of Sciences of the United States of America* 101, 2140-2144.

Students 3 & 4. Gould et al (1999) Learning enhances adult neurogenesis in the hippocampal formation. *Nature Neuroscience* 2, 260-265.

Course Assignments and Tests:

Evaluation: Your grade will be determined by three components:

1. Midterm Exam (25%; Oct 25): Following the series of lectures on the neurobiology of learning and memory, you will write a midterm to assess your understanding of this important material. The exam will be a mixture of multiple choice and short-answer.

2. PowerPoint Presentation (35%; topics to be assigned Oct 2): Your evaluation from the presentation will be based on both form and content. It is important that you demonstrate a clear understanding of the material you are presenting and that this material is clear to the audience. Overly flashy presentations will not earn you extra points if the material covered is highly superficial and/or poorly communicated. Each presentation should be 10 min long to allow for 5 min of questions and class discussion.

The presentations will be based on assigned scientific research articles related to or expanding upon issues covered in the first half of the course. For each research article in this section of the course, one student will present the background and methods for the study, and a second student will present the results and conclusions. The student presenting the Introduction and Methods of the article should clearly describe the background to the target article (including any particularly relevant recent findings that lead directly to the target study), as well as the primary methodology of the target article. The second presenter should aim to clearly describe the main results, their implications, and the authors' conclusions.

For full marks, you should endeavour to go beyond a surface level presentation of the assigned material, incorporating additional readings and your own critical thoughts into your preparation and, ideally, clearly describing empirical findings that support the arguments being made.

Although not required, I am happy to meet with you the week before your presentation to discuss any questions you might have. Just email me to set up a time to meet.

3. Final research proposal (40%; Electronic copy due in the CourseLink Dropbox for PSYC*4470 by 5pm on Monday, Dec 3; no hardcopy required): Throughout the course, we will be discussing topics related to the neural bases of memory. For the final research proposal, you will design an experiment or study to address a question related to one of these topics (you may also suggest topics not included in the course material if you have a specific interest). The proposal will be double-spaced and written in the format of a scientific article (using *Journal of Neuroscience* style), including title page, abstract, introduction, methods section (including the design of the experiment and how you intend to analyse the results), expected results (with mock graphs), and brief discussion. The introduction should be no longer than five pages and should refer to material from *at least five primary references* based on a literature search. The methods section should describe the proposed methodology in sufficient detail to be replicated and should be written in the future tense. The discussion should be no more than three pages long and should consider your predicted findings in the context of the literature presented in your introduction.

You will be penalized 20% per day for late submissions.

Assignment or Test	Due Date	Contribution to Final Mark (%)	Learning Outcomes Assessed
Midterm exam	Oct 25	25%	3, 4
Oral presentation	To be assigned	35%	1, 3, 4, 5
Research proposal	Dec 3	40%	1, 2, 4

Additional Notes (if required): N/A

Final examination date and time: N/A

Final exam weighting: N/A

Course Resources

Required Texts: N/A

Recommended Texts: N/A

Lab Manual: N/A

Other Resources:

Web site: lecture notes will be available on line before each class. Just logon to CourseLink using your U of G email username and password.

All **seminar papers** are available on CourseLink as pdfs. These should be read prior to the seminar in which they will be presented.

Field Trips: N/A

Additional Costs: N/A

Course Policies

Grading Policies

Students will be penalized 20% per day for late submissions of final papers.

Course Policy on Group Work: N/A

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. 56208 or email accessibility@uoguelph.ca or see the website: [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 **November 2nd, 2018**.

For regulations and procedures for Dropping Courses, see the Academic Calendar:

[Current Undergraduate Calendar](#)