

Neurobiology of Learning and Memory

PSYC 3301/BIOL 4142/NRSC 4442

Tentative 2023

Professor: Mary Ellen Kelly, PhD, kellymek@sas.upenn.edu

Course Description:

This course will survey the neural basis of learning and memory using a multi-level approach. As with many topics that concern the study of brain and behavior, scientists have explored our ability to learn and remember using a diverse array of techniques, approaches, and perspectives. The course will highlight classic studies that proved instrumental in shaping our current understanding of learning and memory. From early studies with the *Aplysia* to the detailed assessment of patient H.M, these studies exemplify how such diverse approaches can enhance our understanding of human cognitive processing. The course will highlight current theories of how memory is structured, the neural substrates that support such memories and the molecular and physiological processes involved in both learning and memory. We will review the sophisticated animal models of learning and memory that have enhanced our ability to study complex mental processes in novel ways. The semester will culminate with a broader discussion of how learning and memory is influenced by sleep, hormonal fluctuations, aging and disease. The course will involve both formal (interactive) lectures, seminar style classes that incorporate student presentations, small class activities and at least one guest lecture.

Course Learning Goals:

1. Students will build on their understanding of foundational neuroscience concepts through an in-depth exploration of learning and memory.
2. Students will appreciate the diversity of approaches and the multi-disciplinary tools used to advance our understanding of learning and memory.
3. Throughout the semester, we will appreciate how many of the concepts discussed in class have connections to development, aging, education, and disorders of the nervous system.

4. Students will continue to enhance their analysis of empirical research, critically reviewing the design and interpretation of primary literature. It is hoped that throughout the course, through the class discussions and presentations, students will continue to build on their skills of communicating scientific information.

Readings:

- Though there is no assigned text for this course, access to an introductory level textbook on Brain and Behavior is recommended.
- Background readings (e.g., review articles and book chapters) and primary literature (journal articles) will be distributed electronically via Canvas. Assigned readings should be read prior to class.

Assessments and Grading:

Given that the majority of course content can only be garnered from the lectures and class discussions of journal articles, attendance is important to your learning. However, as with previous semesters since March of 2020, there is flexibility in attendance requirements as the health and safety of our learning community within the class is a key consideration. Thus, I ask that should you need to miss class you communicate this information prior to class and if possible, submit the weekly assignment or discussion prompts. In that way I can incorporate your comments into our class discussion. Should you miss more than 3 classes throughout the semester, we will work together to ensure you are able to meet the course objectives/goals.

Grading:

Participation (readings/assignments/class activities/discussion)	25 %
Mini-Assignments (3 throughout the semester)	20 %
Student Seminar	20 %
Research Proposal Poster Session	10 %
Capstone: Research Proposal	25 %

Participation: (25%)

- Overall participation marks will be dependent on class participation, completion of class assignments/activities (not graded). Part of this

component of the course grade will involve completion of thought papers and/or exercises (see below).

- Thought prompts related to readings will be posted on canvas. These exercises are designed to stimulate your thinking and processing of the course material and to help us focus seminar discussions on what resonated most with the class.
- Please see rubric for more information

Mini-Assignments: (20%)

- These assignments will be take-home and open book and require students to integrate the material and readings discussed during class. There will be 3 mini-assignments throughout the semester.

Student-led Seminars: (20%)

- In a typical week, we will discuss one or two primary research papers as a class. These papers will be relevant and provide a 'deep dive' into the theme of the week. Each student will have the opportunity to present and lead the class through the discussion of a research paper. It is expected that students not presenting will have read the journal article prior to class and have prepared questions/comments for student presenters. A rubric will be posted shortly.
- The selection of a research paper will be a collaborative endeavor between myself and the presenters. Students will choose from 2 or 3 potential papers. These papers will be decided on 2 weeks before the presentation.
- *Graduate students in the class will be asked to develop a lecture style class on the weekly theme rather than a journal club presentation.*

Research Proposal and Poster Session: (10% + 25%)

- This project will provide students an opportunity to explore a topic of interest to them in more depth. Students will choose a topic within the field of learning and memory, synthesize current literature, and propose a novel direction for future research. In the final week of the semester, students will present their topic and proposal to their peers through an informal poster session-hopefully with the opportunity for refreshments. More details on this assignment will be provided during class. **Final papers will be due on the last day of the exam period.** The week following fall break, I will meet with each student to discuss potential topics and directions for this capstone project. There will not be formal classes during this time.

Grading Scale/Letter Grade Determination:

94.0% and above- A/4.0	80.0 – 82.99----- B- / 2.7	67.0-69.99—D+/1.3
90.0 - 93.99---- A- /3.7	77.0-79.99----- C+/2.3	60.0-66.99---D/1.0
87.0-89.99----- B+/3.3	73.0 – 76.99----- C/ 2.0	59.99 and less—F/0.0
83.0 – 86.99----- B /3.0	70.0 – 72.99---- C-/1.7	

Course Policies and Expectations:

COVID Policies: This may change in Fall 2023. *To ensure an equitable and inclusive classroom for all members of our classroom community, I am requiring masking. As noted already in the syllabus, there is flexibility in attendance so that should you have COVID, it is preferable that you not attend class. Reach out and we can make sure you are keeping up with all of the exciting topics to be explored this semester.*

It is important that students come to class having read and synthesized course readings. However, I also understand that despite our best efforts, there are times when this is not possible. I will allow up to 2 late submissions of weekly activities (reading related submissions) throughout the semester. Extensions for mini assignments are not routinely granted-though I ask that you reach out to me to discuss if you feel an exception to this policy is warranted. *Late submissions, without communication, will be subject to a 2-point deduction per day. This semester will work best if we are flexible with our expectations.*

Academic Integrity and Student Support Resources:

A reminder that the university provides a detailed Code of Conduct regarding academic endeavors. Please consult the following link to the [University's Code of Academic Integrity](#) if needed.

The university provides numerous resources for students that provide both academic and wellness support. Please contact this [link](#) for further information regarding student well-being.A