

BIBB/BIOL 442 - PSYC 421 - NGG 575

Neurobiology of Learning & Memory

Spring 2020

Monday + Wednesday, 2-3:20pm

318 College Hall

Professor: Hilary Gerstein, Ph.D.

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Office Location: Goddard Labs 203, Hamilton Walk

Office Hours: Tues 12:30-2:20pm or by appointment

Course Description

This course focuses on the current state of our knowledge about the neurobiological basis of learning and memory, integrating psychological methods and theory with the methods and concepts of neuroscience. How can changes in the brain underlie personal experiences? Where and how does the brain store the experiences that make us individuals? A combination of lectures & student seminars will explore the molecular, cellular, and systems basis of learning and memory in invertebrates and vertebrates from a behavioral & neural perspective.

Webpage & Email

The course webpage is available on Canvas. There you will find this syllabus, lecture slides, all required readings and other course materials. You are expected to check both your college email and the Canvas page frequently for course announcements and updates on readings and assignments. I will respond to emails when I can (usually within 24h), but do not expect quick responses during weekend and evening hours and plan accordingly.

Course Policies and Requirements

Syllabus + Readings: This syllabus is your primary source of information about the policies and schedule of the course. If it's in the syllabus, you are responsible for it. This syllabus is provisional and subject to change. You are expected to do the readings as assigned, available on Canvas. Class time will be spent on discussion of the assigned readings, and it will be difficult to fully participate without having prepared.

Lectures: **Tuesday class meetings will usually be lecture-style.** Lecture slides will be posted on Canvas after lecture, however, to succeed in this course, it is recommended that you attend the lectures. If you miss a lecture, you should attempt to get the notes of a fellow student who did attend, as the slides lack detail for which you will be responsible. Some meetings will feature small group discussions or activities. All students are expected to participate fully and listen to, and respect, everyone else in their group and in the class. Each group will hand in 1 copy of any work generated in class, but each student will receive their own grade.

Student-led Seminars: **Thursday class meetings will usually be student-led seminars** discussing important papers in the field. As a seminar style course, attendance and participation are mandatory. As a courtesy to your fellow students, please make an effort to be on time; your participation grade will suffer if you are habitually late. At minimum, *each student is expected to speak and contribute to the discussion ~3 times during each seminar* as part of their participation grade (participation in all Tues classroom activities is also expected). Asking questions about something in the papers counts as speaking/participation, chances are other students have similar questions, so speak up! If you miss a seminar class meeting, you may contact me (prior to the absence if possible) to make up your participation. 'Entry Tickets' on the reading will be required for each seminar and are to be uploaded to a dedicated assignment dropbox on Canvas the evening prior to the seminar meeting.

Note Taking & Technology: Laptops and tablets are welcome in class, but be mindful of their use and please only use them for note taking, paper reading, and for classroom activities as directed. More broadly, be

considerate: it is distracting for your fellow students if you are accessing e-mail or online in class; research has found that laptop use impairs academic performance for laptop-users and also those around them.

Cell phones must be on silent and stowed away during class unless permission is given for their use in a specific activity. Always bring a pen and paper with you as I will sometimes ask you to complete written or drawing activities in class.

Accommodations & Academic Integrity: Any students with documented academic accommodations or learning disabilities should discuss them with the instructor by the second week of class and register with the Office of Learning Resources at the Weingarten Center (www.vpul.upenn.edu/lrc). In a crisis situation, you are encouraged to contact CaseNet for support (col-casenet@groups.sas.upenn.edu). Penn has strict rules on academic integrity (see www.upenn.edu/academicintegrity) - violations of the rules will be reported to the Office of Student Conduct and will likely result in automatic failure of the course.

Undergraduate Grades

- 20% Midterm Exam (Feb 19th)
- 30% Final Exam (May 6th)
- 30% Seminar Facilitation/Presentation
- 20% Overall Participation

Graduate Student Grades

- 15% Midterm Exam
- 20% Final Exam
- 30% Seminar Facilitation/Presentation
- 20% Overall Participation
- 15% News & Views Paper (due April 8th)

Exams: There is a midterm exam and a final exam, both of which will be taken on the dates above. The midterm will be taken during normal class meeting time. The final exam will take place from 9-11am on Wednesday, May 6th (location to be assigned by the registrar in April). Illness, religious holiday, and other valid reasons for taking the midterm exam at a different time should be brought to my attention as early as possible, ideally prior to said exam.

Seminar Facilitation: I will hand out a separate sheet with details on what is expected of you when you lead class discussion on your paper. I will also lead a seminar on February 17th as an example of how to create slides and how to facilitate a discussion. Sign-ups for facilitation dates will occur the second week of class once the roster is finalized, so please make sure you are aware of major conflicts (trips, exams/projects for other courses, other responsibilities) in your semester and have your calendar with you on Jan 22nd.

News & Views Paper (Grad Students Only): Please refer to the supplemental document for details on what is expected from the News & Views Paper. Only graduate students registered for NGG 575 are required to submit the News & Views Paper, however, undergraduates may petition the instructor to complete the assignment if they wish their midterm and final exams to count for a smaller percentage of their grade. Permission will be granted on a case-by-case basis. The journal article on which students will base the News & Views Paper will be selected by the instructor and distributed in early March (one month before it is due).

COURSE SCHEDULE

Week	Monday	Wednesday
1		January 15 <i>Introduction, Basic Concepts, Historical Background</i>
2	MLK Day NO CLASS	January 22 <i>Action Potentials, Synaptic Plasticity, Modeling of Memory in Aplysia</i>

3	January 27 <i>LTP/LTD as types of Synaptic Plasticity</i>	January 29 <i>Strengthening Synapses, AMPA & NMDA Receptors</i>
4	February 3 <i>Phases of LTP, AMPA Receptor Trafficking</i>	February 5 <i>Molecules & Receptors in Late Phase LTP</i>
5	February 10 <i>LTP Stabilization, Synaptic Tagging & Capture</i>	February 12 <i>PKMζ Controversy</i>
6	February 17 <i>Seminar: Memory Formation</i>	February 19 Midterm
7	February 24 <i>Memory Consolidation & Reconsolidation</i>	February 26 <i>Seminar: Consolidation, Drosophila memory</i>
8	March 2 <i>Memory, neurogenesis & the hippocampus</i>	March 4 <i>Seminar: Neurogenesis</i>
9	SPRING BREAK	SPRING BREAK
10	March 16 <i>Space, Place, Time</i>	March 18 <i>Seminar: Place cells, Time cells</i>
11	March 23 <i>Amygdala, emotion, and memory</i>	March 25 <i>Seminar: Fear conditioning, Extinction</i>
12	March 30 <i>Learned behavior, basal ganglia, and memory</i>	April 1 <i>Seminar: Song bird studies, language</i>
13	April 6 <i>Human memory and the Prefrontal Cortex</i>	April 8 <i>Seminar: Cogneuro memory methods</i>
14	April 13 <i>Homeostatic Plasticity</i>	April 15 <i>Seminar: Homeostatic Plasticity</i>
15	April 20 <i>Seminar: False/Implanted memories</i>	April 22 <i>Seminar: Aging and memory</i>
16	April 27 <i>Seminar: Topic TBA</i>	April 29 Wrap Up & Review

Wednesday, May 6th @ 9am = Final Exam