

PSYCGU4482 Neural Plasticity

Days/Times: Wednesdays from 4:10pm – 6:00pm

Location: tbd

Name of Instructor: Tina Kao, PhD

Email of Instructor: tk2436@columbia.edu

Office Hours: tbd, email to schedule

Office Location: 500 Schermerhorn (if facing the elevators on the 5th floor of SCH, make a left to pass the double doors). If the door to the hallway is not opened, ring the white bell.

Name of TA: Lily Foroozan

Email of TA: Inf2125@columbia.edu

Office Hours: tbd, email to schedule

Overview

This seminar provides an overview of the mechanisms associated with neural plasticity. Students will obtain a basic working knowledge of the different types of neural plasticity, and how these affect cognitions and behaviors. Topics will vary weekly, and original scientific research articles, along with original scientific review articles, will be interpreted and discussed. The topics to be addressed range from structural, functional, injury, experience, and activity induced neural plasticity. The scientific articles will encompass data collected from both human and non-human models.

Upon successful completion of this seminar, students will be better able to:

1. understand the mechanisms of different forms of neural plasticity;
2. evaluate and critique current scientific findings in this dynamic field;
3. prepare students to approach scientific questions with vigor and validity, and therefore, be better at objective, critical and analytical thinking.

Prerequisites

PSYC UN1001 The Science of Psychology, or an equivalent introductory psychology course, plus PSYC UN2430 or PSYC UN2450 or another intermediate-level course in neuroscience, and instructor permission.

Contributions to Curriculum

GU4482 is a seminar course open to graduate and advanced undergraduate students.

This course fulfills the following degree requirements:

- For students pursuing a Psychology major and the Postbaccalaureate Certificate Program in Psychology, this course fulfills the seminar requirement.
- For students pursuing a Psychology major or concentration and the Postbaccalaureate Certificate Program in Psychology, this course fulfills the Group II: Psychobiology & Neuroscience distribution requirement.

- For students pursuing a Neuroscience & Behavior major, the course fulfills the P5 Advanced Psychology Seminar requirement.

Format

Basic background concepts of the very diverse fields of plasticity of the nervous system will be presented and serve as the core knowledge associated with the weekly topics. For the weekly topics, reading assignments will consist of scientific literature from journals relevant to Psychology and Neuroscience. Readings will be made available through Canvas. Most of the classes will consist of a lecture overview during the first half of class time, taught by the professor, followed by presentations and discussions of the assigned readings, led by a student, during the second half of class time. A final paper will be required for each student. This paper will be written like that of an original scientific review article. For this paper, students can choose their topic of interest (within neural plasticity).

Requirements

Postings of insightful and thought-provoking comments/questions on the original research article to be discussed in class (36%)

On a weekly basis, each student will be required to read 1) the assigned *original review article*, along with 2) the assigned *original research article*. ***By 9am, the Monday before each class***, each student, other than the student presenter(s), must post substantial comment(s), question(s), or thought(s) on the original research article to be discussed for the following class.

Your discussions are required to critique/address the contents of the actual original research article being assigned for the week. Do not only include the following for your discussion: what future works should address about the topic at hand, what other works have addressed about the topic at hand. If I read your posts, and it is clear to me that you have not read the research article, points will be deducted.

Discussions will be seen by everyone on Canvas. Discussions will be seen by everyone on Canvas. No late submissions will be accepted

Presentation(s) of assigned original research article (25%)

Each week, different student(s) will present their assigned original research article (students do not need to present on the respective assigned review article). Based on enrollment, which may change, it is anticipated that each student will be required to present one assigned original research article during the semester. This presentation should incorporate the use of visual aides.

Original mini review paper (30%)

Throughout the course, students will gain increasing familiarity of peer reviewed original review articles, which are not the same as peer reviewed original research articles. Each student will be required to submit a paper written as an "original mini review" paper. Your original mini review paper can consist of any topic of your choosing that we have discussed during the semester. Required number of pages for this paper is

4-6 pages, and formatted as follows: one-inch margins, 12 times new roman font, and single space.

You will first be required to submit a one-page “proposal” describing the topic of choice you want to write about. Your topic of choosing is required to be within the scope of the way we define “neural plasticity” for the course. Since this paper will be an original piece of work by you, try not to limit yourself by repeating the themes of what you have learned/will learn, but rather, be creative and add your own mechanisms/systems/opinions about your topic of choice. Your 1-page proposal should be formatted as specified above, or points will be deducted. Additionally, a separate page of citations, in their entirety, will be required to be included as part of your proposal. Submission of these requirements will be worth 5% of the 30% of your final grade for the paper.

Upon instructor approval and/or editing of your proposal (above), you will then submit a 2-page draft (with the same required formats as specified above). This 2-page draft does not include your separate citations page, which is also required. This 2-page draft will elaborate on your approved/edited proposal. Again, since this mini review will be an original piece of work by you, try not to limit yourself by repeating the themes of what you have learned/will learn, but rather, be creative and add your own mechanisms/systems/opinions about your topic of choice. Submission of this 2-page draft, with a separate page listing the citations, will be worth 10% of the 30% of your final grade for this paper.

Finally, upon instructor edition of your 2-page draft (above), you will submit the final version of your original mini review (with the same required formats as specified above). This final version should be 4-6 pages (not including the citations page). Your final version will be worth 15% of the 30% of your final grade for this paper.

Late submissions of any of the above requirements will not be permitted. Additionally, I am not inherently opposed to using chatgpt to help you generalize ideas for your topic for this paper, BUT I am vehemently opposed to using this LLM, known as chatgpt, to generate the contents of your paper. That is, I can tell the difference when students are not comprehending what they are writing. Therefore, I reserve the right to give you a 0, for any of the above requirements, if I believe any of your writing is generated or created by chatgpt.

Participation (9%)

Students are expected to attend every class session, and to complete all the requirements by their respective due dates/times.

Weekly Schedule*

*Note that readings and topics may be subject to change based on student enrollment, and topic preferences. Instructor plans on finalizing the readings/topics by the second week of class.

September 9: Introduction and Overview

September 16: Functional neural plasticity of reorganized cortical maps after spinal cord injury

Presenter: Tina Kao

September 23: Structural neural plasticity and behavioral abilities in the blind

Presenter(s):

September 30: Functional (behavioral) neural plasticity associated with musical training

Presenter(s):

October 7: Functional and structural synaptic plasticity enhanced with exercise (LTP)

Presenter(s):

October 14: Associative plasticity and induction of LTD

Presenter(s):

October 21: Classical conditioning and structural neural plasticity of the olfactory system

Presenter(s):

October 28: Behavioral and structural neural plasticity associated with deep brain stimulation and stress

Presenter(s):

October 29: Physical conditioning on behaviors of sensorimotor gating presumably due to neural plasticity

Presenter(s)

November 4: Neural plasticity associated with expert dance training

Presenter(s):

One-page "proposal" of original mini review due by 4:10pm November 4.

November 11: Structural and functional neuroplasticity associated with cognitive behavioral therapy

Presenter(s):

November 18: Functional neural plasticity of mirror visual feedback

Presenter(s):

Two-page draft of original mini review due by 4:10pm November 18.

November 25: No class, Happy Thanksgiving!

December 2: Epigenetic neural plasticity and exposure-based therapy for PTSD

Presenter(s):

December 9: Functional neural plasticity of meditation

Presenter(s):

December 11: Final original mini-scientific review paper due by 5pm