Introduction to Neuroscience-Course Description

Ekaterina Likhtik Ph.D. el1417@hunter.cuny.edu
Allyson Friedman, Ph.D. afriedman@genectr.hunter.cuny.edu

BIOL 2700
Course code: 44777
Lectures: Mon, Thursday: 9:45 am -11:00 am
Location: Rm. 406 West building
Virtual office hours: Dr. Friedman: Mon 2-4
Dr. Likhtik: Wed 9-11
(appointments can be made on navigate)

COURSE DESCRIPTION: This is a one-term lecture introductory course. The main focus is to provide an understanding of the principles underlying the function of the nervous system while comprehending certain experimental procedures that have led to this knowledge. In the first part of the course, the cellular and molecular mechanisms that regulate the activity of individual neurons will be discussed. Then, based on model systems, we will examine how neurons are assembled in networks to give rise to function. Finally, topics related to the development, maintenance, and plasticity of these networks will be covered.

Learning Objectives:
1) Describe the ionic basis of neuronal membrane potentials.
2) Understand the principles of chemical synaptic transmission.
3) Describe the basic features of nervous system organization and circuit function.
4) Understand the processes by which physical stimuli are transformed into electrochemical signals by the five senses (sensory transduction).
5) Interpret and evaluate primary literature.

Prerequisites: BIOL 101 & BIOL 102

Textbook (required): "Neuroscience", fifth edition. Dale Purves, George J. Augustine, David Fitzpatrick, William C. Hall, Anthony-Samuel LaMantia, Leonard E. White, Eds. Sinauer Associates.

Hybrid Class Format:
Class is a combination of synchronous lectures, asynchronous topic modules, and in-person lessons that will incorporate data-interpretation workshops and lectures.
Synchronously: Lectures at the designated class time.
Asynchronously: Coursework and topic modules that you can complete at your own pace. You will not see a time indicated in CUNYFirst.

COURSE REQUIREMENTS:
Reading: Assigned textbook chapters and additional handouts or reading assignments to accompany the reading and lecture material will be available on BlackBoard.

Examinations : There will be 2 written exams based on the lecture material. None of the exams will be cumulative; however, as the term progresses new information will be based on information provided previously. Various types of questions (e.g., multiple-choice, short-answer, fill-ins, true-false, problem solving, matching) will be included. If you are going to miss an exam, you must contact one of the instructors before the exam takes place, and you must produce a written excuse from your doctor or the dean's office. If you miss an exam and you do not contact the instructor before the exam, you will receive a score of zero (0) for that exam.

Assignments/Quizzes : Assignments are given either to a group working together based on workshop activities or individually. During a workshop groups of students work together, but each group member submits their own written assignment. Assignments are due 1 week after the workshop. Periodic low-stakes quizzes will be given to test overall understanding of the material.

Group Presentation **:** Groups of 4 students will put together a scientifically accurate and informative investigative research project that you will present to the class. You will provide background on the topic, collect/analyze/graph and discuss findings in context of the previous lecture materials. This is an opportunity to dive deeper into a particular research topic and share your interest with the class.

Effort and Participation:
A student who doesn't log in, doesn't come to class, and never takes a quiz receives 0%.
A student who logs in/ comes to class but never participates (never asks or answers questions, never partakes in discussion or discussion boards, quizzes) receives 5-6%.
A student who logs in/ comes to class, asks us questions if they don't understand something, brings up an idea they would like to discuss, speaks up if what we are saying isn't making sense to them, asks "what if" or clarifying questions of us or their classmates after a presentation, etc receives 7-10%.

Grade distribution:

2 exams	40% of final course grade (20% + 20%)
Assignments/Quiz	25% of final course grade
Group presentation	25% of final course grade
Effort and participation	10% of final course grade

Policy on Academic Integrity

Academic integrity is a guiding principle at Hunter College. As stated in the Hunter Policy on Academic Integrity, "The College has the responsibility to review all charges of academic dishonesty and implement sanctions, including, but not limited to, failing the course, official transcript notation, suspension or expulsion from the College when it has been determined that academic dishonesty did occur. Academic dishonesty includes, but is not limited to, cheating, plagiarism, obtaining an unfair advantage, and falsifying records or documents whether intentional or not." **Plagiarizing on any assignment (e.g. HW assignments) will result in an F.**

Think about what it means to plagiarize : From Webster's New World College Dictionary (4th ed.): "plagiarize = to take (ideas, writings, etc.) from (another) and pass them off as one's own". Has anyone passed off your ideas as their own? Make appropriate references, including putting citations in quotes and with a proper reference in your written assignments whenever appropriate.

Behavior that is disrespectful to the instructor or fellow students during class will not be tolerated. **This includes exchanging electronic or other notes, web-surfing, talking amongst each other.**

Late submissions will result in a 50% reduction in score for the particular assignment. What is a late submission? All due dates refer to 11:59pm EST of the assigned day as the latest time when that assignment can be handed in and count as On Time. If the assignment is handed in after that, it will be counted as late. e.g. If an assignment is due on Sept. 1, that means that it has to be handed in by 11:59pm on Sept. 1st. If it's handed in on Sept. 2nd at 12:30am, it's late.

Netiquette

- Be on time.
- Respect the privacy of your classmates and what they share in class.
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Be respectful of each other. We're all in this together. Before posting a comment, ask whether you would be willing to make the same comment to a person's face.

CLASS SCHEDULE

Thursday, Aug. 26- Dr. Friedman- ZOOM
Class Welcome! Student Introductions

Introduction: Structure and diversity of neurons, glial cells.
Chapter 1. *Studying the Nervous System*

Monday, August 30, 2021 – Dr. Friedman- ZOOM
Chapter 2. *Electrical signals of nerve cells*

Thursday, September 2, 2021 – Dr. Friedman- ZOOM
Chapter 3. *Voltage-dependent permeability-The Action Potential*

Monday, September 6, 2021
No class, Labor Day

Thursday, September 9, 2021 - Dr. Friedman- ZOOM
Chapter 4. *Ion channel and transporters*

Model-Cell Workshop

Monday, September 13, 2021- Dr. Friedman- IN PERSON
Chapter 5: *Synaptic transmission*

Thursday, September 16, 2021
No class

Monday September 20th, 2021 – Dr. Friedman
Chapter 6: *Neurotransmitters and their receptors*

Group 1: Design, implement an experiment testing how fast your brain reacts to visual, auditory, and tactile stimuli.

Thursday, September 23, 2021 - Dr. Friedman
Chapter 7: *Molecular signaling within neurons*

Monday, September 27, 2021- Dr. Friedman
Chapter 7: *Molecular signaling within neurons*

Group 2: Design and implement an experiment testing the influence of caffeine on motor output (e.g. handwriting, weightlifting, running time, etc).

Thursday, September 30, 2021- Dr. Friedman
Chapter 8: *Synaptic Plasticity*

Monday, October 4th, 2021 -Dr. Friedman
Chapter 8: *Synaptic Plasticity*

Group 3: Design and implement an experiment that uses an activity to improve performance via synaptic plasticity and compare groups. (eg. non-dominant hand use, learn a new skill, puzzle, etc.)

Thursday, October 7, 2021- Dr. Friedman
Chapter 9: The Somatosensory system: Touch and Proprioception

Monday, October 11, 2021
No class College Closed

Thursday, October 14, 2021 – Dr. Friedman
Chapter 31: Memory

Group 4 :Design and implement an experiment utilizing the memory palace technique to test if you can improve the class's knowledge of transmitters and receptors (remember controls!).

Monday, October 18, 2021- Dr. Friedman
Chapter 10: Memory Pain
Neurotransmitter workshop -Crescent Loom.com

Thursday, October 21, 2021- Dr. Friedman
Exam Review

Group 5: Design and implement a simple experiment to test whether exercise affects memory (e.g. different kinds of memory).

Monday, October 25, 2021 Dr. Friedman
EXAM I
Thursday, October 28, 2021 - Dr. Likhtik

Index: Neuroanatomy

Monday, November 1, 2021 - Dr. Likhtik
Chapter 22 (pg. 495-505), Chapter 23 (pp. 507-521), Chapter 25 (pp. 559 - 575):
Glia: Circuit Building,Function, and Repair

Thursday, November 4th, 2021 – Dr. Likhtik
Chapter 11: The Eye and Phototransduction

Group 6: **Design and implement an experiment to test whether all group members have similar somatosensory fields. Use the Homunculus mapper to visualize your results. https://brainmapper.org/**

Monday, November 8, 2021 Dr. Likhtik
Chapter 12: Visual pathways and construction of the visual scene
Neural Networks workshop

Thursday, November 11, 2021 - Dr. Likhtik
Chapter 15: The Chemical Sense (Focus on olfactory & taste)

Monday, November 15, 2021 - Dr. Likhtik (SFN)
Chapter 13 and 14: The Auditory and Vestibular Systems
Neural Networks workshop assignment due

Group 7: Design and implement a simple experiment to test whether state (e.g. fatigue, hunger, etc.) affects bistable perception in humans.

Thursday, November 18, 2021- Dr. Likhtik
Chapter 28: Circadian Rhythms: Sleep and Wakefulness

Monday, November 22, 2021 – Dr. Likhtik
Chapter 18: Modulation of movement: lower motor neurons, motor cortex, and the basal ganglia
Motor Workshop

Thursday, November 25, 2021
Thanksgiving Holiday. University Closed

Monday, November 29, 2021 - Dr. Likhtik
The Hippocampus and cognitive spatial maps
Group 8: Design and implement an experiment to test the human ability to localize sound in space based on location around the body, and volume.
Motor Workshop Assignment Due

Thursday, December 2, 2021 – Dr. Likhtik
Chapter 29: Emotion

Monday, December 6th, 2021 - Dr. Likhtik
Neuroscience Techniques - Molecules to function, studying the structure and function of the nervous system
Chen F., Tillberg P.W., Boyden E.S. (2015) Expansion microscopy. *Science* 347: 543-548.
Kolar K., Weber W. (2018) Synthetic biological approaches to optogenetically control cell signaling. *Curr Opinions Biotech* 47: 112-119.
Hutchinson E.B., Schwerin S.C., Avram A.V., Juliano S.L., Pierpaoli C. (2018) Diffusion MRI and the detection of alterations following traumatic brain injury. *J Neurosci Res* 1-14.

Group 9: Design and implement an experiment determining the effects of context on memory encoding and recall.

Thursday, December 9, 2021 - Dr. Likhtik
Neurobiology of attention and prediction error learning

Monday, December 13, 2021- Dr. Likhtik

Review for Exam II

Group 10: Design and implement a simple test of how attention affects working memory (e.g. tv on, listening to music, noisey cafe, etc.)

Thursday, December 16, 2021 - Dr. Likhtik

Final Exam II.