NEUR327- Cellular, Neurophysiological, and Pharmacological Neuroscience

SPRING 2021/T 10:30-1:15AM/Online via Zoom

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Office Hours: By appointment
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OBJECTIVES:

- This is a core neuroscience course that teaches key cellular and molecular neuroscience concepts. We will discuss the properties and functions of cell membranes, organelles, receptor and channel proteins, and signaling as it pertains to neural cells.
- We will explore how a subset of neural processes contribute to neural functions in the context of memory and disease.
- Through a combination of lecture, in-class assignments, and student-centered participation you will gain knowledge not only in basic neuroscience but also in trending topics.

TEXTBOOK and NOTES:

- **Required**: Neuroscience 6/e, Purves et al. or older additions.
- PowerPoint slides for each chapter will be provided via Blackboard however these slides are **not complete notes**.

ATTENDANCE:

The course is online and synchronous meeting only once a week. Therefore, attendance and participation are essential for success.

SCHEDULE:

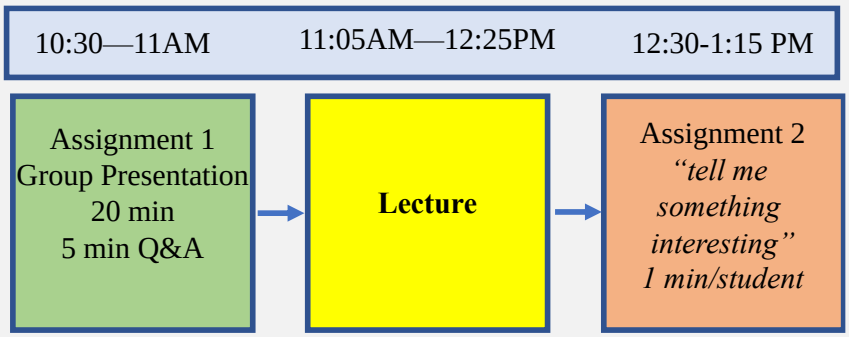
Jan 26: Studying the Nervous System Ch.1
Feb 2: Electrical Signals of Nerve Cells, Ch.2/Group Presentation 1
Feb 9: Voltage Dependent Membrane Permeability, Ch.3/ Group Presentation 2
Feb 16: Channels and Transporters, Ch.4/ Group Presentation 3
Feb 23: EXAM 1 (Ch. 1-4)

March 2: Synaptic Transmission, Ch. 5/ Group Presentation 4
March 9**:** Synaptic Transmission, Ch. 5/ Group Presentation 5
March 16: Neurotransmitters and their Receptors, Ch.6/ Group Presentation 6
March 23: Neurotransmitters and their Receptors, Ch.6/ Group Presentation 7
March 30: EXAM 2 (Ch. 5-6)
April 6: Molecular Signaling within Neurons Ch. 7/ Group Presentation 8
April 13: Molecular Signaling within Neurons Ch. 7/ Group Presentation 9
April 20: Synaptic Plasticity, Ch.8/ Group Presentation 10
April 27: Synaptic Plasticity, Ch.8
May 4: FINAL COMPREHENSIVE EXAM

CLASS STRUCTURE:

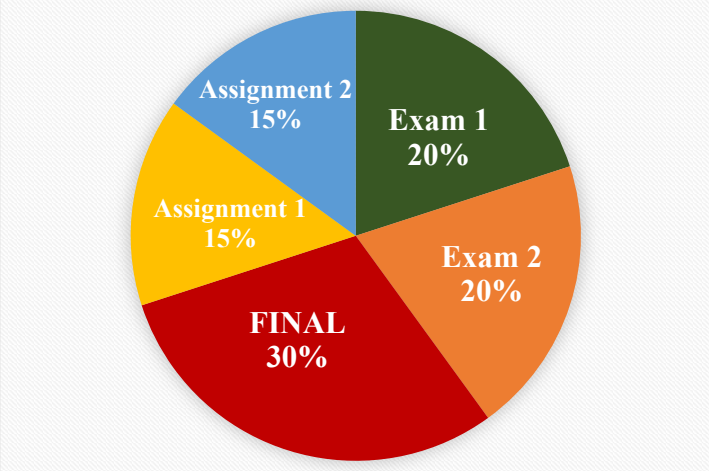
This is an online synchronous course, attendance and participation are required.

- You will be provided a weekly Zoom link prior to the first day of class.
- You must be signed into the Zoom link with audio (muted) and video turned on **by 10:30AM.**
- A noted absence (of two or more times) may result in a point deduction from the final grade.
- The weekly class time is divided into three parts with short breaks in between:



GRADES:

Your final grades will be calculated based on the following allocation:



1. **EXAMS**

- All of the exams will be administered through Blackboard an consist of multiple-choice/True-False questions.
- Exams will be available on the scheduled between 10AM and 2PM.
- Make up exams are not permitted.
- Exams 1 and 2 will consist of 25 questions while the Final exam will be based on 50 questions (½ new material and ½ old material).
- Exams are not open-book, and you must follow the GMU Honor Code.

2. **Assignments**

Weekly assignments aim to expand knowledge on key topics and allow for in class interactions.

Assignment 1: "Group Presentations"

- For this assignment, students will be divided into groups of 4 and each group assigned a topic the first day of the course.

- Students are asked to work together to create a 20 min presentation on their assigned topic. There will be time for 5 mins of Q&A after the presentation.
- The group will be graded collectively along the following rubric:

  50% content and accuracy

  50% clarity and organization

Group	**Topic**
1	In addition to neurons there are other excitable cells in the body. Name them and describe how "excitability" contributes to their function.
2	Neural oscillations (e.g. brainwaves) are rhythmic patterns of network activity. Name 1 or 2 natural oscillations and describe where and how they come to be and what they contribute to.
3	Seizures arise from irregular brain activity. What are the main kinds of seizures and what factors contribute to them? How are they treated/managed?
4	Neurodevelopmental disorders often arise in response to gene-environment interactions. Describe one such disorder and discuss how genes and environmental factors can contribute to it.
5	CNS infecting viruses (e.g. Rabies virus) enter neurons through synaptic endocytosis. Describe how the Rabies Virus enters nervous system and which molecular mechanisms are involved.
6	What is ketamine? Why is it in the news and how does it work?
7	Pick a class of hormone receptors and describe how they work in the brain.
8	Some pharmaceutical medications work by targeting cellular kinases. Name one such class drugs and describe how it works.
9	Visual processing in retina relies on light activated rhodopsin signaling. Describe this process.
10	Do plants have memories? Science suggests maybe. Discuss.

Assignment 2. "Tell me something interesting"

- For this assignment, students required to search major news and information sources for something that captures their attention and relates to the course in any small or big way.
- Each student will be given *a weekly minute of fame* to share with the class ☺