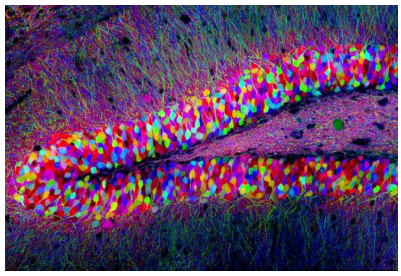
Introduction to Neuroscience

NEUR 101-001, Spring 2024



Instructor: Dr. Gwendolyn (Wendy) Lewis
Instructor e-mail: glewis13@gmu.edu
Course Time: Monday and Wednesday 12:00pm – 1:15pm
Course Location: Horizon Hall 5018
Credits: 3
Instructor Office: Krasnow 254
Office Hours: Drop-in office hours are held during the times below. If you are unable to attend a drop-in time, please email me to schedule an appointment.

- **Monday & Tuesday 2:30pm - 3:30pm (virtual or in-person).** Log in virtually https://gmu.zoom.us/j/4952912681 or come in person to Krasnow 254.
    - If multiple students need to meet at once, in-person visitors will get priority. I'll meet with students in the Zoom room in the order they entered. Please be patient if you are in the Zoom waiting room!
- **Friday 11:00am – 12:00pm (virtual only).** Log in virtually https://gmu.zoom.us/j/4952912681
- Office hours change sometimes, check the Announcements in Blackboard for updates

Course Overview

The nervous system controls everything we think, do, and feel. But how does it do this? And what happens when things go wrong? In this course, we will answer these questions by providing an introduction to the study of the brain (neuroscience). We will cover basic concepts in neuroscience such as neurons, action potentials, and synapses and examine their involvement in everyday life. We will explore what neuroscience has already uncovered about human development, aging, and disease. This course is meant serves an introduction to neuroscience for students of all majors.

Mason Core: Natural Science, Non-lab

This is a Natural Science, non-lab Mason Core course. This course aims to enhance your understanding of scientific inquiry by an introducing you to the tools and methods of neuroscience as well as the application of emerging neurotechnologies for personal, medical, and social purposes.

Course Modality

This is an in-person, face-to-face course. There will be no concurrent instruction, meaning the class will not be streamed online or recorded, and students will not be able to attend virtually. If you are unable to come to class due to illness or other issue, please see the policy under Attendance and Late Work below.

Blackboard Login Instructions

Assignments will be posted and submitted to Blackboard. To access the course Blackboard site, log in to mymason.gmu.edu and select the Courses tab. Under the course list, select the current semester (Spring 2024) and click the course number for NEUR-101-001.

Office Hours and Course Help

Getting help is easy. I am available for office hours every week during the times listed at the top of the syllabus. Please check Blackboard Announcements for any adjustments to office hours. You can also get help by posting questions to the *Ask the Instructor* discussion forum in Blackboard.

Natural Science Core Learning Goals

Natural science learning goals and the course activities that support them are listed below.

- Understand how scientific inquiry is based on investigation of evidence from the natural world, and that scientific knowledge and understanding:
  a) evolves based on new evidence
  b) differs from personal and cultural beliefs
    - Evidence Based Science Unit
    - Neuroscience and Society Project

- Recognize the scope and limits of science.
    - Evidence Based Science Unit
    - Neuroscience and Society Project
    - Neuroethics Unit

- Recognize and articulate the relationship between the natural sciences and society and the application of science to societal challenges (e.g., health, conservation, sustainability, energy, natural disasters, etc.).
    - Neuroscience and Society Project
    - Methods and Emerging Technologies Unit

- Evaluate scientific information (e.g., distinguish primary and secondary sources, assess credibility and validity of information).
    - Evidence Based Science Unit
    - Sources Unit
    - Neuroscience and Society Project

Neuroscience Learning Goals

Neuroscience content-specific learning goals are listed below.

- Describe how the human nervous system is organized from development into adulthood.
- Understand the key mechanisms of brain activity such as action potentials and brain waves.
- Describe how the brain mediates our daily activities from sleep to eating to remembering.
- Appreciate how the nervous system controls complex activities such as movement.
- Understand the basis of key human brain diseases such as Alzheimer's and Parkinson's Disease.
- Find and interpret various types of scientific literature, distinguish the quality of and relevance of sources.
- Evaluate current ethical debates in neuroscience.
- Describe how current technology is used to advance understanding in neuroscience.

Textbook and Materials

No textbook is required. Open educational resources will be provided from various sources.

Grading Scale:

A+ = 97.00-100%, A = 90.00-96.99%, B+ = 87.00-89.99%, B = 80.00-86.99%, C+ = 77.00-79.99%, C = 70.00-76.99%, D = 60.00-69.99%, F = 0-59.99%

Grading and Assessments

Homework	10%
Neuroscience and Society Project	15%
Exams (3 x 25% each)	75%
Total Grade	**100%**

Homework: Approximately every other week there will be a homework assignment. These will help deepen your understanding of the lecture content. Homework assignments will be posted to and turned in through Blackboard.

Neuroscience and Society Project: The goal of this assignment is to apply your new knowledge of neuroscience to examine a current problem or social issue. Possible problems include:

- Drug and behavioral treatment for a mental illness in children
- Animal models of human brain disease (examples: Alzheimer's Disease, Schizophrenia)
- Human-machine interface technologies
- Treatment for nervous system disease
- Genetic testing for brain disease and/or intelligence
- Gene editing to treat brain disease

You will research your topic through primary scientific literature and prepare an informational flyer that defines and examines the problem through the lens of scientific evidence. Further details of the project will be provided.

Exams: There will be 2 regular exams and 1 non-cumulative final exam. These exams may consist of multiple choice, matching, fill in the blank or short answer questions. Students are allowed one 8.5 x 11 sheet of paper notes (front and back) during the exam.

Policies

Attendance: Attendance is expected and is essential for succeeding in the course. Material will be covered in class that is not contained in the slides. **Please do not come to class if you are sick!** If you are sick or have an emergency, contact me to determine what material is missed.

Late Work: Unless prior arrangements are made, late work will incur a deduction of 20% and will not be accepted more than two weeks after the due date. No late work will be accepted after the last day

of class. It is imperative that you contact me as soon as possible regarding any issues that may affect your ability to complete assignments.

Missed Exams: Make-up exams may be offered at the discretion of the instructor. Generally, a make-up exam will only be offered in case of emergency or illness and may require documentation. The request for a make-up exam must be submitted before the start of the exam, unless an emergency precludes it.

Extra Credit: You can earn up to 5 points of extra credit by sharing something to the "Cool Stuff" discussion board forum. You can earn 3 points for posting something interesting and neuroscience related to this forum, and 1 point for responding to another students post. You can earn an additional 5 points of extra credit by attending a seminar and writing a summary (details in the Assignments area of Blackboard). Extra credit will be added to the Exams grade at the end of the course. No additional or individual extra credit will be available.

Communication: If you need to contact me, please do so using e-mail **from your university account only**, and **include the course number and section in the subject line and include your name in the e-mail**. Check your e-mail and course Blackboard account daily and before each class meeting. I will use e-mail and Blackboard to communicate with you regarding changes related to the course, syllabus, and other essential information. You are responsible for all announcements posted and sent via Blackboard, e-mail, and made in class, whether you are present or not.

Conduct: Be kind and respectful to your classmates. Disrespectful behavior will lead to a potential deduction of points from the course, and an unhappy me.

Academic Integrity: Honesty and integrity are issues at the very core of this course and of science as a whole. George Mason has an honor code with clear guidelines for academic integrity. A few of the most important rules that pertain to this course are: 1) All work submitted must be your own should be done individually unless explicitly stated otherwise. You will be encouraged to discuss ideas, collaborate, and brainstorm with your classmates, but actual assignments need to be completed individually. 2) When referencing the work of others (this includes published and non-published work or ideas), full credit must be given through appropriate citations. 3) If you are ever unsure about the rules for an assignment, ask for clarification. Cheating and plagiarism of any form is not tolerated. Plagiarism means using the exact words, opinions, or information from another person without giving the appropriate credit. Per the Office of Academic Integrity, "subcategories of plagiarism include:

- Self-plagiarism: Intentionally or unintentionally using portions of one's old work for new assignments without appropriate attribution and/or advanced permission from the current course instructor
- Failure to adequately quote and/or cite sources or material
- False citation: This includes but is not limited to referencing work that does not appear in the indicated source."

Any offense will be referred to the academic integrity office and be dealt with in accordance with university regulations. Get more information about the Office of Academic Integrity here: https://oai.gmu.edu/. Get more information about plagiarism here https://oai.gmu.edu/mason-honor-code/what-is-plagiarism/ and tips for avoiding it here https://writingcenter.gmu.edu/writing-resources/citing-sources/plagiarism.

AI Text Generators: When explicitly stated by the instructor, Generative AI tools are allowed on the named assignment. Use of these tools on any assignment not specified will be considered a violation of the academic integrity policy. All academic integrity violations will be reported to the office of Academic Integrity. Use of Generative AI tools will sometimes be in alignment with the learning outcomes for this course; when meeting the outcome requires original human action, creativity or knowledge, AI tool use would not align with the stated course goals. Work produced with the aid of Generative AI is not without risk. You will be responsible for any incorrect, biased, or unethical information that is submitted and you must be transparent with your use, even on assignments where you are required to use Generative AI. A statement-of-usage is always required when using generative AI. Citations for source material are always required whether using generative AI or not.

Disability Accommodations

If you have a documented learning disability or other condition that may affect academic performance you should: 1) make sure this documentation is on file with Office of Disability Services (SUB I, Rm. 4205; 993-2474; http://ods.gmu.edu) to determine the accommodations you need; and 2) talk with me to discuss your accommodation needs.

Mason Diversity Statement

George Mason University promotes a living and learning environment for outstanding growth and productivity among its students, faculty and staff. Through its curriculum, programs, policies, procedures, services and resources, Mason strives to maintain a quality environment for work, study and personal growth. An emphasis upon diversity and inclusion throughout the campus community is essential to achieve these goals. Diversity is broadly defined to include such characteristics as, but not limited to, race, ethnicity, gender, religion, age, disability, and sexual orientation. Diversity also entails different viewpoints, philosophies, and perspectives. Attention to these aspects of diversity will help promote a culture of inclusion and belonging, and an environment where diverse opinions, backgrounds and practices have the opportunity to be voiced, heard and respected.*
** This is an abbreviated statement; full statement is available at http://ctfe.gmu.edu/professional-development/mason-diversity-statement/*

Privacy and E-mail Use

Students must use their MasonLive email account to receive important University information, including communications related to this class. I will not respond to messages sent from or send messages to a non-Mason email address. Student privacy is protected under FERPA (https://registrar.gmu.edu/ferpa/).

Student Services

- Learning Services (learningservices.gmu.edu/keeplearning/)
- University Libraries (library.gmu.edu)
- Writing Center (writingcenter.gmu.edu)
- Counseling and Psychological Services (caps.gmu.edu)
- See a longer list of Mason student support services posted on The Stearns Center website.

Add/Drop Deadlines

Deadlines for this semester can be found on the Mason Academic Calendar page.

All policies may be modified at the discretion of the instructor.

Course Calendar

NEUR 101-001 Spring 2024

Date	Topic	Readings and Assignments Due *All assignments are due before class (11:59am) and will be submitted to Blackboard unless noted. Read/Watch should be completed before class.*
Jan 17	Introduction/ What is Neuroscience?	
Jan 22	Cells of the Nervous System	**Read/Watch** • Know Your Neurons: The Discovery and Naming of the Neuron • Know Your Neurons: How to Classify Different Types of Neurons • 2-Minute Neuroscience: The Neuron • 2-Minute Neuroscience: Glial Cells
Jan 24 Virtual class	Building a Brain: Development Asynchronous videos	**Read** • The Life and Death of a Neuron • Watch Building a Brain videos
Jan 29	Building a Brain: Development	
Jan 31	Organization of the Nervous System	**Read/Watch** • The Brain (Bozeman Science) • Brain Evolution: Searching for What Makes Us Human
Feb 5	Organization of the Nervous System	**Homework 1 Due**
Feb 7	Action Potentials and Synapses	**Watch** • The Squids Giant Axons • 2-Minute Neuroscience: Action potential • 2-Minute Neuroscience: Synaptic Transmission
Feb 12	Action Potentials and Synapses	
Feb 14	*Scientific Principles I: Evidence-Based Science*	**Homework 2 Due** **Read** Shah et al. 2017 posted in Blackboard
Feb 19	*No Class- Study for Exam 1* *Virtual exam review in the evening, time TBD (will be recorded)*	Use Exam 1 Study Guide to study Submit topics for review
Feb 21	**Exam 1**	Make notes sheet for exam
Feb 26	The Senses Part 1	**Read/Watch** • McGurk effect • The more you hear the less you hear • Curse of living without pain Phantom Limbs
Feb 28	The Senses Part 2	**Read/Watch/Listen** • A Matter of Taste

		• Hearing Red, Tasting Blue Seeing in Tongues
Mar 4	**Spring Break!**	
Mar 6	**Spring Break!**	
Mar 11	The Senses contd.	
Mar 13	Movement	**Homework 3 Due** **Watch** • Mirror Neurons
Mar 18	Stress	**Watch** • 2-Minute Neuroscience: Hypothalamus and Pituitary Gland • 2-Minute Neuroscience: HPA axis
Mar 20	*Scientific Principals II: Sources and the Neuroscience and Society Project*	**Read** Neuroscience and Society Project Assignment Sheet in Blackboard
Mar 25 Possible Virtual Class	Emotion	**Homework 4 Due**
Mar 27 Possible Virtual Class	Spillover, Exam 2 Review	Review Exam 2 Study Guide Submit topics for review
Apr 1	**Exam 2**	
Apr 3	Blood and Barriers, Feeding and Motivation	**Read/Watch** • The Blood Brain Barrier (video and article) • What is Addiction? • 2-Minute Neuroscience: Nicotine
Apr 8 Virtual class Eclipse day!	Learning and Memory Prep Asynchronous videos	**Homework 5 Due** **Watch** • 2-Minute Neuroscience: Long-Term Potentiation • 2-Minute Neuroscience: Long-Term Depression
Apr 10	Learning and Memory	
Apr 15	Sleep and Circadian Rhythms	**Homework 6 Due** **Listen/Do** • Brains sweep themselves clean • Take the Morningness/Eveningness Questionnaire
Apr 17	*Scientific Principals III: Methods and Emerging Technologies*	**Watch** • Future You episodes (2) • Nature Video
Apr 22	*Scientific Principals IV: Neuroethics*	**Watch** • Neuroethics- the BRAIN Initiative
Apr 24	Injury and Regeneration	**Neuroscience & Society Project Due**
Apr 29	Neurodegenerative Diseases and Exam Review	Review Exam 3 Study Guide
Final Exam Monday May 6th 10:30am – 1:15pm		