

Molecular and Cellular Neurobiology

BIO 4690

Syllabus

Credits: 3

Time: M/W 2:30 – 3:45PM

Place: 0137 State Hall

Instructor: Dr. Justin Kenney

Biological Sciences Building, room 2117

Ph: 313-577-5943

Preferred method of contact: within Canvas

Office hours: By appointments scheduled in Canvas. Please sign up for time slots within Canvas, if you do not sign-up at least an hour ahead of time I may not be in my office.

Textbooks: The primary textbook for this course is: *Neuroscience: Exploring the Brain*, 4th Ed. By Mark Bear et al. ISBN: 978-0-7817-7817-6

A significant portion of lecture material is also derived from: *From Neuron to Brain*, 5th Ed. By John Nicholls et al. ISBN: 978-0-87893-609-0.

Course website: On Canvas

Course pre-requisites: Bio 3200 (Human Physiology) with a minimum of a C-

Course description

The way we define ourselves as embodied creatures is determined by how we interact with the world. In this course, you will learn about the molecular and cellular mechanisms underlying the ability of our nervous system to detect and process such external information. To achieve this goal, the class has been broken down into the following sections:

Unit I

1) *Electrical signaling in neurons*. This section focuses on how electrical signals are generated and propagated within a given neuron. You will also learn about the molecular basis for these processes.

Unit II

2) *Chemical signaling in neurons*. In this section you will learn about how neurons communicate with each other via neurotransmitters and their influence on electrical signaling.

Unit III

3) *Sensory systems*. In this section we will start to integrate our understanding of the electrochemical nature of neurons with a goal of understanding how external information is transduced into the language of neurons.

4) *Integrated systems*. In this section we will examine how the cellular and molecular mechanisms discussed thus far contribute to various important behaviors, higher level functions, and how they are disrupted in various neurological disease states.

Learning objectives

- An understanding of the molecular basis for how neurons process and transmit information using electrochemical signaling
- An understanding of how neurotransmitters contribute and modulate electrochemical signaling in neurons
- Introduction to the cellular and molecular basis for the senses
- Introduction to how the brain integrates electrochemical signaling to regulate various processes such as learning, memory and movement.
- An appreciation for the challenges involved in deciphering the functions of the nervous system

Grading

Exam 1	9/23	175 pts
Exam 2	10/21	175 pts
Exam 3	11/11	175 pts
Homework	Dates in canvas	175 pts
Final Exam	12/11	300 pts
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Total		1000 pts

Grades will be calculated on the following scale:

		A	92.5-100%	A-	90.0-92.4%
B+	87.5-89.9%	B	82.5-87.4%	B-	80.0-82.4%
C+	77.5-79.9%	C	72.5-77.9	C-	70.0-72.4%
D+	67.5-69.9%	D	62.5-67.4%	D-	60.0-62.4%
		F	0-59.9%		

I do not curve the grades, everyone can earn an A if they perform well. I do not offer extra credit.

Exams

There will be three midterm exams, each worth 17.5% of your final grade, and a cumulative final exam worth 30% of your final grade.

Students with any exam scheduling conflicts must notify Dr. Kenney by September 18th, 2019. There will not be any alternate make-up exams other than for University-sanctioned obligations, such as WSU team athletic competitions or University recognized religious holidays. No make-up exams will be given unless notified in writing by this date.

Reasonable exceptions will be granted in cases of illness, which will require notification prior to the exam and must be followed up with an original signed note from a physician.

Exam policies

- Exams may include multiple choice, fill-in-the-blank, problem solving, or short answers.
- All exams will be closed book and held in class.
- For exams you will only require a pencil and a calculator.
- Phones are **not** allowed and must be turned off.
- If you leave during an exam, you will not be allowed back in
- Late arriving students will not be allowed after the first student finishes the exam and leaves.

Exam grades will be posted on Canvas as soon as possible following the exam.

Homework

There will be homework assignments due throughout the semester (due dates within Canvas). Homework's will consist of online quizzes within Canvas. You will only have one opportunity to answer the questions correctly. You will be able to see your scores and correct answers after the due date has passed.

Grade disputes

- Students will have one (1) week after the return of an exam or an assignment to challenge a grade for any question with a written note providing an explanation.
- Failure to challenge the grade within this period indicates a willingness to accept the grade as is.
- The challenge should consist of a written description of why the answer is correct based on other published material that you cite.

Cheating

- A strict zero-tolerance policy for cheating will be enforced.
- Anyone caught cheating on an exam will receive a score of 0 (zero) for that portion of the grade.
- Students found to be cheating during an exam (using a "cheat sheet", looking at another's paper, or allowing another to look at yours), will receive a zero for that test with no opportunity to drop or replace that score.
- A second episode of cheating will result in a grade of F for the course and may also result in initiation of university disciplinary action.

Technical Support

WSU Computing and Information Technology (C&IT): For free help with campus computing, including email, Canvas, or your AccessID call (313) 577-4778, see computing.wayne.edu/ or email csthhelp@wayne.edu. Unfortunately, I am not trained to provide technical computing support.

Special considerations for students with disabilities

You need to register documented disabilities with Student Disability Services for coordination of your academic accommodations. They need a week or more to arrange accommodations, so make an appointment early. The Student Disability Services (SDS) office is located at 1600 David Adamany Undergraduate Library in the Student Academic Success Services department. SDS telephone number is 313-577-1851 or 313-577-3365 (TTY: telecommunication device for the deaf; phone for hearing impaired students only). Once you have your accommodations in place, I will be glad to meet with you privately during my office hours to discuss your needs. Please refer to the SDS website for further information about students with disabilities and the services we provide for faculty and students: studentdisability.wayne.edu/

Class

Please turn off your cell phones while in class. If you absolutely need to have your phone on because of a potential emergency, please put it on vibrate and sit near the door so you can excuse yourself if necessary (i.e. to answer the phone or text). Phones not only distract you but also those around you.

Lecture slides will be posted to Canvas before class.

Any issues that arise that are not in the syllabus will be dealt with according to University policies.

Unexpected closures

If the University is officially closed on an exam day, the exam will be held on the next regularly scheduled class day. Closure of the University is announced by the following mechanisms: 1) University Newsline (313) 577-5345 2) WSU Homepage (www.wayne.edu) 3) WSU Pipeline (www.pipeline.wayne.edu) 4) WDET-FM (Public Radio 101.9) 5) by other local radio and television stations.

Tentative schedule

Date	Topic	Chapter (Exploring Brain)	Chapter (Neuron to Brain)
Electrical Signaling in Neurons & Glial Cells			
8/28	Intro to neuroscience, nervous system and neurons	1,2,7(180-186)	1
9/2	<i>No Class – Labor day</i>	-	-
9/4	The resting membrane potential, ion channels, ion transport	3	6,9
9/9	Ion transport, the action potential	4	7,9
9/11	The action potential, voltage gated ion channels	4	5,7
9/16	Voltage gated ion channel, signal transmission	5 (133-136)	8
9/18	Glial cells	2	10
9/23	Unit Exam 1 (Electrical Signaling and glial cells)		
Chemical Signaling in Neurons			
9/25	General Principals of Synaptic Transmission	5	-
9/30	Synaptic Integration, Neurotransmitter release	5	13
10/2	Neurotransmitter systems	6	14, 15
10/7	Neurotransmitter systems	6	14, 15
10/9	Neurotransmitter Receptors & Signaling	6	12
10/14	Signaling, tripartite synapse	6	12
10/16	Synaptic Plasticity	25 (873-891)	16
10/21	Unit Exam 2 (Chemical Signaling & Plasticity)		
Sensory Systems			
10/23	Audition and Vestibular	11	19,22
10/28	Taste and Olfaction	8	19
10/30	Touch, Pain and Texture	12	19, 21
11/4	Vision	9,10	2, 20
11/6	Vision	9,10	2, 20
Integrated Systems			
11/11	Movement	13	24
11/13	Autonomic Nervous System	15	17
11/18	Circadian rhythms	1	-
11/20	Learning and memory	24,25	-
11/25	Learning and memory	24,25	-
11/27	<i>No Class – Happy Thanksgiving!</i>	-	-
12/2	CNS Diseases & Graduate student presentations	22	-
12/4	Unit Exam 3 (Sensory and Integrated Systems; NOT CNS diseases)		
12/9	Make-up lecture and/or review		
12/11	Final Exam (Cumulative)		

This schedule is **tentative** and may be altered. It is your responsibility to attend class to be aware of any changes.

For some materials supplementary readings may be made available on Canvas prior to class.

Anticipated homework due dates:

Homework #	Date	Time
1	Sept. 9 th	2:30 PM
2	Sept. 16 th	2:30 PM
3	Sept. 21 st	12:00 PM
4	Oct. 7 th	2:30 PM
5	Oct. 14 th	2:30 PM
6	Oct. 19 th	12:00 PM
7	Nov. 4 th	2:30 PM
8	Nov. 11 th	2:30 PM
9	Nov. 18 th	2:30 PM
10	Dec. 2	2:30 PM

NOTE: These due dates may change. If they do, it will be updated in Canvas. It will be your responsibility to keep up to date with any changes.