

Spring 2023

<b>Lecture time &amp; location:</b> Sator 108 (“Genetics Lab”) MWF 12:15 – 1:10 pm	<b>Instructor title and name:</b> Dr. Yoojin Choi <b>Phone:</b> (619) 849-2654
<b>Final Exam:</b> Fri May 5 10:30am – 1pm	<b>Email:</b> ychoi@pointloma.edu
<b>Office location and hours:</b> Rohr Science 188 MWF after chapel until 11:30am, Tue 10-10:30am & 2-2:30pm, Wed before chapel from 8:30am <ul style="list-style-type: none"><li>You’re welcome to come in and chat if my door is open at other times. Or if you prefer a designated meeting time, email me to set up an in-person meeting or a Zoom meeting.</li></ul>	

### PLNU Mission

### To Teach ~ To Shape ~ To Send

Point Loma Nazarene University exists to provide higher education in a vital Christian community where minds are engaged and challenged, character is modeled and formed, and service is an expression of faith. Being of Wesleyan heritage, we strive to be a learning community where grace is foundational, truth is pursued, and holiness is a way of life.

#### Course Description:

Bio 4070 Neuroscience is a study of the nervous system at the molecular, cellular, intercellular, and gross anatomy levels. Topics include neuroanatomy, nervous system development, neurons and glia, physiology of neurons, neural networks, and learning and memory. Diseases and conditions corresponding to the topics covered will also be discussed. Other possible topics include intelligence, language, and ethics. Some laboratory work is included during class meeting times.

#### Prerequisite: Biology 1040, Biology 2012, Biology 4023 or Psychology 3001

The university catalog specifically states that the prerequisites for this course are Biology 1040 Human Anatomy and Physiology 2, Biology 2012 Organismal Biology, Biology 4023 Advanced Human Physiology or Psychology 3001 Physiological and Neuropsychology.

#### Student Learning Outcomes:

1. Students will identify the major anatomical structures of the human central nervous system and their functions.
2. Students will demonstrate their understanding of electrical and chemical communication between neurons, supporting role of neuroglia for nervous system function, nervous system development, sensory and motor systems, and molecular mechanisms of learning and memory.
3. Students will explain the mechanism of neurons contributing to a complex phenomenon such as motivation, sexuality, emotion, sleep, language, or consciousness.

#### Required Text:

Reading the textbook should be the biggest component of your out-of-class study time. Read the assigned pages in the textbook before and after class.

Bear, M. F., Connors, B. W., & Paradiso, M. A. (2020). *Neuroscience: Exploring the Brain*. 4th edition. Jones & Bartlett Learning. ISBN: 9781284211283

You will need to access Canvas for handouts and course activities: [Canvas.pointloma.edu](https://Canvas.pointloma.edu).

## Spiritual Care

Please know that PLNU strives to be a place where you grow as whole persons. To this end, we provide resources for our students to encounter God and grow in their Christian faith. If you have questions or prayer requests and you feel comfortable talking to me, you are welcome to do so. "Office Hours" are drop-in time for students to have conversations about all topics, not just academics. If you want further support on your faith journey, you can contact [Student Life and Formation](#).

## Teaching and Learning Philosophy

You are the main player in your learning, not just a spectator of my teaching. Fundamentally, the responsibility to learn is yours and yours alone. For learning to happen, you must take an active role in the process. However, you are not alone in the process: I am here to work with you. Extending the sports analogy, your classmates are like teammates, and we learn together in community. There will be a lot of interactive learning in class. I expect you to pull your weight and collaborate actively. Let us all help in each other's learning.

You are expected to come to class prepared, which requires you to read, study, and learn *before* class. Of course, you're expected to keep reading, studying, and practicing after class, too. Invest your time in your own learning. For every "credit hour" in college, students are expected to spend one hour or more in class per week and two hours or more outside of class per week ("Credit Systems – US Department of Education", publication date unknown). In other words, for this 3-unit course, you should plan to spend a minimum of six hours per week outside of class studying this material.

## Evaluation

- Each student is responsible for tracking their grade throughout the semester. Use Canvas Grades.
- The final semester grade will be calculated as a percentage of 1000 points total. 500 points come from quizzes and exams; and 500 points come from other forms of assessment including Participation and Collaboration (100pts), assignments (250pts), and a project (150pts).

- **Participation and Collaboration** (100pts: 50pts per quad): We are expected to respect each other, have an openness of mind toward new points of view, and have curiosity for learning new material. You are expected to participate actively in all class activities in collaboration with classmates from diverse backgrounds.

Your active participation in class is critical to our collective understanding and growth. Make sure you prepare for every class in order to participate well. Simply attending class does not earn you 5 out of 5 points for a given recorded class. See Appendix: Participation and Collaboration Rubric (last page) to understand how you will be graded. Note that simply attending class does not merit 5 out of 5pts.

Participation and Collaboration will be recorded every class on a sheet of printed roster, then eight random records will be entered into Canvas Grades at the end of each quad (5 pts x 8 = 40 pts). If you are absent for a class meeting that happens to be selected, a zero will be entered. If the absence is excused due to an official University obligation (requiring prior notification from the administration and the student), you will receive a 3 out of 5. You can make up the "lost" points by participating on Canvas. See below.

In addition to in-person participation and collaboration, *online* participation and collaboration is *required*. Post questions and answer others' questions on the Canvas Discussion "Muddiest Point" (link on Canvas). The minimum requirement is that everyone posts at least one question (must be done by halfway point, 4<sup>th</sup> week and 12<sup>th</sup> week) and one answer (by 8am on the last Friday of before Spring Break and the Friday of the Final Exam). See "Muddiest Point" on Canvas for further instructions and grading guide.

There are several reasons for including online participation, which I implemented long before the COVID online switch. Having to think about what to ask has learning benefits, so everyone is required to ask at least one question. Explaining your answers to each other's questions in writing is a great practice for quizzes and exams, so everyone is required to answer at least once. This student-to-student conversation has been very useful for many past students who listed a variety of reasons (e.g. get extra help with questions, feel like they're not alone in not knowing something, use it as a study guide). I also respect individual differences in comfort levels about speaking up in person, so if you choose to not speak up in front of the whole class in person, you can participate online instead.

Extra online participation will make up for in-person participation for students who do not want to speak in class or must miss some classes. For example, if you earned anything less than 5 out of 5 from in-class Participation and Collaboration for any reason, you can earn back those points by participating online. Everyone is required to participate at a certain level, and above that, active online participation will make up for low in-person participation. Please see Canvas for further information.

I hope you can tell from the large amount of information in this section that I truly care about active participation from individual students and about collaboration between students. You are an active agent in your own learning, and we are learning together in community.

- **Learning Reflection Assignments (150pts):** Being aware of what you are learning and how you're learning it is an important metacognitive skill. To develop this ability, students will end every week by writing a Learning Reflection. A Learning Reflection is like keeping a log, summarizing what you learned, what you're struggling with, and how you plan to get those questions answered. Often, students feel like exam questions do not address what they consider important and/or what they learned and studied. The Learning Reflection can be a place to demonstrate your learning process apart from the exams.

In addition, I would like you to reflect on how the specific prerequisite course you took prepared you for that specific week's learning in Neuroscience. This exercise will help you connect the new knowledge to prior knowledge, and it will help me understand the path PLNU students take toward Neuroscience.

Each Learning Reflection entry will be graded for minimum length, thoughtfulness given to class content, and insight into the prerequisite(s). Feedback on writing mechanics may be given for your learning but will not affect your grade, unless the writing mechanics are so poor that they interfere with my comprehension of your writing.

Late assignments are accepted, but Canvas is set up to automatically take off 10% every 24 hours starting from the second it is late. See Canvas for more information.

- **End of Semester Reflection (50pts):** Making connections between seemingly disparate topics of study and observing one's growth as a student are important metacognitive skills. To encourage you to engage in their practice, I would like you to write an End of Semester Reflection, connecting all your coursework and activities from this semester/academic year and reflecting on your personal growth. See Canvas for more information. I will make it due on Monday of Finals Week to help you stay on track but will accept late work. The last day that any late assignment is accepted is Friday of Finals Week.

- **Small Assignments** (50pts): Several small assignments (each one approximately 5 pts) will be given throughout the semester as an encouragement to participate, to read before class, for formative assessment, and to provide constructive feedback. More information on Canvas.
- **Student-led Classes** (150pts): Students may work alone or in pairs, and teach the rest of the class their chosen topic in Weeks 11 and 12. Students will choose their topic of interest before Spring Break, have their progress checked by me, and teach the class.
  - Student or pair will choose their topic of interest from a pre-determined list of topics. Student or pair will make their own timeline of checkpoints with me, instead of having check-in times imposed on them. Each student or pair must check in at least twice before the presentation. The last date for a checkpoint is Mar 27 (two days before the first Student-led Class). The sequence of presentations will be determined once everyone chooses a topic. Everyone should assume they are presenting in week 11, until otherwise announced. See Canvas for more information.
  - In a given student-led class, student presenters will be assessed on their ability to communicate the topic and engage their students (80pts), and student audience members will be assessed on their engagement with the presenters (20pts). See Canvas for more information and rubrics. After all student-led classes, all students will be assessed on their content knowledge on Quiz 3 and the final exam. All students are responsible for learning the material presented by their peers.
  - Student presenters will write quiz questions for their topic (40pts), I will choose the questions, and student presenters will grade their classmates' answers (10pts). For the final exam, I will modify student questions. See Canvas for more information.
- **Exams and Quizzes** (340pts): In the first quad, there are two quizzes and a midterm exam. After Spring Break, there is a quiz and two unit exams. Each quiz is approximately 30-40 points and takes half a class period. Each exam is 80 points and takes the whole class period. The format is appropriate to the specific content being covered. The dates are indicated in the Tentative Schedule below. Quizzes and exams can only be rescheduled with advance notice and with a valid reason, such as an official University obligation (requiring prior notification from the administration and the student).
- **Final Exam** (160pts): The Final Exam is cumulative. According to the University's Final Exam Schedule, ours is scheduled for Friday, May 5 at 10:30am. The Final Exam cannot be rescheduled except in extenuating circumstances.

**Your letter grade will be determined from your cumulative percent score as follows:**

<b>A:</b> 93.0—100%	<b>B-:</b> 80.0—82.99	<b>D+:</b> 67.0—69.99
<b>A-:</b> 90.0—92.99	<b>C+:</b> 77.0—79.99	<b>D:</b> 63.0—66.99
<b>B+:</b> 87.0—89.99	<b>C:</b> 73.0—76.99	<b>D-:</b> 60.0—62.99
<b>B:</b> 83.0—86.99	<b>C-:</b> 70.0—72.99	<b>F:</b> ≤ 59.99

- To model professionalism, I strive for honest and timely feedback, and transparency and fairness in grading. Grades are posted on Canvas Grades. Please ask about grades as soon as you have a question. Do not wait until the end of the semester. The course follows a straightforward point system, so there is no need for “negotiating” over letter grades at the end of the semester.
- Records are kept for one year from the end of the semester.

## Laboratory Safety and Clean-Up:

Although Bio 4070 Neuroscience does not have a formal and separate lab component, we will spend three class periods for the Neuroanatomy unit doing hands-on activities in laboratories. Dissection tools and safety glasses will be provided, but you are welcome to bring your own particularly if you are concerned about quality of the tools and/or hygiene of shared safety glasses.

- **No food (including gum) or water in the laboratory.**
- **Keep all backpacks and other personal materials stored as instructed, such that no one could possibly trip over these items.**
- **Enclosed shoes are mandatory. Open-toed shoes, clogs, or sandals are not permitted. You cannot wear shoes that expose the top of the foot.**
- On dissection days, tie long hair and remove or tuck in any loose-hanging accessories (e.g. lanyard, necklace, hoodie strings, bracelets). Also bring a writing utensil that you don't mind getting dirty from the specimen preservatives.
- At the end of each laboratory period make sure that your table and the equipment you've used have been **cleaned and returned** to its appropriate place. Points are deducted for messes not cleaned up.

## PLNU Policies

### STATE AUTHORIZATION

State authorization is a formal determination by a state that Point Loma Nazarene University is approved to conduct activities regulated by that state. In certain states outside California, Point Loma Nazarene University is not authorized to enroll online (distance education) students. If a student moves to another state after admission to the program and/or enrollment in an online course, continuation within the program and/or course will depend on whether Point Loma Nazarene University is authorized to offer distance education courses in that state. It is the student's responsibility to notify the institution of any change in his or her physical location. Refer to the map on State Authorization to view which states allow online (distance education) outside of California.

### PLNU COPYRIGHT POLICY

Point Loma Nazarene University, as a non-profit educational institution, is entitled by law to use materials protected by the US Copyright Act for classroom education. Any use of those materials outside the class may violate the law.

### PLNU ACADEMIC HONESTY POLICY

Students should demonstrate academic honesty by doing original work and by giving appropriate credit to the ideas of others. Academic dishonesty is the act of presenting information, ideas, and/or concepts as one's own when in reality they are the results of another person's creativity and effort. A faculty member who believes a situation involving academic dishonesty has been detected may assign a failing grade for that assignment or examination, or, depending on the seriousness of the offense, for the course. Faculty should follow and students may appeal using the procedure in the university Catalog. See [Academic Policies](#) for definitions of kinds of academic dishonesty and for further policy information.

The laboratory portion of the course has two practical exams. Since these exams are administered in the lab, they cannot be given to the entire class at once, but must instead be given to smaller groups of students at separate times. Any discussion of the content of the exam between a student who has taken the practical exam with another student who has yet to take the exam will be considered to be cheating on the part of both students, and dealt with as described above.

### PLNU ACADEMIC ACCOMMODATIONS POLICY

PLNU is committed to providing equal opportunity for participation in all its programs, services, and activities. Students with disabilities may request course-related accommodations by contacting the Educational Access Center (EAC), located in the Bond Academic Center ([EAC@pointloma.edu](mailto:EAC@pointloma.edu) or 619-849-2486). Once a student's eligibility for an accommodation has been determined, the EAC will issue an academic accommodation plan ("AP") to all faculty who teach courses in which the student is enrolled each semester.

PLNU highly recommends that students speak with their professors during the first two weeks of each semester/term about the implementation of their AP in that particular course and/or if they do not wish to utilize some or all of the elements of their AP in that course.

Students who need accommodations for a disability should contact the EAC as early as possible (i.e., ideally before the beginning of the semester) to assure appropriate accommodations can be provided. It is the student's responsibility to make the first contact with the EAC.

### PLNU ATTENDANCE AND PARTICIPATION POLICY

Regular and punctual attendance at all class sessions is considered essential to optimum academic achievement. If the student is absent for more than 10 percent of class sessions, the faculty member will issue a written warning of de-enrollment. If the absences exceed 20 percent, the student may be de-enrolled without notice until the university drop date or, after that date, receive the appropriate grade for their work and participation.

### SEXUAL MISCONDUCT AND DISCRIMINATION

Point Loma Nazarene University faculty are committed to helping create a safe learning environment for all students. If you (or someone you know) have experienced any form of sexual discrimination or misconduct, including sexual assault, dating or domestic violence, or stalking, know that help and support are available through the Title IX Office at [pointloma.edu/Title-IX](http://pointloma.edu/Title-IX). Please be aware that under Title IX of the Education Amendments of 1972, it is required to disclose information about such misconduct to the Title IX Office.

If you wish to speak to a confidential employee who does not have this reporting responsibility, you can contact Counseling Services at [counselingservices@pointloma.edu](mailto:counselingservices@pointloma.edu).

# Tentative Schedule

Bio 4070 Spring 2023

Week#	Date	Topic	Reading
1	1/10 Tue	Intro to the course and each other	Ch 7 p.179-191 & Table 7.1, 7.2 (p.192)
	1/11 Wed	Sheep brain dissection lab	Ch 7 Appendix p.220-237
	1/13 Fri	Human CNS observation lab	Ch 7 Appendix p.220-237 <i>Optional: p.241-243, 246-247, 248-249</i>
2	1/16 MLK Jr Day – no classes		
	1/18 W	Human brain observation lab	Ch 7 Append p.220-237
	1/20 F	<b>Quiz 1: Neuroanatomy (part of Ch 7)</b> Neuroscience as Cellular Neurobiology	Ch 1
3	1/23	Cellular Neurobiology: Neuron	Ch 2 p.23-46
	1/25	Cellular Neurobiology: Glia	Ch 2 p.46-53 Microglia review paper
	1/27	Electrophysiology of the Neuron: RMP	Ch 3 p.55-78
4	1/30	Electrophysiology of the Neuron: RMP	Astrocyte & astrocytoma paper
	2/1	<b>Quiz 2: Ch 1, 2, 3</b> ECF [K] modulation by astrocytes	
	2/3	Electrophysiology of the Neuron: AP	Ch 4 p.81-99, Box 4.2
5	2/6	Electrophysiology of the Neuron: AP conduction Synaptic Transmission intro	Ch 4 p.100-107 Ch 5 p.109-119
	2/8	Synaptic Transmission: Chemical Synapse	Ch 5 p.119-131
	2/10	Synaptic Transmission: Synaptic Integration Neurotransmitters intro	Ch 5 p.132-141 Ch 6 p.143-153
6	2/13	Neurotransmitters and Receptors	Ch 6 p.153-177 (no synthesis pathways)
	2/15	Nervous System Development	Ch 7 p.192-215
	2/17	Review	
7	<b>Midterm Exam (Exam 1): Foundations</b>		
	2/22	Sensory Systems intro: Chemical Senses and Somatosensory Senses	Ch 8 p.266, 275-278, 287-289 Ch 12 p.415-421, 425-432 <i>Optional: p.437-441</i>
	2/24	The Eye: Anatomy of the Eye	Ch 9 p.293-312
8	2/27	The Eye: Phototransduction	Ch 9 p.312-323
	3/1	The Central Visual System	Ch 10 p.331-338 Skim p.341-346, 357, 363-366
	3/3	The Ear: Auditory System	Ch 11 p.369-388

3/6-10 Spring break – no classes			
9	3/13	Central Auditory Processes The Ear: Vestibular System	Ch 11 p.388-399 & p.403-412
	3/15	Motor System intro Brain Control of Movement	Ch 14 p.484-485, p.491-504,
	3/17	Brain and Spinal Control of Movement	Ch 14 p.512-516 Ch 13 Box 13.1 & 13.2
10	3/20	<b>Exam 2: Sensory &amp; Motor Systems</b>	
	3/22	The Brain and Behavior unit intro	TBD
	3/24	The Brain and Behavior group work	TBD
11	3/27	The Brain and Behavior group work	TBD
	3/29	Student-led class: Ch 16, 17, 18, 19. 20, 21, 22 or a "Box plus paper"	TBD
	3/31	Student-led class: Ch 16, 17, 18, 19. 20, 21, 22 or a "Box plus paper"	TBD
12	4/3	Student-led class: Ch 16, 17, 18, 19. 20, 21, 22 or a "Box plus paper"	TBD
	4/5	Student-led class: Ch 16, 17, 18, 19. 20, 21, 22 or a "Box plus paper"	
	<b>Quiz 3: The Brain and Behavior</b>		
4/7 Easter Break – no classes			
13	4/10 Easter Break – no classes		
	4/12	Wiring the Brain: Brain Development	Ch 23 p.783-802
	4/14	Wiring the Brain: Brain Development	Ch 23 p.802-820
14	4/17	Memory Systems	Ch 24 p.823-845
	4/19	Memory Systems	Ch 24 p.858-859 Additional readings TBD
	4/21	Molecular Mechanisms of Learning and Memory	Review p.813-820 Ch 25 p.865-879
15	4/24	Molecular Mechanisms of Learning and Memory	Ch 25 p.880-898
	4/26	Review day	
	4/28	<b>Exam 3: The Changing Brain</b>	
16	5/5 Fri 10:30am	<b>Final Exam</b>	



## Appendix: Participation and Collaboration Rubric

adopted from Kendra Hearn, PhD (U of Michigan, Ann-Arbor)

	2	3	4	5**
Active Listening*	Student has incurred 2 or more instances of unprofessional or inattentive behavior during class. On multiple occasions, s/he uses technology for purposes not related to the course and/or in ways that are distracting to peers and/or the instructor. S/he often has side conversations that are distracting to those around him/her. S/he does not track the speaker with his/her eyes (e.g. head down on desk).	Students is typically professional and attentive during class. <b>S/he has uses technology for purposes not related to the course and/or in a way that is distracting. S/he has occasional side conversations that are sometimes distracting to those around him/her.</b> S/he rarely tracks the speaker with his/her eyes or use non-verbal cues to engage with the speaker.	Student is always professional and attentive during class. S/he uses technology for the purposes of the course and is not distracting. S/he limits side conversations; those in which she may engage are always about what is currently occurring in the class. S/he often tracks the speaker with his/her eyes.	Student is always professional and attentive during class. S/he uses technology for the purposes of the course and is not distracting or easily distracted. S/he doesn't have side conversations. S/he routinely tracks the speaker with his/her eyes, and uses non-verbal cues to engage with the speaker. S/he routinely uses techniques to ensure understanding, such as asking or answering questions. Student responds to iClicker prompts.
Contributions to Discussion and Activities	Student's contributions are disrespectful or shows unwillingness to learn, or s/he does not contribute.	Student's contributions are respectful and inclusive. S/he may, however, contribute rarely or contributes often but dominates the 'air' time. When s/he speaks, his/her comments may be tangential or confusing to the current direction of the group.	Student's contributions are respectful and inclusive. They position him/her as active learner of the topic. S/he watches his/her 'air' time by not dominating the discussion.	Student's contributions are respectful and inclusive. They position him/her as an active learner of the topic. S/he watches his/her 'air' time by not dominating the discussion. His/her comments and questions often improve the thinking of the group.
Preparedness	Student exhibits minimal preparedness in that it is apparent that s/he has read little or none of the materials prior to class as evidenced by no references to the required materials during discussion. S/he does not bring appropriate notes.	Student exhibits moderate preparedness in that it is apparent that s/he has read some of the materials prior to class as evidenced by nominal references to the required materials and bringing appropriate notes.	Student exhibits sufficient preparedness in that it is apparent that s/he has read the materials prior to class by citing references to those materials during class. S/he brings appropriate notes to class.	Student exhibits good preparedness in that it is apparent that s/he has read all materials prior to class by accurately citing references to those materials during discussions and bringing annotated notes to class. It is clearly apparent that s/he has given depth of thought to the topic as his/her comments, questions, and ability to respond to questions.

\* Merely attending class does not merit 5 out of 5 points.

\*\* Asking questions is a type of contribution.