

Biology 470: Neuroscience
3 units
Point Loma Nazarene University
Spring 2019

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lecture time/location:	Sator 108 MW: 8:00—9:25 a.m.
laboratory time/location:	Sator 108 F: 8:00—9:25 a.m.
office hours:	MF: 1:15—3:00 p.m. W: 1:15—2:30 p.m.

If you have any questions about the material in this course, feel free to stop by during my office hours as listed above. Either drop by or set up an appointment. I may also be in my office at other, unscheduled, times. If my office hours don't work for your schedule, e-mail me or stop by and we can try to find a workable time to talk.

Course Description:

A study of the nervous system at the molecular, cellular and intercellular levels with the goal of understanding the generation and control of thoughts and behavior. The relationship of brain and mind are examined in discussions of nervous system development, intelligence, memory, pathophysiology, sexuality and gender identity, and religious faith and ethics. Lecture and lab. 3 units

Prerequisites: Biology 140, Biology 212, Biology 423 or Psychology 301:

The university catalog specifically states that the prerequisites for this course are Biology 140 *Human Anatomy and Physiology 2*, Biology 212 *Organismal Biology*, Biology 423 *Advanced Human Physiology* or Psychology 301 *Physiological and Neuropsychology*. If you are in doubt about whether you meet this requirement, please talk to me.

Student Learning Outcomes:

1. Students will learn the molecular biology, cellular biology, and electrophysiology of neuron function. Students will understand how actions of individual neurons contribute to the activity of the entire central nervous system.
2. Students will be able to describe the development and function of different regions of the brain.
3. Students will understand how consciousness, emotion, language, sexuality, memory and intelligence are encoded by normal brain function; and will be able to describe how pathologies can selectively affect these functions.

Required Text:

For each lecture there is an assigned reading. It is recommended that you read through these pages both prior to and following the related lecture. We may also have additional handouts that will be distributed throughout the semester.

Purves D, et. al.; *Neuroscience*, 6th ed. (Sinauer, 2017).

Konyndyk DeYoung, R, *Glittering Vices* (Brazos Press, 2009)

Studying:

It is highly recommended that you **study at least 2-3 hours for every lecture hour**. Since Bio 420 is a three-credit course, **you should be studying 6-9 hours every single week, throughout the week**—and not just the week prior to an exam. While studying includes reading the assigned text, you should concentrate on the lecture material presented in class. Make sure that you both **memorize** the information and **understand** the material. Various study tips will be given in class throughout the semester.

Do not use any study materials from students who have previously taken this class. This includes notes, exams, presentations, essays and laboratory write-ups.

Exams:

Exams will be administered on the dates indicated in the schedule. If an exam needs to be rescheduled due to an illness or a school-related activity, students must notify me **in advance** of the need to reschedule the exam. **The final exam cannot be rescheduled.**

Laptop Policy:

On occasion, we will use laptop computers in the lab. In the classroom, however, laptops tend to interfere with your education and can serve as a distraction for your neighbors. Numerous studies (some highlighted here) have confirmed that classroom laptop use can be detrimental to learning. For this reason, I do not allow the use of laptops or other electronic devices in the classroom.

1. Laptops and other electronic devices enable more than just note-taking, introducing numerous distractions (web-surfing, homework for other classes, social media, etc.) for you and your neighbors. You may think that you can multitask, but studies show you can't.
http://www.slate.com/articles/health_and_science/science/2013/05/multitasking_while_studying_divided_attention_and_technological_gadgets.html
2. As already mentioned, using your laptop in class can be less than neighborly. Your classmates' grades can also suffer due to the distracting pull of the laptop.
<https://www.sciencedirect.com/science/article/pii/S0360131512002254>
3. Writing is a more effective way of learning material than is typing. With typing, each letter is pretty much the same thing for the brain. Writing, however, uses different muscle groups with each word and encourages the brain to integrate material during the writing process. Typing may be easy and fast, but by making the brain passive, it discourages learning.
<https://www.npr.org/2016/04/17/474525392/attention-students-put-your-laptops-away>
4. Using electronic devices in class also impairs long-term retention, with one study suggesting that cellphone use in class can lower one's grade by half a letter grade.
<https://www.insidehighered.com/news/2018/07/27/class-cellphone-and-laptop-use-lowers-exam-scores-new-study-shows>

Class/Laboratory Participation:

It is **not** possible to schedule make-up labs. Come prepared for the laboratory exercise by reading the materials supplied ahead of time. Laboratory exercises will be posted to Canvas (canvas.pointloma.edu) at least two days prior to the lab. If possible, save a tree by printing these handouts as double-sided copies.

- ☠ **No food (including gum) or drinks in the laboratory.** This includes when you are in the lab for lecture exams.
- ↪ At the end of each laboratory period make sure that your table, and the equipment you've used, has been **cleaned and all materials returned to its appropriate place**. Points will be deducted for messes not cleaned up.

Laboratory assignments will be due as announced in lab.

- ↪ **You will not be allowed to hand in a laboratory write-up for a lab you did not attend.** In general, laboratory write-ups will need to be typed.
- ↪ Late lab write-ups will not receive full credit.
- ↪ Be sure that when you are asked to write up an individual laboratory report that this report reflects your own work, and not someone else's. This means that you can discuss the assignment with your classmates, but that you cannot copy their answers. Students who hand in identical assignments will not be given any credit for that particular assignment.

Grades are tentatively based on the following:

660 expected points

300 pt—3 non-cumulative exams (100 pt/exam)

100 pt—final cumulative exam

50 pt—laboratory participation

60 pt—primary literature summaries

70 pt—primary literature presentation

80 pt—virtues and vices assignments

Additional points may come from in-class assignments or other homework

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

Following each exam I will provide an update on the total points you have earned up until that point. At other times, I expect you can calculate your own grade based on quizzes, exams, and assignments that have been returned. Your final grade will be calculated from your cumulative percent score as follows:

A: 93.0—100%

A-: 90.0—92.99

B+: 87.0—89.99

B: 83.0—86.99

B-: 80.0—82.99

C+: 77.0—79.99

C: 73.0—76.99

C-: 70.0—72.99

D+: 67.0—69.99

D: 63.0—66.99

D-: 60.0—62.99

F: ≤ 59.99

Other Academic Issues:

FINAL EXAMINATION POLICY

Successful completion of this class requires taking the final examination **on its scheduled day**. The final examination schedule is posted on the [Class Schedules](#) site. No requests for early examinations or alternative days will be approved.

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.

PLNU ACADEMIC ACCOMMODATIONS POLICY

If you have a diagnosed disability, please contact PLNU's Disability Resource Center (DRC) within the first two weeks of class to demonstrate need and to register for accommodation by phone at 619-849-2486 or by e-mail at DRC@pointloma.edu. See [Disability Resource Center](#) for additional information.

PLNU ATTENDANCE AND PARTICIPATION POLICY

Regular and punctual attendance at all classes is considered essential to optimum academic achievement. If the student is absent from more than 10 percent of class meetings, the faculty member can file a written report which may result in 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. See [Academic Policies](#) in the Undergraduate Academic Catalog.

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 becomes an expression of faith. Being of Wesleyan heritage, we aspire to be a learning community where grace is foundational, truth is pursued, and holiness is a way of life.

tentative lecture and laboratory schedule:

Handouts for each lecture are posted on Canvas.

date	topic	reading
Jan 8 (Tu)	Studying the Nervous System	Purves, chp. 1
Jan 9 (W)	Survey of Anatomy Sheep brain dissection	Purves, Appendix
Jan 11 (F)	Virtues and Vices	handouts
Jan 14 (M)	Electrical signals of nerve cells	Purves, chp. 2
Jan 16 (W)	Voltage-dependent membrane permeability	Purves, chp. 3
Jan 18 (F)	Ion channels and transporters	Purves, chp. 4
Jan 21 (M)	Martin Luther King Day	
Jan 23 (W)	Synaptic transmission	Purves, chp. 5
Jan 25 (F)	Neurotransmitters and their receptors	Purves, chp. 6
	Molecular signaling within neurons	Purves, chp. 7 1
Jan 28 (M)	Synaptic Plasticity	Purves, chp. 8
Jan 30 (W)	Early brain development	Purves, chp. 22
Feb 1 (F)	Presentation 1 Virtues & Vices	
Feb 4 (M)	Construction of neural circuits	Purves, chp. 23
Feb 6 (W)	NO CLASS	
Feb 8 (F)	Exam 1	
Feb 11 (M)	Modification of neural circuits... experience	Purves, chp. 24
Feb 13 (W)	Repair and regeneration in the nervous system	Purves, chp. 25
Feb 15 (F)	The somatic sensory system: touch and proprioception	Purves, chp. 9
Feb 18 (M)	Pain Cow eye dissection	Purves, chp. 10
Feb 20 (W)	Vision: the eye Quiz: cow eye anatomy	Purves, chp. 11
Feb 22 (F)	Presentation 2 Virtues and Vices	
Feb 25 (M)	Vision: the eye	Purves, chp. 11
Feb 27 (W)	Central visual pathways	Purves, chp. 12
March 1 (F)	The auditory system	Purves, chp. 13
March 4—8	SPRING BREAK	
March 11 (M)	The vestibular system	Purves, chp. 14
March 13 (W)	NO CLASS	
March 15 (F)	Exam 2	
March 18 (M)	The chemical senses	Purves, chp. 15
March 20 (W)	Lower motor neuron circuits and motor control	Purves, chp. 16
March 22 (F)	Presentation 3 Virtues and Vices	

March 25 (M)	Upper motor neuron control of the brainstem & spinal cord	Purves, chp. 17
March 27 (W)	Modulation of movement by the basal ganglia	Purves, chp. 18
	Modulation of movement by the cerebellum	Purves, chp. 19
March 29 (W)	The Visceral Motor System	Purves, chp. 21
April 1 (M)	Cognitive Functions & the Organization of the Cerebral Cortex	Purves, chp. 27
April 3 (W)	Cortical States	Purves, chp. 28
April 5 (F)	Presentation 4	
	Virtues and Vices	
April 8 (M)	Attention	Purves, chp. 29
April 10 (W)	NO CLASS	
April 12 (F)	Exam 3	
April 15 (M)	Memory	Purves, chp. 30
April 17 (W)	Emotion	Purves, chp. 31
April 19 (F)	Easter Break	
April 22 (M)	Easter Break	
April 24 (W)	Thinking, Planning, and Deciding	Purves, chp 32
April 26 (F)	Speech and Language	Purves, chp. 33
May 3 (F)	Final exam, 7:30—10:00 a.m.	