Introduction to Neurophysiological Psychology (PSY 451)

Bill Griesar, Ph.D., Instructor, griesar@pdx.edu
(Please use this email address; NOT d2l)
Bill Office Hours: Mon, 11:30 – 12:30; CH 309
McKenzie Figuracion, TA; mtf2@pdx.edu
Ariana Gonzalez, TA, argonz2@pdx.edu
Aliza Lipman, Graduate TA, alipman@pdx.edu
Aliza Office Hours: Tuesdays, 1-2pm; CH 367

September 30 – December 13, 2019
MWF, 12:45 – 1:50pm, Parkmill 183

TEXTBOOK (HIGHLY recommended):
Neuroscience: Exploring the Brain, by Bear, et al…
(4th, 3rd or 2nd editions are all acceptable options; supplementary materials on d2l)

GOAL OF THE COURSE: Neurophysiological Psychology is the study of the nervous system and how it underlies behavior. The goal of this class is to introduce you to the structure and function of the nervous system, some methods used to study the brain and behavior, and specific cognitive abilities (including attention, memory, and emotional regulation) that are currently under study.

GRADES: Grades are assigned on a 90+ (A), 80-89 (B), 70-79 (C) and 60-69 (D) point scale. Points are awarded on the basis of your understanding of the material as assessed by a midterm and a final exam. Additional points can be earned by answering questions on five in-class quizzes. Students taking this course with the pass-fail option must maintain a C-average (70%) to receive a passing grade.

QUIZZES (25 points; 5 points each): Five in class quizzes will test your knowledge of the material presented during the previous few lectures. **** In a large class, it is difficult to offer any makeup quizzes, even for dire, legitimate reasons. So instead, your lowest quiz grade will be dropped, and replaced with full credit (5 points!).
MIDTERM EXAM (40 points): The midterm will cover all the material presented in the class up to and including the lectures on the auditory system. Questions may also be drawn from the reading assignments in the Neuroscience textbook.

FINAL EXAM (40 points): The final exam will be comprehensive, but will draw more from the lectures and reading assignments presented after the midterm exam. The final is offered during finals week, and will not be re-scheduled for any reason.

GRADUATE STUDENT PRESENTATIONS (15 percent*): Students taking the course for graduate credit must enroll in PSY 505 (reading and conference), by special arrangement. They will prepare a 10 minute online video about a neurological disorder, and present live in class. Students should cover the nature of the disorder, the physiological basis for the disorder, and the various treatment options or therapies used to treat it. ***NOTE: Graduate students will be assessed out of 115 “points,” with percentages in each category first converted to points: i.e., points earned/115 = grade/100.

ACADEMIC HONESTY: Any evidence of cheating or plagiarism will lead to serious academic consequences, including possible failure of the course and/or dismissal from school. Plagiarism is also a violation of the PSU Student Conduct Code. For more information see: http://www.ess.pdx.edu/OSA/osa_b.htm.

STUDENTS WITH DISABILITIES: Students registered with the Disability Resource Center (DRC) should contact the instructor to facilitate academic accommodations. If you have a disability and have not registered with the DRC, please contact the DRC immediately. If exams are to be taken at the PSU Testing Center, it is the student’s responsibility to make the appointment well in advance (particularly for our scheduled course final exam), for the same day and as close as possible to the same time as the officially scheduled test.

NOTE: Incompletes are rarely given, and are based on criteria described in the university catalog. Incompletes are not appropriate when less than ¾’s of the course work has been scored. No incomplete will be assigned without a written formal agreement and timeline related to course completion.
THE LECTURES:

Introduction to the nervous system:

1. **Introduction to the course** (9/30): introductions, course information, syllabus; dividing up the nervous system (PNS vs. CNS, ANS vs. “voluntary”); historical debates (localization vs. holism, evolving perspectives on the brain)
   - **READ BEFORE CLASS** Neuroscience: Exploring the Brain textbook *(2nd Edition)* Ch. 1 (3 – 20), Ch. 15 (505 – 511); *(3rd Edition)* Ch. 1 (4-21), Ch. 15 (490-97); *(4th Edition)* Ch. 1
   - **READ** *(2nd)* Ch. 2 (23 – 40, 42 – 47), Ch. 3 (51 – 65); *(3rd)* Ch. 2 (24-49), Ch. 3 (52-73); *(4th)* Ch. 2, Ch. 3

2. **Neurons and glia** (10/2): what is a cell?, how many brains cells do we have?, how many do other animals have? basic intracellular components, what are glial cells?; new research on importance of glia; what are neurons?, neuron structure and function; resting potential
   - **READ** *(2nd)* Ch. 4 (74 – 97); *(3rd)* Ch. 4 (76-100); *(4th)* Ch. 4

3. **Electrical properties of neurons** (10/4): What do neurons do?; The resting potential (How are neurons set up to carry information? What form does this information take?)

4. **The action potential** (10/7): propagation, voltage-gated ion channels, voltage changes/time course; QUESTION: *How do neurons carry electrical messages?*
   - **QUIZ ONE** (Introduction to the course, neurons, glia, resting potential)
   - **READ** *(2nd)* Ch. 5 (99 – 117); *(3rd)* Ch. 5 (102-122); *(4th)* Ch. 5

5. **More on the action potential, and the synapse** (10/9): Introduction to neural networks; types of connections, peri-neuronal nets; importance of myelin, multiple sclerosis; *What happens when the timing of neural signaling changes?*

6. **More on the synapse** (10/11): *How do messages travel between neurons?* Golgi and Cajal, parts of the synapse, presynaptic release of neurotransmitter; postsynaptic receptors (ionotropic vs. metabotropic/GPCR), postsynaptic responses (EPSPs, IPSPs, summation)
   - **READ** *(2nd)* Ch. 6 (131, 140 – 147), Ch. 15 (512 - 520), Ch. 16 (541); *(3rd)* Ch. 6 (134-152), Ch. 16 (526); *(4th)* Ch. 6
7. **Neuropharmacology** (10/14): How do neurons communicate with each other?; neurotransmitters, neuromodulators, hormones; modulatory neurotransmitters, including dopamine and norepinephrine…

8. **Review with Course TAs** (10/16):
   - QUIZ TWO (The action potential, and the synapse)

   **NO CLASS ON FRIDAY, OCTOBER 18**

9. **Graduate/Undergraduate TA lecture** (10/18): TBD

10. **More on neuropharmacology** (10/21): More neurotransmitters, including serotonin and acetylcholine; glutamate and GABA; mechanisms of drugs, drug abuse/dependence

   - READ *(2nd)* Ch. 7 (164 – 173, 193 – 199); *(3rd)* Ch. 7 (168-178, 192-199); *(4th)* Ch. 7, Ch. 7 Appendix (look over)

11. **Large scale structures/networks in the brain** (10/23): anatomical terminology; basic gross neuroanatomy (e.g., cortex, lobes, sulci and gyri, white matter vs. gray matter, ventricles/CSF, cerebellum).

12. **MORE on basic brain organization** (10/25): brainstem, hypothalamus, thalamus, basal ganglia, limbic system structures (including amygdala, nucleus accumbens, hippocampus, anterior cingulate, septal area,…).

13. **The neocortex** (10/28): primary motor and sensory cortices, corpus callosum, cortical structure/function, higher-level association cortex; distributed network development

   - READ *(2nd)* Ch. 9 (281 – 301), Ch. 10 (314 – 321, 324 – 330, 337 – 347); *(3rd)* Ch. 9 (278-298), Ch. 10 (310-337); *(4th)* Ch. 9, Ch. 10

14. **Visual system** (10/30): introduction to sensory systems, general stimulus aspects; a focus on vision: eye, retina, photoreceptors, bipolar/horizontal/amacrine/ganglion cells…

   - QUIZ THREE (Neuropharmacology, basic brain organization, neocortex)

15. **More on the visual system** (11/1): phototransduction (the paradoxical dark current); central visual pathways, optimal stimuli, receptive fields (primary vs. higher order areas)
16. **Auditory system** (11/4): Sound (frequency/pitch, intensity/loudness, complexity/timbre), the ear (outer, middle, inner), the cochlea, hair cells…

17. **More on the auditory system** (11/6): how the brain encodes pitch, loudness; central auditory pathways, tonotopy, sound localization…

18. **MIDTERM EXAM** (11/8)

**NO CLASS ON MONDAY, NOVEMBER 11th (Veteran’s Day)**

19. **MIDTERM REVIEW** (11/13): *Bring questions* - a chance to go over the exam!

**Methodology**

- **READ** (2nd) Ch. 19 (607 – 614), Ch. 7 (173 – 175); (3rd) Ch. 19 (586-598); (4th) Ch. 19, p. 646 - 673

20. **Neuroanatomical techniques** (11/18): microscopes and microtomes, retrograde and anterograde staining, electron microscopy, metabolic tracers, Brodmann areas/updates

21. **Electrophysiological techniques** (11/20): direct electrical stimulation, single vs. multi-cell recording, EEG, Event related potentials (ERP), transcranial magnetic stimulation

22. **Imaging techniques & Genetic techniques** (11/22): *Pictures!* Structural vs. functional techniques; indepth examination of CAT, PET, MRI, fMRI, rsfMRI, DTI, Western blots, knockout mice, in situ hybridization, etc…

**Current Topics in Neuroscience Research**

- **READ** (2nd) Ch. 18 (584 – 604); (3rd) Ch. 18 (564-583); (4th) Ch. 18

23. **Emotion/Feeling and the Limbic System** (11/25): Papez circuit (rationale and anatomy), Kluver-Bucy syndrome, the limbic system, role of the amygdala, motivation and reward, the hippocampus; contributions of emotion to memory; emotional regulation

- **QUIZ FOUR** (Anatomy, electrophysiology, imaging, genetic techniques)

**WATCH: Secret Life of the Brain (on d2l)**
24. **Selective attention** (11/27): various forms of attention; arousal vs. attention, alertness and attention; visual attention, what versus where visual pathways, selective attention increases cell response; attention enhances processing of specific visual features

**HAPPY THANKSGIVING!**

No class Friday, November 29 😊

25. **More on Attention, and “Default”** (12/2): hemispatial neglect syndrome, Balint’s syndrome; the default mode network (rumination, taking the perspective of others, daydreaming, retrieving memories, planning future activities)

26. **REVIEW** (12/4): Bring questions!
   - **QUIZ FIVE** (Topics in cognition - Emotion/Feeling, Attention, Default)

27. **FINAL EXAM** (MONDAY, DECEMBER 9th, 12:30 – 2:20pm)
   * Please note that the final exam will not be moved for any reason *

**QUIZ TOPICS**

- Quiz One: Introduction to the course, neurons, glia, resting potential
- Quiz Two: The action potential, and the synapse
- Quiz Three: Neuropharmacology, basic brain organization, neocortex
- Quiz Four: Neuroanatomy, electrophysiology, genetic and imaging techniques
- Quiz Five: Selected topics in cognition - Emotion/Feeling, Attention, Default

**EXCUSES:** Life has ups and downs, and everyone struggles sometimes with family, work, and other personal concerns and commitments. However, unless there is a serious, unexpected and unforeseen, sudden, and significant emergency, please do not petition for special treatment regarding deadlines for projects, quizzes, or exams. I am obligated to treat all students fairly, and that means each of you must think ahead and plan for when assignments are due. Everyone is subject to the same course expectations …
**Title IX**: Title IX is a federal law that requires the university to appropriately respond to any concerns of sex/gender discrimination, sexual harassment or sexual violence.

*To assure students receive support, faculty members are required to report any instances of sexual harassment, sexual violence and/or other forms of prohibited discrimination to PSU’s Title IX Coordinator, Julie Caron.*

If you would rather share information about these experiences with an employee who does not have these reporting responsibilities and can keep the information confidential, please contact one of the following campus resources (or visit this [link](https://psuwrc.youcanbook.me)):

Women’s Resource Center (503-725-5672) or schedule on line at [https://psuwrc.youcanbook.me](https://psuwrc.youcanbook.me)

Center for Student Health and Counseling (SHAC): 1880 SW 6th Ave, (503) 725-2800

Student Legal Services: 1825 SW Broadway, (SMSU) M343, (503) 725-4556

PSU’s Title IX Coordinator and Deputy Title IX Coordinators can meet with you to discuss how to address concerns that you may have regarding a Title IX matter or any other form of discrimination or discriminatory harassment. Please note that they cannot keep the information you provide to them confidential but will keep it private and only share it with limited people that have a need to know. You may contact the Title IX Coordinators as follows:

PSU’s Title IX Coordinator: Julie Caron by calling 503-725-4410, via email at titleixcoordinator@pdx.edu or in person at Richard and Maureen Neuberger Center

Deputy Title IX Coordinator: Yesenia Gutierrez by calling 503-725-4413, via email at yesenia.gutierrez.gdi@pdx.edu or in person at RMNC, 1600 SW 4th Ave, Suite 830

Deputy Title IX Coordinator: Dana Walton-Macaulay by calling 503-725-5651, via email at dana26@pdx.edu or in person at Smith Memorial Union, Suite, 1825 SW Broadway, Suite 433

For more information about the applicable regulations please complete the required student module [Creating a Safe Campus](https://d2l.pdx.edu) in your D2L.