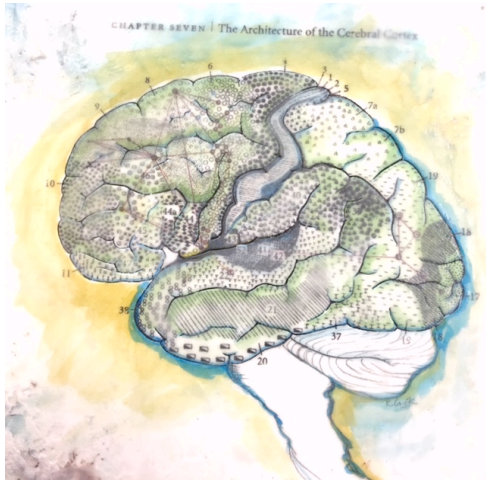


## Introduction to Neurophysiological Psychology (PSY 451)



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*(Please use this email address; NOT d2l)*

Office Hours: Mon, 11:30 – 12:30pm; CH 317Z

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D2L course login: <https://d2l.pdx.edu/>

September 26 – December 10, 2016

MWF, 9:00 – 10:05am, Cramer Hall 171

**TEXTBOOK** (required): **Neuroscience: Exploring the Brain**, by Bear, et al...

*(4<sup>th</sup>, 3<sup>rd</sup> or 2<sup>nd</sup> 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 some specific cognitive functions (including attention, and emotion) 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](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** (9/26): introductions, course information, syllabus; parts of the nervous system (PNS vs. CNS, ANS vs. “voluntary”); historical debates (localization vs. holism, 19<sup>th</sup>/20<sup>th</sup>/21<sup>st</sup> century perspectives on the brain)

- READ BEFORE CLASS *Neuroscience: Exploring the Brain* textbook (2<sup>nd</sup> Edition) Ch. 1 (3 – 20), Ch. 15 (505 – 511); (3<sup>rd</sup> Edition) Ch. 1 (4-21), Ch. 15 (490-97); (4<sup>th</sup> Edition) Ch. 1
- READ (2<sup>nd</sup>) Ch. 2 (23 – 40, 42 – 47), Ch. 3 (51 – 65); (3<sup>rd</sup>) Ch. 2 (24-49), Ch. 3 (52-73); (4<sup>th</sup>) Ch. 2, Ch. 3

2. **Neurons and glia** (9/28): what is a cell?, basic intracellular components, what are glial cells?; what are neurons?, neuron structure and function; resting potential

- READ (2<sup>nd</sup>) Ch. 4 (74 – 97); (3<sup>rd</sup>) Ch. 4 (76-100); (4<sup>th</sup>) Ch. 4

## QUIZ

3. **Electrical properties of neurons** (9/30): The resting potential

4. **The action potential** (10/3): propagation, voltage-gated ion channels, voltage changes/time course, AP is “all or none,”

- **QUIZ ONE** (Introduction to the course, neurons, glia, resting potential)
- READ (2<sup>nd</sup>) Ch. 5 (99 – 117); (3<sup>rd</sup>) Ch. 5 (102-122); (4<sup>th</sup>) Ch. 5

5. **More on the action potential, and the synapse** (10/5): Importance of myelin, multiple sclerosis; *How do neurons carry electrical messages?*

6. **More on the synapse** (10/7): Golgi and Cajal, types of synapses, parts of synapse, presynaptic release of neurotransmitter; postsynaptic receptors (ionotropic vs. metabotropic), postsynaptic responses (EPSPs, IPSPs, summation)

- READ (2<sup>nd</sup>) Ch. 6 (131, 140 – 147), Ch. 15 (512 - 520), Ch. 16 (541); (3<sup>rd</sup>) Ch. 6 (134-152), Ch. 16 (526); (4<sup>th</sup>) Ch. 6

## QUIZ

7. **Neuropharmacology** (10/10): neurotransmitters, neuromodulators, hormones; modulatory neurotransmitters, including dopamine and norepinephrine...
- **QUIZ TWO** (The action potential, and the synapse)
8. **More on neuropharmacology** (10/12): serotonin, and acetylcholine; the amino acid neurotransmitters (glutamate, GABA); drugs and drug abuse/dependence
- READ (2<sup>nd</sup>) Ch. 7 (164 – 173, 193 – 199); (3<sup>rd</sup>) Ch. 7 (168-178, 192-199); (4<sup>th</sup>) Ch. 7, Ch. 7 Appendix (look over)
9. **Basic brain organization** (10/14): anatomical terminology, lobes, sulci and gyri, white matter vs. gray matter, basic structures (ventricles, basal ganglia, cerebellum)
10. **MORE on basic brain organization** (10/17): brainstem, hypothalamus, central role of the thalamus, basal ganglia, limbic system...
11. **The neocortex** (10/19): primary motor and sensory cortices, corpus callosum, cortical structure/function, higher-level association cortex

## QUIZ

- READ (2<sup>nd</sup>) Ch. 9 (281 – 301), Ch. 10 (314 – 321, 324 – 330, 337 – 347); (3<sup>rd</sup>) Ch. 9 (278-298), Ch. 10 (310-337); (4<sup>th</sup>) Ch. 9, Ch. 10
12. **Visual system** (10/21): introduction to sensory systems, stimulus aspects, the eye, retina, photoreceptors...
- **QUIZ THREE** (Neuropharmacology, basic brain organization, neocortex)
13. **More on the visual system** (10/24): phototransduction; central visual pathways, optimal stimuli, receptive fields (primary vs. higher order visual areas)
- READ (2<sup>nd</sup>) Ch. 11 (351 – 371, 380 – 385); (3<sup>rd</sup>) Ch. 11 (344-376); (4<sup>th</sup>) Ch. 11
14. **Auditory system** (10/26): Sound (frequency/pitch, intensity/loudness, complexity/timbre), ear, cochlea, hair cells; how the brain encodes pitch, loudness; central auditory pathways, tonotopy, localization...
15. **MIDTERM EXAM** (10/28)
16. **MIDTERM REVIEW** (10/31): A chance to go over the test

*Methodology*

- READ (2<sup>nd</sup>) Ch. 19 (607 – 614), Ch. 7 (173 – 175); (3<sup>rd</sup>) Ch. 19 (586-598); (4<sup>th</sup>) Ch. 7, p. 186 – 191, Ch. 19, p. 646 - 673
17. **Neuroanatomical techniques** (11/2): microscopes and microtomes, retrograde and anterograde staining, electron microscopy, metabolic tracers, Brodmann areas
  18. **Electrophysiological techniques** (11/4): electrical stimulation, single cell recording, EEG, Event related potentials (ERP)
  19. **Imaging techniques** (11/7): CAT, TMS, PET, MRI, fMRI, DTI
  20. **Genetic techniques** (11/9): Western blots, knockout mice, in situ hybridization, etc.

**\*\* NO CLASS ON WEDNESDAY, NOVEMBER 11<sup>th</sup> (for VETERAN'S DAY) \*\***

**\*\* NO CLASS ON MONDAY, NOVEMBER 14<sup>th</sup> \*\***

QUIZ

21. **REVIEW SESSION WITH COURSE TAs** (11/16): Please come with questions. A chance to review course material during our normally scheduled class time...
  - **QUIZ FOUR** (Anatomy, electrophysiology, imaging, genetic techniques)

*Current Topics in Neuroscience Research*

- READ (2<sup>nd</sup>) Ch. 18 (584 – 604); (3<sup>rd</sup>) Ch. 18 (564-583); (4<sup>th</sup>) Ch. 18
22. **Emotion/Feeling and the Limbic System** (11/18): Papez circuit (rationale and anatomy), Kluver-Bucy syndrome, the limbic system, importance of the amygdala, pleasurable emotions, the hippocampus (and contributions of emotion to memory)



**\*\* HAPPY THANKSGIVING! \*\***

**No classes or assignments 11/21 – 11/25 ☺**

- READ (2<sup>nd</sup>) Ch. 20 (659 – 673); (3<sup>rd</sup>) Ch. 21 (644-659); (4<sup>th</sup>) Ch. 21

23. **Selective attention** (11/28): various forms of attention; arousal vs. attention, alertness and attention, what versus where pathways, selective attention increases cell response; attention enhances processing of specific visual features

24. **More on Attention, and “Default”** (11/30): hemispatial neglect syndrome, Balint’s syndrome; the default mode network (rumination, taking the perspective of others, daydreaming, retrieving memories, planning future activities)

QUIZ



25. **REVIEW** (12/2): Bring questions!

- **QUIZ FIVE** (Topics in cognition - Emotion/Feeling, Attention, Default)

26. **FINAL EXAM** (TUESDAY, DECEMBER 6<sup>th</sup>, 8:00am – 9:50am)

\* 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 ...