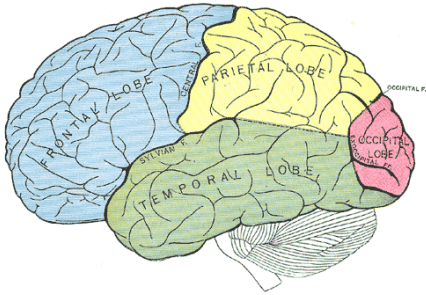


# PSU Psychology 410: Psychopharmacology



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TBD, Graduate TA,

SPRING TERM: March 29 – June 11, 2021

PREREQUISITES: None

**ZOOM CLASSES MEET ONLINE, Mondays & Wednesdays 12:45 – 1:45pm**  
**Teaching Assistant Review ZOOM Sessions Fridays 12:45 – 1:45pm**

Office hours (Bill): Mondays, 2:00 – 3:00pm, ZOOM (by appointment)

Office hours (Grad TA): ZOOM (by appointment)

**COURSE OBJECTIVES:** For generations, people across the globe have used mind-altering chemicals, many derived from plants, for medicine, culturally significant ceremonies, and to influence cognition and mood. *Neuropsychopharmacology* is the study of how drugs affect the nervous system, and how drug actions alter physiology and behavior. The goal of this class is to introduce you to the structure and function of the nervous system, techniques used to study drug actions and effects, and the specific molecular and behavioral influence of alcohol and other drugs (including opioids, cocaine, methamphetamine, nicotine, caffeine, cannabinoids and LSD).

**OPTIONAL TEXTBOOK:** **Psychopharmacology**, by Meyer & Quenzer, First edition (ISBN-13: 978-0878935345); or 2nd edition (978-1-60535-179-7). **NOT REQUIRED.**

**STUDENT LEARNING OUTCOMES:** The primary outcomes of this course are:

- (1) **DISCIPLINARY AND PROFESSIONAL EXPERTISE:** To acquire accurate, evidence-based knowledge of drug actions and effects, including relevant neural and genetic mechanisms, affected brain networks, developmental considerations, and techniques used in drug research.
- (2) **COMMUNICATION:** To interact with fellow undergraduates, teaching assistants and your instructor in a respectful, empathetic and constructive manner, and to communicate effectively through classroom activities and assignments.
- (3) **CREATIVE AND CRITICAL THINKING:** To investigate publicly funded drug research, current drug access and enforcement policies, and gain experience presenting and discussing complex brain and behavior related topics through examinations and art projects.

- (4) **ENGAGEMENT:** To consider the policy implications of drug research, and how research might better inform public K-12 educational efforts concerning the consequences of adolescent drug exposure, use and abuse.

**GRADES:** Grades are assigned on a 90+ (A), 80-89 (B), 70-79 (C) and 60-69 (D) point scale. ***An A or B is an ABOVE AVERAGE grade, a C is AVERAGE, and a D is BELOW AVERAGE.*** Points (a maximum of 105, which includes 5 points of extra credit) are awarded on the basis of your understanding of material as assessed by a midterm and a final exam. Additional points can be earned by answering questions on four online quizzes, participating in online discussion forums, and completing an art project. Students taking this course with the pass-fail option must maintain a C- average (70%) to receive a passing grade.

**\* DEADLINES ARE IMPORTANT: Late work receives half credit.**

**QUIZZES** (20 points; 5 points each): Four quizzes will test your ability to recall and think critically about material presented during the previous few Zoom classes. ***You will have 30 minutes to complete each online quiz.***

**DISCUSSION FORUMS** (20 points, 2 points/forum): Students are required to post their own responses to questions in our ten weekly discussion forums, which cover topics we'll be learning about in Zoom class meetings, online video lectures and other resources and links on d2l. ***Each post must be at least 150 words (300 max) and you must respond to TWO peers in at least 50 words. FORUM POSTS ARE DUE THURSDAYS (by 11:59pm); peer responses DUE by SUNDAY (by 11:59pm). NOTE: One forum post/response can be missed without penalty 😊***

**ART PROJECT** (20 points): Design a poster to educate adolescents about making good, evidence-based choices when it comes to taking risks with specific drugs (15 points). As part of this project, include a separate sheet explaining the reasons for your approach (5 points). Be sure to reference research that helped determine what you included and explain why you think your poster might be effective at influencing behavior. This project should be uploaded to d2l in the form of a \*.jpg or \*.pdf file.

**MIDTERM EXAM** (20 points): The midterm will cover all the material presented in the class up to and including the lectures on behavioral pharmacology techniques. ***You will have one hour to complete the online midterm.***

**FINAL EXAM** (25 points): *The final exam will be comprehensive but will draw more from lectures and d2l resources presented after the midterm exam. **You will have two hours to complete the online final exam.***

**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 please visit: [http://www.ess.pdx.edu/OSA/osa\\_b.htm](http://www.ess.pdx.edu/OSA/osa_b.htm).

**ACCESS AND INCLUSION FOR STUDENTS WITH DISABILITIES:** PSU values diversity and inclusion; we are committed to fostering mutual respect and full participation for all students. My goal is to create a learning environment that is equitable, useable, inclusive, and welcoming. ***If any aspects of instruction or course design result in barriers to your inclusion or learning, please let me know.*** The Disability Resource Center (DRC) provides reasonable accommodations for students who encounter barriers in the learning environment.

If you have, or think you may have, a disability that may affect your work in this class and feel you need accommodations, contact the Disability Resource Center to schedule an appointment and initiate a conversation about reasonable accommodations. The DRC is available at 503-725 -4150, [drc@pdx.edu](mailto:drc@pdx.edu), <https://www.pdx.edu/drc>.

- If you already have accommodations, please contact me to make sure that I have received a faculty notification letter and discuss your accommodations.
- Students who need accommodations for tests and quizzes are expected to schedule their tests to overlap with the time the class is taking the test.
- For information about emergency preparedness, please go to the [Fire and Life Safety webpage \(https://www.pdx.edu/environmental-health-safety/fire-and-life-safety\)](https://www.pdx.edu/environmental-health-safety/fire-and-life-safety) for information.

**INCOMPLETES:** **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 is assigned without a written formal agreement and timeline related to course completion.

**COVID-19:** *PSU has been working diligently to address the health, safety, and well-being of the entire community during the COVID-19 pandemic. Efforts are being made to provide an accurate, efficient flow of communication to students, staff and faculty. As questions and concerns arise, many campus resources are available. If you are ever unsure how to find a resource you need or want, explore the College of Liberal Arts and Sciences' website at [pdx.edu/clas/covid-19-resources-for-students](https://pdx.edu/clas/covid-19-resources-for-students). Help is near. Reach out.*

PLEASE DO NOT SHARE CLASS VIDEO OR AUDIO RECORDINGS: We will use technology for virtual meetings and recordings in this course. Our use of technology is governed by FERPA, the Acceptable Use Policy and PSU's Student Code of Conduct. A record of all meetings and recordings is kept and stored by PSU, in accordance with the Acceptable Use Policy and FERPA. Your instructor will not share recordings of your class activities outside of course participants, including fellow students, TAs/GAs/Mentors, and any guest faculty or community-based learning partners that we may engage with. You may not share recordings outside of this course. Doing so may result in disciplinary action.

**PLEASE NOTE:** Life *clearly* has ups and downs, and everyone struggles sometimes with family, work, and other personal concerns and commitments. Unless there is a serious, unexpected, sudden and significant emergency, ***please do not petition for special treatment regarding deadlines for projects, quizzes, forums or exams.*** We are asked 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.***

## THE CLASSES

### *Introduction to the nervous system:*

#### **WEEK ONE (3/29 – 4/2): Introductions**

**\*POST: Discussion FORUM by THURSDAY; student responses by SUNDAY**

Course information, syllabus; what is neuropsychopharmacology?, what is a drug?, the nervous system (brain, spinal cord, peripheral nerves, CNS vs. PNS, autonomic, somatic; drug actions vs. effects, therapeutic vs. side effects, specific vs. non-specific effects, placebo effect; “central dogma” of biology, pharmacokinetics, “ADME,” drug administration methods, pharmacodynamics, drugs act on cells, what is a cell?, the cell membrane, protein targets (“protein machines”) in the nervous system; what are glial cells?

#### **WEEK TWO (4/5 – 4/9): Electrical properties of neurons**

**\*POST: Discussion FORUM by THURSDAY; student responses by SUNDAY**

Neuron structure and function, dendrites, soma, axons; excitable membranes and the resting potential; forces act on moving ions (currents): electric, concentration gradient, ATP-driven “pumps;” voltage gated Na<sup>+</sup>, K<sup>+</sup> channels and the action potential; importance of myelin; *How do neurons carry information?*; drug effects on the action potential

QUIZ



- **QUIZ ONE** (Pharmacokinetics, pharmacodynamics)
- **Available 4/5 – 4/11**

### **WEEK THREE (4/12 – 4/16): The chemical synapse – and brain!**

**\*POST: Discussion FORUM by THURSDAY; student responses by SUNDAY**

#### **QUIZ**



Synapse types (electrical, chemical, various connections), synapse components, presynaptic release of neurotransmitter; *What is a language? What two forms of “language” does the nervous system use?*; autoreceptors, pre and postsynaptic receptors (ionotropic, metabotropic/GPCR), postsynaptic responses (EPSP’s, IPSP’s, spatial/temporal summation), 2nd messenger systems, biochemical cascades; cortex, lobes, sulci and gyri, white matter vs. gray matter, basal ganglia, cerebellum, brainstem, hypothalamus, thalamus, brain networks; *How are complex cognitive abilities organized in the brain?*

- **QUIZ TWO** (Resting potential, action potential, synaptic transmission)
- **Available 4/12 – 4/18**

### **WEEK FOUR (4/19 – 4/23): Neuropharmacology & neurotransmitters**

**\*POST: Discussion FORUM by THURSDAY; student responses by SUNDAY**

Neurotransmitters, “classical” and “non-classical”; neurotransmitter synthesis, release, inactivation; agonists and antagonists, dose-response curves, ED-50 and TD-50, drug efficacy versus drug potency. *CONSIDER: How does the chemical synapse offer primary sites for drug action?*; Catecholamines, dopamine (DA) and norepinephrine (NE); synthesis, release, inactivation; DA pathways (nigrostriatal, mesolimbic, mesocortical), nigrostriatal link to Parkinson’s disease, DA receptors; NE pathway, receptors; Acetylcholine (ACh) and Serotonin (5-HT), ACh synthesis, release, inactivation; peripheral cholinergic systems (neuromuscular junction and autonomic nervous system), central cholinergic pathways (pontine, & basal forebrain), ACh receptors (nicotinic, muscarinic); Serotonin (5-HT) synthesis, release, inactivation; 5-HT pathways, receptors, importance for mood & psychological health; *How are the catecholamine, acetylcholine and serotonin systems similar? How do they differ?*

### **WEEK FIVE (4/26 – 4/30): Neuropharmacology & Drug Use Disorders**

**\*POST: Discussion FORUM by THURSDAY; student responses by SUNDAY**

Amino Acid Neurotransmitters, glutamate is the primary excitatory brain neurotransmitter; GLU synthesis, release, inactivation; receptors (including ionotropic AMPA, kainate, NMDA); excitotoxicity; GABA is the primary inhibitory neurotransmitter in the brain, synthesis, release, inactivation, receptors; Drug Use Disorders, terminology, drug “addiction,” dependence, abuse, tolerance

("resistance"), withdrawal, risk potential of different drugs, traditional models of drug use disorders (two process, physical dependence, positive reinforcement, medical models (genetics versus exposure), new ideas

### *Neuropsychopharmacology Methodology*

#### **WEEK SIX (5/3 – 5/7): Drug Research Techniques**

**\*POST: Discussion FORUM by THURSDAY; student responses by SUNDAY**

Neuropharmacology techniques, stereotaxic surgery, lesioning, microinjection of drugs/chemicals, microdialysis, neuroelectrophysiological stimulation and recording, radioligand binding, receptor autoradiography, genetic engineering, "knockout" and transgenic animals, antisense, CRISPR, optogenetics, additional techniques; Behavioral pharmacology techniques, animal testing, locomotor activity, analgesia (tail flick), learning/memory (T-maze, radial arm maze, Morris water maze, delayed recall), anxiety (elevated plus maze, light/dark crossing), fear (conditioned emotional response, fear-potentiated startle), reward (conditioned place preference, drug and electrical self-administration); *How do the techniques available to study drug effects on the nervous system limit the scientific questions we can ask?*

- **QUIZ THREE** (Brain organization, neuropharmacology/neurotransmitters)
- **Available 5/3 – 5/9**

#### **\*\*\* MIDTERM EXAM**

- Includes material up through Week Six; **Available 5/8 – 5/16**

### *Drugs*

#### **WEEK SEVEN (5/10 – 5/14): Alcohol and Opioids**

**\*POST: Discussion FORUM by THURSDAY; student responses by SUNDAY**

Alcohol, psychopharmacology, mechanisms of action, behavioral and physiological effects, alcohol use disorder; *How does alcohol use vary among different cultural groups? Between different families? Among people at different ages? What do these differences suggest about societal/legal approaches to alcohol use/abuse?*; Opioids, narcotic analgesics; receptors and endogenous neuropeptides; opioids and pain; Oxycontin, Vicodin, opioid crisis; *How can we balance the need to reduce suffering and pain with the abuse potential of these drugs?*

QUIZ

**WEEK EIGHT (5/17 – 5/21): PSYCHOSTIMULANTS**

**\*POST: Discussion FORUM by THURSDAY; student responses by SUNDAY**

Psychostimulants, cocaine, amphetamine, methamphetamine; psychopharmacology, mechanisms of action, behavioral and physiological effects; amphetamine psychosis; *What is lost with the hijacking of mesolimbic dopamine network by drugs such as meth?*; Nicotine and caffeine, nicotine psychopharmacology and smoking; caffeine psychopharmacology, mechanisms of action, behavioral & physiological effects; *How are nicotine and caffeine similar? How do they differ? How would you discuss effects and actions of these two drugs with adolescents exposed to both?*

**WEEK NINE (5/24 – 5/28): CANNABIS**

**\*POST: Discussion FORUM by THURSDAY; student responses by SUNDAY**

Cannabis, cannabinoid pharmacology, mechanisms of action, endogenous cannabinoids, behavioral and physiological effects, acute vs. chronic exposure; *How do you feel about medical and recreational marijuana laws? How does knowledge of cannabinoid psychopharmacology influence your views?*

**WEEK TEN (5/31 – 6/4): PSYCHEDELICS**

QUIZ



- **NO ZOOM CLASS MONDAY (5/31): Happy Memorial Day**

**\*POST: Discussion FORUM by THURSDAY; student responses by SUNDAY**

Psychedelics/hallucinogens (mescaline, psilocybin, DMT, LSD), pharmacology of hallucinogenic drugs, mechanisms, physiological and perceptual/behavioral effects; therapeutic potential (depression, anxiety); *Why is the use of hallucinogens often associated with religious/spiritual ceremonies?*

- **QUIZ FOUR (DRUGS)**
- **Available 5/31 – 6/6**

**\*\*\* ART PROJECT DUE 6/2**

**\*\* FINAL EXAM**

*Scheduled for FINALS WEEK; Available 6/5 – 6/10*

**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](#)):

Women's Resource Center (503-725-5672) or schedule on line at <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](mailto: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](mailto:yesenia.gutierrez.gdi@pdx.edu) or in person at RMNC, 1600 SW 4<sup>th</sup> Ave, Suite 830

Deputy Title IX Coordinator: Dana Walton-Macaulay by calling 503-725-5651, via email at [dana26@pdx.edu](mailto: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](#) in your D2L.