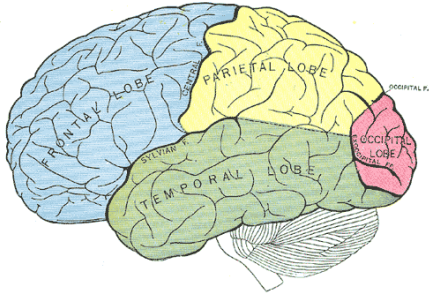


PSU Psychology 450: Psychopharmacology



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HYBRID SPRING TERM: April 1 – June 14, 2024

PREREQUISITES: None

ZOOM CLASSES meet ONLINE Mondays 12:45 – 1:45pm
IN PERSON CLASSES meet (FMH B128) Wednesdays, 12:45 – 1:45pm
TA Review ZOOM Sessions ONLINE meet Fridays 12:45 – 1:45pm

Office hours (Bill): 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).

NO TEXTBOOK 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. It's difficult in a large class to track late assignments for a whole term, so after one week late assignments will be zeroed out. No late work accepted after Week Ten.**

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 Canvas. ***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).***

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 Canvas 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 Canvas 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.

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, <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 $\frac{3}{4}$'s of the course work has been scored. No incomplete is assigned without a written formal agreement and timeline related to course completion.

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. And not everyone experiences the world in the same way. If there is a serious, unexpected, sudden and significant emergency, please reach out. But also be aware that we strive 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 (4/1 – 4/5): Introductions

***MEET:** ZOOM Monday, IN PERSON Wednesday, ZOOM Friday, all 12:45 – 1:45pm

***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 (4/8 – 4/12): Electrical properties of neurons

***MEET:** ZOOM Monday, IN PERSON Wednesday, ZOOM Friday, all 12:45 – 1:45pm

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

Neuron structure/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⁺, K⁺ channels, action potential; importance of myelin; *How do neurons carry information?*; drug effects on the action potential

- **QUIZ ONE** (Pharmacokinetics, pharmacodynamics)
- **Available 4/10 – 4/14**

QUIZ



WEEK THREE (4/15 – 4/19): The chemical synapse – and brain!

***NO CLASS WEDNESDAY: Outreach on the North Coast**

***MEET:** ZOOM Monday, IN PERSON Wednesday, ZOOM Friday, all 12:45 – 1:45pm

***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 4/17 – 4/21**

WEEK FOUR (4/22 – 4/26): Neuropharmacology & neurotransmitters

***MEET:** ZOOM Monday, IN PERSON Wednesday, ZOOM Friday, all 12:45 – 1:45pm

***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 (4/29 – 5/3): Neuropharmacology & Drug Use Disorders

***NO CLASS WEDNESDAY: Outreach in Astoria**

***MEET:** ZOOM Monday, ZOOM Friday, all 12:45 – 1:45pm

***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 (5/6 – 5/10): Drug Research Techniques

***MEET**: ZOOM Monday, IN PERSON Wednesday, ZOOM Friday, all 12:45 – 1:45pm

***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

- **QUIZ THREE** (Brain organization, neuropharmacology/neurotransmitters)
- **Available 5/8 – 5/12**

*** MIDTERM EXAM

- Includes material up through Week Six; **Available Online 5/8 – 5/15**

Drugs

WEEK SEVEN (5/13 – 5/17): Alcohol and Opioids

***MEET**: ZOOM Monday, IN PERSON Wednesday, ZOOM Friday, all 12:45 – 1:45pm

***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/use disorders?*

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 known risks of these substances?*

WEEK EIGHT (5/20 – 5/24): PSYCHOSTIMULANTS

***MEET:** ZOOM Monday, IN PERSON Wednesday, ZOOM Friday, all 12:45 – 1:45pm

***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 (5/27 – 5/31): CANNABIS

***NO CLASS MONDAY: Happy Memorial Day**

***MEET:** IN PERSON Wednesday, ZOOM Friday, all 12:45 – 1:45pm

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

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

*** ART PROJECT DUE 6/2

WEEK TEN (6/3 – 6/7): PSYCHEDELICS

***MEET:** ZOOM Monday, IN PERSON Wednesday, ZOOM Friday, all 12:45 – 1:45pm

***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); *What is the evidence for the therapeutic benefits of these substances? Why is the use of psychedelics often associated with religious/spiritual ceremonies?*

- QUIZ FOUR (DRUGS)
- Available 6/5 – 6/9

** FINAL EXAM

Scheduled for FINALS WEEK; Available 6/7 – 6/12

QUIZ



TITLE IX REPORTING OBLIGATIONS

Portland State is committed to providing an environment free of all forms of prohibited discrimination and sexual harassment (sexual assault, domestic and dating violence, gender or sex-based harassment and stalking). If you have experienced any form of sexual harassment, know that help and support are available. PSU has staff members trained to support survivors in navigating campus life, providing academic support and more. Information about PSU's support services on campus, including [confidential services](#) and [reporting options](#), can be found on PSU's [Sexual Misconduct Response website](#) or you may call a Confidential Advocate at 503.894.7982 or by scheduling [online](#). You may also report any incident of discrimination or discriminatory harassment, including sexual harassment, to the **Title IX Coordinator**, [Office of Equity and Compliance](#), or the [Office of the Dean of Student Life](#).

Please be aware that all PSU faculty members and instructors **are required to report** information of an incident that may constitute prohibited discrimination, including sexual harassment and sexual and relationship violence. This means that if you tell me about a situation of sexual harassment or discrimination, I have to share the information with the University's Title IX Coordinator or the Office of the Dean of Student Life. However, the information will be kept private and only those with a need to know will be provided with what you disclose.

Please complete the required student module [Understanding Sexual Misconduct and Resources](#) in Canvas, which provides information about PSU policy and resources. You may also report sexual and relationship violence to law enforcement on campus with [Campus Public Safety Office \(CPSO\)](#). Or you may file an [anonymous report with Campus Public Safety Office](#) or a [Bias Incident report](#) with the [Bias Review Team \(BRT\)](#). PSU does not typically investigate the reports that are made through these two avenues. These reports help PSU understand what students and employees are experiencing on and around campus and provide support where needed.