NJIT New Jersey Institute of Technology

Course Syllabus

Biology of Addiction: BIOL 443-001 / 643-001

- COURSE SCHEDULE: TR 10-11:20 am
- INSTRUCTOR: Farzan Nadim (farzan@njit.edu) **OFFICE**: CKB 420E
- CLASSROOM: Central King Building Room 313
- OFFICE HOURS: TR: 11:30 am-12 pm or ZOOM (email me!)
- COURSE WEBSITE: NJIT Canvas (https://canvas.njit.edu/)

COURSE SUMMARY

The course reviews the biological mechanisms of addiction as substance abuse. The biological mechanisms fall into three main categories: Brain systems involved, such as the mesolimbic reward system; Cells, such as midbrain dopaminergic neurons and their target cells in the striatum; Molecules, such as neurotransmitters, for example dopamine, norepinephrine and GABA and receptors such as cannabinoid receptors. The course also briefly discusses genetic factors involved in addiction.

TEXTBOOK

Rosenthal, Drugs: Mind, Body, and Society, 2nd Ed. Oxford University Press

LEARNING GOALS

- To understand the definition of addiction and substances of abuse.
- To understand the basics of pharmacokinetics and pharmacodynamics.
- To describe neurotransmitters and neuromodulators and their receptors, and to understand the role of these molecules in brain function.
- To describe drug actions on different brain systems and outline which drugs lead to which effects according to their brain targets.
- To describe the major categories of drugs of abuse and to outline the mechanistic actions of each drug category.
- To develop critical thinking skills. This will be measured in the ability to interpret graphs, experimental designs, and problem discussion. Students will be required to participate in discussions of the material as they analyze problems and propose possible mechanisms related to addiction, the body and the nervous system.

COURSE OUTLINE

Introduction and course overview

- Addiction and the Brain

Module 1: Addiction

- What is a Drug?
- Drug use and classification
- History of drug policies and laws

- What is Addiction?
- Is Addiction a Disease?

Module 2: Substances of Abuse

- Depressants
    - Cannabinoids
    - Opioids
    - Alcohol
    - Sedative-Hypnotics
- Stimulants
    - Cocaine
    - Amphetamine-Like Substances
    - Nicotine
    - Caffeine
- Hallucinogens (time permitting)
    - Psychedelics
    - Deliriants
    - Dossociatives

Module 3: Psychopharmacology

- Pharmacokinetics
- Pharmacodynamics
- Biobehavioral effects

Module 4: The Central Nervous System

- **Cells of the Nervous System**
    - Intro
    - Electrical signals and action potentials
- **Neurotransmitters and Neuromodulators**
    - Glutamate & GABA
    - Catecholamines (dopamine and norepinephrine)
    - Serotonin
    - Acetylcholine
- **Structure and function of the nervous system**
    - Basic anatomy of the human nervous system
    - The limbic system including the amygdala and hippocampal structures
    - The midbrain catecholamine (dopamine & norepinephrine) systems and their targets
    - Other brain modulatory systems involved in addiction (serotonin and neuropeptides)
    - Brain structures involved in mood and reward

Assignments, quizzes, exams and grading

- The course will have two midterms and a final exam.
    - Make-up exams will not be in the same format as the original assignment or follow the same rules.
    - BIOL 643 will have different exams from BIOL 443.
- Quizzes will be administered in class and each will cover only material from the previous 2 lectures.
    - There will be no makeup quizzes.
    - The lowest 2 grades of quizzes will be dropped.
    - Cheating in quizzes is treated as a violation of academic integrity (see above).
- The project is based on the research that each student does on a unique psychoactive substance (aka, drug). This research will be performed throughout the semester and will receive a grade each time a deadline is set..

Assignment	**%**
Quizzes	16
Project	16
Midterm 1	18
Midterm 2	22
Final	28
Exceptional Performance (extra credit only)	(10)

Grading Scale		
	443	**643**
A	92 - 100	
B+	84 - 91	
B	75 - 83	
C+	69 - 74	
C	61 - 68	
D	55 - 60	N/A
F	0 - 54	0 - 60

IMPORTANT INFORMATION, RULES AND POLICIES

1. **Emergency Support:** NJIT Public Safety connects you to emergency support systems - 973.596.3111.
    a. For medical, psychological or psychiatric emergencies: University Hospital Crisis 973.623.2323.
    b. To report a concern about another student's wellbeing: reach out to the NJIT CARE Team (https://www.njit.edu/care) or the Dean of Students Office 973.596.3466.
    c. Mental Health and Stress Management Center for Counseling and Psychological Services (C-CAPS). If you or someone you know is feeling overwhelmed, depressed, and/or in need of support, services are available: https://www.njit.edu/counseling/gethelp
2. **Accommodations**
    a. **Students with disabilities:** The NJIT Office of Accessibility Resources and Services (OARS) offers long term and temporary accommodations for undergraduate, graduate and visiting students at NJIT. For further information regarding self identification, the submission of medical documentation and additional support services provided please visit the OARS website.
    b. **Religious:** Students must notify the instructor in writing or by email of any conflicts between course requirements and religious observances by the end of the second week of classes.
3. **Attending class**
    a. Note the Biology Policy on Absences. More than 3 unexcused absences will reduce your overall grade.
    b. If you already know that you will miss an exam or assignment, discuss it with me (the instructor) beforehand.
    c. If you miss an exam or assignment due to a valid excuse, medical or other, you need to provide valid and verifiable documentation to the NJIT Dean of Students Office and ask them to inform the instructor.
    d. Make-up assignments will be determined on a case-by-case basis and will not be in the same format or according to the same rules (e.g. grade replacement, grade curves, etc.) as the original assignment.
4. **Academic Integrity**.
    a. There will be ZERO TOLERANCE for violations of academic integrity.
    b. All assignments are checked with TurnItIn for plagiarism and AI use.
    c. The use of generative AI in this course's assignments is prohibited and considered cheating.
    d. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy.
    e. NJIT requires instructors to report any academic misconduct to the Dean of Students Office. Any incident found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a score of 0 for an assignment, a grade of F for the course, and/or suspension or dismissal from the university. If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office.