

Fall 2023

## **BIOL 443-001: Biology of Addiction**

Farzan Nadim

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## **BIOL 443: Biology of Addiction**

### ***Fall 2023 Course Syllabus***

#### **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](#)

#### **INSTRUCTOR**

Farzan Nadim, [farzan@njit.edu](mailto:farzan@njit.edu), CKB 420E, 973-596-8453

#### **OFFICE HOURS**

TR 11:30 AM – 12 PM and by appointment.

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#### **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 further 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 instructor-led discussions of the material as they analyze problems and propose possible mechanisms related to addiction and the nervous system. Weekly quizzes will be used to test some of these goals and reinforce the learning of the material.

# 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?
- How to deal with Addiction

## *Module 2: Substances of Abuse*

- Cannabinoids
- Opioids
- Alcohol
- Sedative-Hypnotics
- Stimulants
- Nicotine and Caffeine
- Hallucinogens (time permitting)

## *Module 3: Psychopharmacology*

- Pharmacokinetics
- Pharmacodynamics
- Biobehavioral effects

## *Module 4: The Central Nervous System*

- **Cells of the Nervous System**
  - Electrical signals and action potentials
- **Neurotransmitters and Neuromodulators**
  - Glutamate
  - GABA
  - Catecholamines (dopamine and norepinephrine)
  - Serotonin
  - Acetylcholine
- **Structure and function of the nervous system**
  - Basic neuroanatomy
  - The Limbic system including the amygdala and hippocampal structures
  - The midbrain dopaminergic systems and their targets
  - The brainstem noradrenergic and serotonergic systems
  - Cortical structures involved in mood and reward

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## IMPORTANT INFORMATION, RULES AND POLICIES

1. **Emergency Support:** NJIT Public Safety connects you to emergency support systems - 973.596.3111. **For medical, psychological or psychiatric emergencies:** University Hospital Crisis 973.623.2323. **To report a concern about another student's well being:** reach out to the NJIT CARE Team (<https://www.njit.edu/care>) or the Dean of Students Office 973.596.3466. **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. **Accommodation and support services for students with disabilities:** The 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](#).
3. **If you already know that you will miss an exam or assignment,** discuss it with me (the instructor) beforehand. Otherwise, **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 [Dean of Students Office](#) and ask them to inform the instructor. Make-up assignments will be determined on a case-by-case basis.
4. **Academic Integrity** is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. 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](#). Please note **NJIT requires us to report any academic misconduct** to the Dean of Students Office. Any student 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](#).

## GRADING POLICY AND SCALE

- The course will have two midterms and a non-cumulative final whose date and time will be scheduled by the Registrar. Each of these three exams will cover approximately one third of the course.
- Quizzes will be administered on Canvas and are limited in time and date.
- Every second Thursday class will include class discussions on topics posted on Canvas beforehand. Assigned students should do research on the topic for the purpose of in class discussions. This is 5 points of your Participation grade. The rest of your participation grade will be based on asking questions and being vocal in class discussions.

Assignment	%
Class and discussion participation	8
Quizzes	20
Midterm Exam I	22
Midterm Exam II	22
Final Exam	28
Active involvement in class (extra credit: only at the discretion of the instructor)	(12)
<b>TOTAL</b>	<b>100</b>

Grading Scale	
<b>A</b>	91 - 100
<b>B+</b>	84 - 90
<b>B</b>	75 - 83
<b>C+</b>	68 - 74
<b>C</b>	61 - 68
<b>D</b>	55 - 60
<b>F</b>	0 - 54