

BIOL 643-003: Biology of Addiction

COURSE SCHEDULE:	T, R: 10-11:30 am
INSTRUCTOR:	Farzan Nadim (farzan@njit.edu)
OFFICE HOURS:	T, R: 11:30 am-12 pm or by appointment
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

Psychopharmacology, 3rd ed, by Jerrold S. Meyer, and Linda F. Quenzer. Oxford University Press
Student Resources: <https://learninglink.oup.com/access/psychopharmacology-3e-student-resources>
Be sure to have access to Canvas, login with UCID.

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.

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COURSE OUTLINE

- **Introduction and course overview** – Addiction and the Brain
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Module 1: Addiction

- Introductory Lectures
 - What is Addiction?
 - DSM-5 definition of Substance Abuse
 - Is Addiction a Disease?
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Module 2: Substances of Abuse

- Cannabinoids
 - Opioids
 - Alcohol
 - Sedative-Hypnotics
 - Stimulants
 - Nicotine and Caffeine
 - Hallucinogens (time permitting)
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Module 3: Psychopharmacology

- Pharmacokinetics
 - Pharmacodynamics
 - Biobehavioral effects
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Module 4: The Central Nervous System

- **Basics**
 - 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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GRADING POLICY AND SCALE

- The project would be on a topic related to the course. Topics must be pre-approved by the instructor. There will be a 20-30 minute in class presentation and a paper for the project.
- The course will have two midterms, on 10/5 and 10/28, and a non-cumulative final whose date and time will be scheduled by the Registrar. Each of these three exams will cover one third of the course.
- All lectures will be pre-recorded and posted online. You should go through these each week. Most lectures will have a quiz on Canvas. Quizzes are due on Thursdays before class time.
- Tuesday classes will be dedicated to review and questions of the lecture material. Thursday classes will be class discussions, usually on topics that would be posted on Canvas beforehand and students should do a bit of research on it for the purpose of in class discussions. We may dedicate some Thursday classes to guest lectures.
- Tuesday classes are optional, Thursday classes are not. I will do my best to audio record Tuesday classes.

Assignment	%
Class Discussions and Participation	14
Online Quizzes	10
Project	22
Midterm Exam I	18
Midterm Exam II	18
Final Exam	18
TOTAL	100

Grading Scale	
A	88.1 - 100
B+	80.1 - 88
B	73.1 - 80
C+	66.1 - 73
C	60.1 - 66
F	0 - 50

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IMPORTANT RULES AND POLICIES

- ❖ If you miss an exam 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.
- ❖ 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 that it is my professional obligation and responsibility 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 failing grade of F, 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](#).