NJIT BIOLOGY

Course Syllabus

Fall 2025

BIOLOGY 605: Principles of Bioprocessing

INSTRUCTOR:	John Yarotsky, PhD	**PHONE:**	973-642-7976
OFFICE:	CKB 340C	**EMAIL:**	yarotsky@njit.edu
LECTURES:	FMH 321 Monday 6-9 PM via Zoom: https://njit-edu.zoom.us/my/yarotsky?pwd=TVlUVk9qajdvbmhMbEJ4OWtYNU5IQT09		
OFFICE HOURS:	***Mon 3-6***		

DESCRIPTION:

THIS COURSE COVERS THE MAIN CONCEPTS OF CELL PHYSIOLOGY, MOLECULAR BIOLOGY, AND CELL BIOLOGY. THE FUNDAMENTAL ASPECTS OF BIOCHEMISTRY THAT RELATE DIRECTLY TO PHARMACEUTICAL DEVELOPMENTS ARE DISCUSSED AND INCLUDE BASIC ORGANIC CHEMISTRY, BLOOD AND BUFFERS, PROTEIN BASED ENZYMES, COMPLEX CARBOHYDRATES, NUCLEIC ACIDS, AND FATS. THOSE TOPICS WILL THEN BE INTEGRATED INTO A THOROUGH UNDERSTANDING OF BIOPROCESSING IN PHARMACEUTICAL INDUSTRIES. THIS COURSE IS FOR PROFESSIONAL SCIENCE MASTER'S STUDENTS WITH LIMITED KNOWLEDGE OF BIOLOGY.

GOALS:

This course will review general principles of the function of cells and the biochemistry that allows them to operate. It will give students a solid foundation for understanding the molecular mechanisms that underlie basic metabolic pathways. That knowledge will be used to understand how enzymatic reactions control cellular and systemic functions in the human body. Finally, students will be learn how pathogenic organisms disrupt human health and how modern pharmaceutical manufacturing techniques are used to combat invading microorganisms.

TEXTBOOKS:

THE MOLECULAR BASIS OF LIFE, SIXTH EDITION, TRUDY MCKEE AND JAMES R. MCKEE, JULY 2015

ISBN: 9780190209896

ANALYTICAL CONSIDERATIONS FOR CELLULAR THERAPY MANUFACTURING, CHRIS WIWI

CELL CULTURE BASICS HANDBOOK, GIBCO

BIOLOGY 605: Principles of Bioprocessing

COURSE OUTLINE

WEEK	DATES	TOPICS
Week 1	Sep 1	No Class
Week 2	Sep 8	History of Bioprocessing and the cell theory
Week 3	Sep 15	Cell Cycle, Mitosis, and Meiosis
Week 4	Sep 22	Energy: Enzyme-substrate kinetics and basic chemistry
Week 5	Sep 29	Amino Acids, peptides and proteins
Week 6	Oct 6	Carbohydrates and their metabolism
Week 7	Oct 13	Exam 1
Week 8	Oct 20	Lipids and membranes /Second messenger signaling pathways: Receptors and Ligands
Week 9	Oct 27	Microbiology basics: Bacterial and viral replication/ Viral transformation and other viral biotechnologies
Week 10	Nov 3	Vaccine Development
Week 11	Nov 10	Exam 2
Week 12	Nov 17	Sterile lab environment/ Cell Culture Basics
Week 13	Nov 24	Good Manufacturing Processes and Drug Development
Week 14	Dec 1	Good Manufacturing Processes and Drug Development part 2
Week 15	Dec 8	Exam 3

BIOLOGY 605: Principles of Bioprocessing

LEARNING OBJECTIVES/GOALS: Upon successful completion of this course, students will be able to:

1. DESCRIBE IN A BROAD VIEW WHAT BIOPROCESSING IS.
2. DEFINE KEY ELEMENTS IN CELL CYCLE REGULATION.
3. IDENTIFY SPECIFIC ASPECTS OF BIOCHEMISTRY AS THEY RELATE TO CELL SURVIVAL AND GROWTH.
4. DEMONSTRATE KNOWLEDGE OF HOW BIOTECHNOLOGY IS USED TO MANIPULATE ORGANISMS FOR THE PRODUCTION OF PHARMACEUTICALS.
5. DESCRIBE TECHNOLOGIES THAT RELATE TO THE DEVELOPMENT OF CELL BASED THERAPIES.
6. DESCRIBE IN DETAIL A WORKING LABORATORY SETUP FOR THE DEVELOPMENT OF PHARMACEUTICALS.
7. DEFINE KEY ASPECTS OF MICROBIAL LIFE CYCLES.
8. IDENTIFY SPECIFIC TARGETS OF MICROBIAL LIFE CYCLES FOR MAINTAINING STERILE ENVIRONMENTS IN LABORATORIES.
9. CITE FDA REGULATIONS PERTAINING TO THE DEVELOPMENT OF PHARMACEUTICALS.

EXAMINATIONS:

- Your final letter grade is based on lecture exams. The exams will each be worth 30% of your grade. Attendance is 10%. **Extra credit is not an option**.

GRADING SCALE			
A	**90-100**	**C**	**70-74**
B+	**85-89**	**D**	**65-69**
C+	75-79	F	Below 65

ATTENDANCE POLICY:

Attendance is mandatory.
The Zoom link for the class is found in the first module of the canvas page. Students not attending the University via distance learning are encouraged to attend the class in person.

This course will strictly adhere to the NJIT Honor Code!! Both the lecture and the lab will have zero tolerance for violations to the NJIT's University Code on Academic Integrity!!