

Fall 2023

## **BIOL 605-101: Principles of Bioscience Processing**

John Yarotsky

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## BIOLOGY 605: Principles of Bioprocessing

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<b>OFFICE:</b>	CKB 340C	<b>EMAIL:</b>	<a href="mailto:yarotsky@njit.edu">yarotsky@njit.edu</a>
<b>LECTURES:</b>	KUPF 118 (or via Webex) Monday 6-9 PM		
<b>OFFICE HOURS:</b>	Thursday 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 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
<b>Week 1</b>	Sep 4	No Class
<b>Week 2</b>	Sep 11	History of Bioprocessing and the cell theory
<b>Week 3</b>	Sep 18	Cell Cycle, Mitosis, and Meiosis
<b>Week 4</b>	Sep 25	Energy: Enzyme-substrate kinetics and basic chemistry
<b>Week 5</b>	Oct 2	Amino Acids, peptides and proteins
<b>Week 6</b>	Oct 9	Carbohydrates and their metabolism
<b>Week 7</b>	Oct 16	Exam 1
<b>Week 8</b>	Oct 23	Lipids and membranes /Second messenger signaling pathways: Receptors and Ligands
<b>Week 9</b>	Oct 30	Microbiology basics: Bacterial and viral replication/ Viral transformation and other viral biotechnologies
<b>Week 10</b>	Nov 6	Vaccine Development
<b>Week 11</b>	Nov 13	Exam 2
<b>Week 12</b>	Nov 20	Sterile lab environment/ Cell Culture Basics
<b>Week 13</b>	Nov 27	Good Manufacturing Processes and Drug Development
<b>Week 14</b>	Dec 4	Good Manufacturing Processes and Drug Development part 2
<b>Week 15</b>	Dec 11	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 33.3% of your grade. **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. Missed classes will result in a 5% deduction of the total grade for the exam that class covers.

The Webex 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](#)!!

