

## BIOLOGY 605-101: Principles of Bioscience Processing

**INSTRUCTORS:** Dr. John Yarotsky

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**OFFICE:** Central King Building 340C

**OFFICE HOURS:** By Appointment Only (Email)

**COURSE SCHEDULE:** M: 6:00pm – 8:50pm in CKB 222

**COURSE 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.

**PREREQUISITES:** permission from the Instructor

**TEXT BOOKS:**

- The Molecular Basis of Life, Sixth Edition, Trudy McKee and James R. Kee, 2015. ISBN: 9780190209896.
- Analytical Considerations for Cellular Therapy Manufacturing, Chris Wiwi
- Cell Culture Basics Handbook, Gibco

**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

**GRADING POLICY:** 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    |                   |
|------------------|-------------------|
| <b>A:</b> 90% +  | <b>B+:</b> 85-90% |
| <b>B:</b> 80-85% | <b>C+:</b> 75-80% |
| <b>C:</b> 65-75% | <b>D:</b> 50-65%  |
| <b>F:</b> < 50%  |                   |

**Attendance, Make-up, and Lateness Policy:** Attendance is mandatory. Missed classes will result in a 5% deduction of the total grade for the exam that class covers.

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**LEARNING OBJECTIVES:** UPON SUCCESSFUL COMPLETION OF THIS COURSE, STUDENTS WITH 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.

**Academic Dishonesty:** The course has a zero tolerance policy for academic dishonesty, including plagiarism. A zero on the assignment and consultation with the office of the Dean of Students to determine if further action is required will punish instances of dishonesty. If you have any questions about what constitutes plagiarism or cheating, please ask us or refer to the academic integrity code: <https://www.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf>.

**SCHEDULE AND COURSE OUTLINE:**

| WEEK / DATES                                 |       | LECTURE TOPICS   |
|--|-------|--|
| <b>Week 1</b>                                | 9/3   | Labor day – No Class   |
| <b>Week 2</b>                                | 9/9   | History of Bioprocessing and Cell Theory   |
| <b>Week 3</b>                                | 9/16  | Cell Cycle, Mitosis, and Meiosis   |
| <b>Week 4</b>                                | 9/23  | Energy: Enzyme-substrate kinetics and basic chemistry  |
| <b>Week 5</b>                                | 9/30  | Amino Acids, peptides and proteins   |
| <b>Week 6</b>                                | 10/7  | Carbohydrates and their metabolism   |
| <b>Week 7</b>                                | 10/14 | <b>Exam 1</b>  |
| <b>Week 8</b>                                | 10/21 | Lipids and membranes/ Second messenger signaling pathways: Receptors and Ligands                           |
| <b>Week 9</b>                                | 10/28 | Microbiology basics: Bacterial and viral replication/ Viral transformation and other viral biotechnologies |
| <b>Week 10</b>                               | 11/4  | Vaccine Development  |
| <b>Week 11</b>                               | 11/11 | <b>Exam 2</b>  |
| <b>Week 12</b>                               | 11/18 | Sterile lab environment  |
| <b>Week 13</b>                               | 11/25 | Good Manufacturing Processes and Drug Development  |
| <b>Week 14</b>                               | 12/2  | Cell Culture Basics/ FDA regulations   |
| <b>Week 15</b>                               | 12/19 | <b>Exam 3</b>  |
| <b>FINAL EXAM WEEK: DECEMBER 14-20, 2019</b> |       |  |