

## BIOLOGY 606: Applied Bioprocessing & Immunological Based Therapies

<b>INSTRUCTOR:</b>	John Yarotsky, PhD	<b>PHONE:</b>	973-642-7976
<b>OFFICE:</b>	CKB 340C	<b>EMAIL:</b>	<a href="mailto:yarotsky@njit.edu">yarotsky@njit.edu</a>
<b>LECTURES:</b>	CKB 114 Webex Tuesday 6-9 PM		
<b>OFFICE HOURS:</b>	Friday 9am-12pm	<b>Students must make an appointment to meet!</b>	

### DESCRIPTION:

THIS COURSE BUILD UPON THE CONCEPTS COVERED IN BIOLOGY 605. STUDENTS WILL LEARN HOW THE IMMUNE SYSTEM FUNCTIONS AND HOW DISEASE STATES RELATE TO THE FUNCTIONAL ASPECTS OF THE IMMUNE SYSTEM. ONCE A BASIC UNDERSTANDING OF THE IMMUNE SYSTEM IS COVERED THE CLASS WILL FOCUS ON HOW MODERN BIOTECHNOLOGY IS BEING USED TO HARNESS AND ALTER THE IMMUNE SYSTEM IN ORDER TO FIGHT DISEASE. 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-

STUDENTS WILL GAIN A THOROUGH UNDERSTANDING OF IMMUNE FUNCTION AND DISORDER. BIOTECHNOLOGICAL INNOVATIONS WILL BE PRESENTED AND STUDENTS WILL LEARN HOW BIOLOGICS ARE PRODUCED IN ORDER TO ALTER AND ENHANCE IMMUNE FUNCTION. STUDENTS WILL BE GIVEN INFORMATION REGARDING CUTTING EDGE AND RAPIDLY EVOLVING IMMUNOLOGICALLY BASED THERAPIES THAT ARE BEING DEVELOPED TO COMBAT DISORDERS SUCH AS AUTOIMMUNE DISEASES AND CANCERS.

### TEXTBOOKS:

KINDT, THOMAS. (2007) IMMUNOLOGY SIXTH EDITION. W.H. FREEMAN AND COMPANY, NEW YORK, NEW YORK. ISBN-13: 978-1-4292-0211-4

ANALYTICAL CONSIDERATIONS FOR CELLULAR THERAPY MANUFACTURING, CHRIS WIWI

**BIOLOGY 606: Applied Bioprocessing & Immunological Based Therapies**

**COURSE OUTLINE**

WEEK	DATES	TOPICS
<b>Week 1</b>	Jan 18	Intro: Overview of the Immune System
<b>Week 2</b>	Jan 25	Cells and Organs of the Immune System
<b>Week 3</b>	Feb 1	Antigens and Antibodies-Immune Genes and Antibody Interactions
<b>Week 4</b>	Feb 8	Complement
<b>Week 5</b>	Feb 15	<b>Exam 1</b>
<b>Week 6</b>	Feb 22	The MHC complex and Antigen Presentation/ T Cell Receptors
<b>Week 7</b>	March 1	B Cell Maturation, Activation and Differentiation Leukocyte Activation and Migration
<b>Week 8</b>	March 8	Cytotoxicity, Hypersensitivity, and Autoimmunity
<b>Week 9</b>	March 14-18	<b>Spring Break-No class</b>
<b>Week 10</b>	March 22	Gene Therapy
<b>Week 11</b>	March 29	<b>Exam 2</b>
<b>Week 12</b>	April 5	Transplants, Infectious Diseases, and Cancers
<b>Week 13</b>	April 12	Cancer Therapies
<b>Week 14</b>	April 19	Cell-based Immunotherapies
<b>Week 15</b>	April 26	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 THE IMMUNE SYSTEM IS AND HOW IT RELATES TO HEALTH
2. DEFINE KEY ELEMENTS OF BOTH INNATE AND ADAPTIVE IMMUNITY AND CONTRAST THEIR INDIVIDUAL ROLES IN MAINTAINING HEALTH
3. IDENTIFY SPECIFIC CELLS OF THE IMMUNE SYSTEM AND DESCRIBE THEIR ROLES AND INTERACTIONS
4. DESCRIBE HOW BIOTECHNOLOGIES LIKE VACCINES USE THE IMMUNE SYSTEM TO COMBAT INFECTION AND MAINTAIN HEALTH
5. UNDERSTAND HOW ABERRANT IMMUNE RESPONSES GENERATE DISEASES LIKE AUTOIMMUNE DISORDERS
6. DESCRIBE IN DETAIL THE ROLE OF THE IMMUNE SYSTEM IN ORGAN TRANSPLANT REJECTION
7. DEFINE KEY BIOCHEMICAL PATHWAYS WHOSE OVER OR UNDER-EXPRESSION ALLOW CERTAIN CANCERS TO DEVELOP AND EVADE IMMUNE DETECTION
8. DESCRIBE THE PROCESS OF MANUFACTURING BIOLOGICALLY-BASED THERAPIES FOR DISEASES LIKE CANCER.
9. IDENTIFY THE ADVANTAGES AND DISADVANTAGES OF CURRENT IMMUNOLOGICALLY BASED THERAPIES.
10. DEFINE CURRENT FDA GUIDELINES FOR BIOLOGICALLY-BASED IMMUNOTHERAPIES AND GOOD MANUFACTURING PROCESSES.

⊗ You must have a computer of some kind with both a working webcam and microphone. The class will be held via Webex and participation and attendance are required portions of the class. Your webcam must be turned on and your face must be visible. You will have your microphone muted unless you are speaking. Speaking is not only encouraged but necessary during this class but feedback will result if everyone leaves their mics on at all times. So, please self monitor and be diligent about turning your mic on and off at appropriate times.

**CLASSES WILL BE HELD EXCLUSIVELY VIA WEBEX ON JANUARY 18 AND 25. CLASSES WILL RETURN TO IN PERSON AND WEBEX FROM FEB 1<sup>ST</sup>. ONLY LONG DISTANCE STUDENTS ARE PERMITTED TO ATTEND CLASS VIA WEBEX FROM FEB 1<sup>ST</sup>. OTHER STUDENTS MUST THEN ATTEND CLASS IN PERSON FROM THAT POINT FORWARD FOR THE REST OF THE SEMESTER. THE LECTURE WEBEX LINK WILL BE POSTED IN THE "GENERAL" MODULE ON THE COURSE'S CANVAS PAGE.**

### EXAMINATIONS:

- ⊗ Your final letter grade is based on lecture exams. The exams will each be worth 30% of your grade. The remaining 10% of your grade is based on attendance and class participation.
- ⊗ You must have a laptop or iPad with a working webcam in order to take the online exams. The software used to monitor the exams does not work with Chromebooks or Android Tablets. Therefore, you **MUST** have a

computer that has a working webcam and runs on either Apple's IOS operating system or a PC that runs Windows. If you do not you must drop the class because you cannot take the exams.

⊗ Exams will require the student to download the Lockdown Browser and Respondus Monitoring Software. Instructions for downloading and installing these are found in the Canvas page for the course.

⊗ "Exams will be proctored using both Respondus LockDown Browser+Monitor and Webex. Students will be required to join a Webex meeting from their phone with their cameras on, and to access the exam through LockDown Browser on a Mac or Windows PC with webcam. Students must follow all instructions related to environment checks and camera positioning."

⊗ Extra credit is not an option.

**ATTENDANCE POLICY:**

Attendance is mandatory. Participation in the class is also mandatory. You must attend class with your webcam on and your microphone muted unless you wish to ask a question. Microphones should be muted to insure that feedback will not occur when one voice travels through multiple microphones at once.

**Grade Scale:**

**A=90-100**

**B+=85-89**

**B=80-84**

**C+=75-79**

**C=70-74**

**D=65-69**

**F=64 or lower**

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](#)!!

