## **Biopharmaceutics – PHEN 698**

Instructor: Professor Xiaoyang Xu Departments of Chemical and Material Engineering Office: Tiernan Hall, 362 Email: <u>xiaoyang@njit.edu</u> Phone: 973-596-5359

Date to be offered: Friday 6:00- 8:50 pm

Location: CKB 315

**Prerequisite**: Graduate standing

## **Course description:**

This course is designed to furnish students with an understanding of state-of-the-art advanced pharmaceutics, with a particular focus on biologic drugs (proteins, peptides, nucleic acids, vaccines, and cells). The course will initially cover the major families of biologic drugs and delivery systems, along with the major challenges associated with their delivery and specific disease applications for these drugs. Additionally, the course will delve into fundamental principles for drug delivery, encompassing mass transport, bio-distribution, bio-availability, and pharmacokinetic/pharmacodynamic aspects. The class format will include lectures and critiques of recent literature.

By the end of the course, students will be able to:

- Familiar with state-of-the-art technologies in biopharmaceutics.
- Identify advanced approaches for controlled drug delivery in an effective manner, from administration to site-specific delivery.
- Assess the pros and cons of drug delivery systems.
- Critically assess current research and trends in biopharmaceutics
- Understand the principles of drug absorption, distribution, metabolism, and elimination.
- Classify dosage forms by formulation, route of administration and mechanism of drug release.
- Design appropriate formulations for delivering different therapeutics, including small molecule drugs, protein drugs and genes.
- Propose methods and relevant experiments to validate delivery efficacy of certain drugs.

## **Tentative schedule:**

Date	Торіс	Assignment
	Introduction of Biopharmaceutics and Drug delivery	
	Protein, Peptide, siRNA, DNA, cell	

Drug delivery barriers	
Drug administration routes (injection, oral, topical, inhalation, etc.)	
Intracellular Delivery and Trafficking	
Nanotechnologies and Nanomedicines	
Nucleic Acid Therapeutics and Delivery (siRNA, plasmid DNA, miRNA, mRNA, etc.)	
Protein Therapeutics and Delivery	
Cell based Therapeutics	
Gene Editing	
Vaccines	
Diffusion, permeability, dissolution	
Kinetics of delayed release, sustained and controlled release	
Implantable delivery systems	
Tumor drug delivery	
Oral delivery	
Topical delivery	
Inhalation and Sublingual	
Challenges and perspectives	

Texts and supplemental materials: Relevant articles will be sent to the class prior to lectures.

## Lectures

- This course is a face-to-face course and attending the class sessions in person is mandatory.
- Food and drink are expressly prohibited in the classroom.
- Cellphones should be turned off during lectures.
- Students are expected to be in the classroom by the start time of each class.

Attendance: Attendance is mandatory. You must notify the instructor in advance if possible, of any absence by sending an email stating the date and reason for the absence. If you are absent for up to two class periods because of illness or injury, an email message stating the reason for absence will be sufficient. If you are absent from more classes because of illness or injury, verification of a visit to a health care professional may be required. <u>Two times class absence (without verification/notification) will disqualify your final exam for this course</u>.

**Evaluation:** Grades will be determined based on class participation and assigned homework (25%), midterm exam (25%), and project report/presentation (50%) given by the students. Homework assignments (literature summaries and short lecture) for this course are considered individual assignments. Students may discuss the questions with other students in the course, but each student should prepare their solutions to the assignment individually.

January	20	Monday	Martin Luther King, Jr. Day
January	21	Tuesday	First Day of Classes
January	25	Saturday	Saturday Classes Begin
January	27	Monday	Last Day to Add/Drop a Class
January	27	Monday	Last Day for 100% Refund, Full or Partial Withdrawal
January	28	Tuesday	W Grades Posted for Course Withdrawals
February	3	Monday	Last Day for 90% Refund, Full or Partial Withdrawal, No Refund for Partial Withdrawal after this date
February	17	Monday	Last Day for 50% Refund, Full Withdrawal
March	10	Monday	Last Day for 25% Refund, Full Withdrawal
March	16	Sunday	Spring Recess Begins - No Classes Scheduled - University Open
March	22	Saturday	Spring Recess Ends
April	3	Thursday	Wellness Day
April	7	Monday	Last Day to Withdraw
April	18	Friday	Good Friday - No Classes Scheduled - University Closed
April	20	Sunday	Easter Sunday - No Classes Scheduled - University Closed
May	6	Tuesday	Thursday Classes Meet
May	7	Wednesday	Friday Classes Meet
May	7	Wednesday	Last Day of Classes
May	8	Thursday	Reading Day 1
May	9	Friday	Reading Day 2
May	10	Saturday	Final Exams Begin
May	16	Friday	Final Exams End
May	18	Sunday	Final Grades Due
May	19	Monday	Master's and PhD Candidate Commencement - Bloom Wellness and Events Center

May	21	Wednesday	Undergraduate Candidate Commencement - Prudential Center