

Spring 2019

# CHE 702-102: Introduction to Therapeutics and Drug Delivery

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**Course title:** Introduction to Therapeutics and Drug Delivery

**Date to be offered:** Spring, 2019

**Instructor:** Dr. Xiaoyang Xu

**Prerequisite:** Graduate standing

**Course description:**

The course aims to provide an introduction to pharmaceuticals and conventional oral, injected, topical and inhaled drug delivery systems. This course is designed to provide students with an understanding of the current state of the art for advanced drug delivery with a particular focus on biologic drugs (proteins, peptides and nucleic acids). The course will first cover the major families of biologic drugs, major challenges associated with their delivery and specific disease applications for these drugs. The course will also cover fundamental principles for drug delivery including mass transport, bio-distribution, bio-availability and pharmacokinetic/pharmacodynamic. The class format will be lectures and also critiques of recent literature.

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

- 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.
- 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	Topic	Assignment
	Introduction of Drug delivery	
	Protein, Peptide, siRNA, DNA, cell	
	Drug delivery barriers	
	Drug administration routes (injection, oral, topical, inhalation, etc.)	
	Intracellular Delivery and Trafficking	
	Small molecule delivery	
	Nucleic Acid Delivery (siRNA delivery, plasmid DNA, etc.)	
	Protein delivery	
	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.

**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.