

# COLLEGE OF CHEMISTRY COURSE GUIDE (../INDEX.HTML)

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## BIOE 124 (BIOE 224) - BASIC PRINCIPLES OF DRUG DELIVERY (3 UNITS)

### COURSE OVERVIEW

#### SUMMARY

(From Syllabus) BioE 124/224 “focuses on providing students with the foundations needed to understand contemporary literature in drug delivery”. Its goal is to “give students the ability to understand problems in drug delivery. Emphasis is placed on the design and synthesis of new molecules for drug delivery.” It has a mixture of undergraduate and graduate students.

Literature-focused lectures, homework, and exams covering a wide range of drug delivery topics.

#### PREREQUISITES

CHEM 3A (chem3a.html) and MCB C100A (chemc130.html)

BIOE 11 (bioe11.html) or CHEM 3B (chem3b.html); BIOE 103 (bioe103.html); and BIOE 104 (bioe104.html)

#### TOPICS COVERED

- Introduction, pKa, hydrolysis reactions and acid/base catalysis
- Elimination and fragmentation reactions, self-immolative linkers and design of prodrugs

- The HepDirect family of prodrugs
- The strategies for developing “traceless” linkers
- Disulfide bonds, other thiol-specific reactions, antibody drug conjugates and polymer drug conjugates based on free radical polymerization
  - PEG Drug Conjugates
  - Block Copolymer Micelles for Drug Delivery
  - Polymers for Controlled Release
  - Hydrogels
  - Endosomal Disruption
  - RAFT Polymerization
- Introduction to Immunology and Immunoengineering
  - Including the design and synthesis of vaccine delivery vehicles
  - TLR Signaling and Immuno-Engineering
- Drug delivery to the brain and oral drug delivery
- siRNA delivery and the delivery of nucleic acid therapeutics
- Intracellular protein delivery and peptide delivery
  - Peptide Therapeutics and Delivery
- Applications of drug delivery in the treatment of cancer
  - Tumor Biology and Drug Delivery to Tumors
  - Tumor Drug Delivery with Nanoparticles and cells
- Applications of drug delivery in the treatment of atherosclerosis
  - Atherosclerosis and Heart Failure
  - Drug Delivery to the Heart Examples
    - Sepsis and Resolvins
- Applications of drug delivery in the treatment of infectious diseases
  - Bacterial Drug resistance, and Antibiotic Drug Delivery
- Emerging therapeutic strategies
- Genome Editing and CRISPR/Cas9
- Elastin and Protein Conjugations
- Angiogenesis and Biomaterials

## WORKLOAD

### COURSEWORK

- Homework

- ~6 in total
- Each one ~ 6 questions some with multiple parts
- Including but not limited to fundamental chemistry, literature reading, specific delivery design/mechanisms, specific biological system, design new molecules subject to certain drug delivery constraints and requirements.
- Two midterms and one final

## **TIME COMMITMENT**

3 hours of lecture per week

## **CHOOSING THE COURSE**

### **WHEN TO TAKE**

Fall only.

This class fulfills the Chem/ChemBio allied subject requirement, as well as the ChemE engineering elective requirement

### **WHAT NEXT?**

- If the mathematical / transport side of the drug delivery is the main interest for the next step, BioE 104 – Biological Transport Phenomena ([bioe104.html](http://bioe104.html)) would be a good fundamental.
- If the interest for the next step is a disease (i.e. cancer, or maybe immunology), corresponding MCB or biology courses might be more in depth.
- If the interest for the next step is more drug molecule synthesis, maybe courses such as the following should be considered:
  - CHEM 114 - Advanced Synthetic Organic Chemistry ([chem114.html](http://chem114.html))
  - CHEM 263A - Synthetic Design I
  - CHEM 263B - Synthetic Design II

## **ADDITIONAL COMMENTS AND TIPS**

The blackboard notes during the lectures could be quite important.

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## COLLEGE OF CHEMISTRY PEER SERVICES

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