

## INTRO TO POLYMERS AND BIOPOLYMERS

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### Course Description

This is an advanced undergraduate / introductory graduate level class that is designed to provide fundamental knowledge in synthetic and natural polymers. The class will focus on the basic properties of polymers, how these polymers are made chemically and biologically, and the structure-property relationships as related to their use in biomedicine such as making implants, designing drug delivery vehicles, and creating scaffolds for tissue engineering. The class also aims to give students creative perspectives in engineering biologically active polymers, which will be achieved by highlighting the similarities and differences in the chemistry, molecular structures and high-order assemblies, and physical/biological characteristics between synthetic polymers and naturally derived biopolymers. The types of biopolymers to be covered in this class are mainly protein and peptides, but polysaccharides, polyesters, and natural rubbers are also included. Advanced topics to be discussed are ring-opening polymerization of poly(amino acids), solid-phase peptide synthesis, phage display and combinatorial synthesis, as well as the latest topics in chemical biology for biosynthesis of proteins comprised of unnatural amino acids.

### Course Objectives

On completion of this class, the students are expected to:

1. Understand the fundamentals of polymer science relevant to biomedical application.
2. Understand the basic structures and biosynthetic processes of biopolymers (proteins/peptides and polysaccharides).
3. Understand various ways to synthesize/engineer polymers and biopolymers, and have confidence in reading and reproducing synthetic protocols in modern literatures.
4. Be familiar with latest development in engineered biopolymers.
5. Understand modern tools for proteins and peptide discovery.

**Pre-requisites:** Organic chemistry and Biochemistry (or closely related class), or permission from Dr. Yu

### Assessment

Homework, quiz, and class participation (combined 15%), Midterm exam (closed book) 35%; Final project/presentation 15%; Final exam (closed book 35%)

### Textbook

There is no textbook for this class. Reading materials will be provided in the class; however I do recommend purchasing the following book which is an excellent reference for polymer science.

**"Introduction to polymers,"** 3<sup>rd</sup> edition,  
R. J. Young and P. A. Lovell

CRC Press, 2011

ISBN-10: 0849339294

*Book info: general polymer science*

### **Ethics and academic integrity**

The strength of this university and your personal reputation depend on your academic and personal integrity. I insist on the highest standards of academic integrity from all of my students. Your enrollment in this course constitutes implicit agreement with the guidelines outlined below. If you find that you cannot consent to them, you should speak to me. In return for your consent, I promise to trust you implicitly, unless and until you give me reason to do otherwise.

Generally speaking, ethical violations include cheating on exams, unauthorized collaboration on homework, alteration of graded assignments, forgery, plagiarism, falsification, lying, facilitating academic dishonesty, and unfair competition. In this course, you may discuss the homework problems only in general terms with your classmates which include interpretations of the questions and general approaches to solutions. However, in preparing your solutions, you must work without assistance of others, and you must prepare an independent set of solutions for submission. If you have any questions about what might constitute a violation of academic ethics in this course, please ask before it becomes an issue. **Any violations of academic ethics will be dealt with according to the school policy.** Many students believe that if they do not cheat they have fulfilled the requirement of academic integrity. This is incorrect. If you witness or otherwise become aware of any ethical violations in this course, it is your duty as a member of our academic community to report them to me. If you wish, you are entitled to raise the issue with the Department Chairman or the Ethics Board before contacting me.