

CHE 476 / CHE 514
INTRODUCTION TO POLYMER CHEMISTRY

Course Syllabus
Spring 2017

INSTRUCTOR: Javid Rzayev jrzayev@buffalo.edu
OFFICE HOURS AND LOCATION: By appointment (NSC 826)

CLASS HOURS AND LOCATION: Tu/Th 9:30-10:50 am (Hoch 139)

Synthetic polymers have become an integral part of our lives and can be found in many everyday and advanced materials: rubber tires, bullet-proof vests, paints, fibers, contact lenses, drug delivery vehicles and many others. This course will cover the basics of polymer synthesis, including traditional polymerization techniques, such as free-radical and anionic chain polymerizations, and step-growth polymerization. Newer methods of polymer synthesis, such as ring-opening metathesis polymerization and living free-radical polymerizations will also be discussed. Students will be introduced to the methods of preparation of advanced polymer structures, such as block, star and brush copolymers, semi-conducting and biodegradable polymers. Fundamentals of structure and physical properties of polymers, and methods of characterization will also be covered.

HELPFUL BOOKS:

- Hiemenz and Lodge, *Polymer Chemistry*, CRC Press, 2nd ed., 2007 .
Chapters 1-5 are most relevant for this course.
- Odian, *Principles of Polymerization*, Wiley, 4th ed., 2004.
This is a polymer synthesis bible that covers majority of synthetic techniques in depth.
- Young and Lovell, *Introduction to Polymers*, CRC Press, 2nd ed., 1991.
A good introductory book on polymer synthesis, properties and characterization.
- Walton and Lorimer, *Polymers*, Oxford University Press, 2000.
An inexpensive summary of polymer synthesis and properties. Clear and concise.

COURSE OUTLINE:

- Introduction to polymers (size, properties, nomenclature)
- Step-growth polymerization (nylons, polyesters, polycarbonates)
- Radical chain polymerization (polystyrene, polyacrylates, PVC)
- Ionic polymerizations (polystyrene, poly(vinyl ethers), synthetic rubber)
- Living polymerization (towards monodisperse macromolecules)
- Ring-opening polymerization (polylactide, poly(ethylene oxide))
- Advanced polymeric materials (conducting polymers, block copolymers)

Learning Outcomes	Assessment Tools
Calculate molecular weight averages, understand basic characterization tools	Midterm 1, Homework 1
Understand principles of step-growth polymerization	Midterm 1, Homework 2
Understand principles of chain-growth polymerization	Midterm 2, Homework 3
Identify major classes of commodity polymers	Midterm 2, Homework 4
Understand living/controlled radical polymerization	Midterm 2, Homework 5
Propose synthesis of various polymer architectures	Final Exam, Homework 6
Understand principles of self-assembly	Final Exam

Note: The Final Exam for this course is cumulative.

Exam Schedule

Homework	15%
Midterm I (Mar 7 th)	25%
Midterm II (Apr 18 th)	25%
Final (TBA)	35%

The Course: Polymer Chemistry is built on the principles that you learned in General Chemistry, Organic Chemistry and Physical Chemistry courses. You will be responsible for everything covered in class during lectures plus additional reading material. You will benefit from developing a systematic approach to learning the material in this class. The following should be essential elements of any study plan:

- 1) Regular attendance at lectures.
- 2) Reviewing and expanding upon your notes as soon as possible after each lecture.
- 3) Regularly doing homework sets and solving as many problems as possible.

Courtesy: Please be considerate to others during lectures. The use of cell phones (including text messaging) is strictly prohibited during lectures. Please do not disturb others by loud talking, noises and inappropriate behavior. The attendance at lectures will greatly benefit you if you can concentrate and pay full attention to the instructor. However, the attendance is not mandatory. If you feel like taking a nap, please find another room to do so.

Grading: If you want to have your exam regarded, then return it to me along with a note explaining the nature of the error in grading. I reserve the right to regrade your whole exam even if you find an error only in one of the questions.

Missed examinations: Do not miss the exams. Only students with a documented excused absence which is in conformance with the University guidelines for excused absences will be allowed to miss exams. No make-up exams will be offered.

Letter grade assignment: The letter grade will be determined from the results of three midterm examinations, the final examination and homework assignments based on the average performance of the class (curve).

Cheating: Cheating is an insidious practice. Your grade is assigned by measuring your performance against the average performance of others in this class. Cheating raises the class average for the benefit of those who cheat, and to the detriment of honest students. Cheaters who are caught in the act will receive zero for the examination. If second academic dishonesty is committed, the student will automatically fail the class.

CHE 514/476 Course website on UBLearn: The URL for this site is <http://ublearns.buffalo.edu/>. Syllabus, grade distributions, occasional announcements and other course-related material will be posted on this site. Please check the site regularly for class materials.

Disabilities: Students who have a disability must be on file at the UB Office of Accessibility Resources. Written indications from this office about the accommodations required for exams, class discussions, and written assignments should be provided to the instructor as soon as possible.