THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING

Introduction to High Polymer Engineering

CBE 5773

Credit Hours:
3.00 - 3.00

Course Levels:
Undergraduate (1000-5000 level)
Graduate (5000-8000 level)

Course Components:
Lecture

Course Description:
Introduction to polymeric materials, polymerization methods and kinetics, polymer solution properties, molecular weight determination and polymer physical/mechanical properties.

Prerequisites and Co-requisites:
Prereq: 3610 (610) or Chem 2510 (251), or permission of instructor.

Course Goals / Objectives:
- Be familiar with polymer structure, polymer type, average molecular weights and polymer morphology
- Be familiar with polymerization mechanism and reaction kinetics
- Be familiar with principals underlying and the derivation of Flory-Huggins equation
- Be familiar with various molecular weight determination methods
- Be exposed to important polymer characterization methods
- Be familiar with mechanical properties of polymers

Course Topics:

- Defining a polymer, history of polymer science and industry, polymers and petroleum, types of polymers and polymerization, nomenclature of polymers, chain structures, molecular weights and distribution, molecular forces, thermal & mechanical behavior
- Step growth polymerization, kinetics, molecular weight control in linear polymerization, molecular weight distribution in linear polymerization
- Chain growth polymerization, structural arrangement of monomer units, mechanism, type of initiation, kinetics
- Degree of polymerization, molecular weight control and chain transfer, thermochemistry of chain growth polymerization, comparison between step and chain growth polymerization
- Polymerization processes, types of polymerization process, changes of emulsion polymerization, copolymerization, the copolymer equation, types of copolymerization
- Polymer Characterization, Polymer solutions, physical chemistry review, ideal solution, polymer solution theories
- Molecular weight determination, end group analysis, colligative prop. Measurement, Light scattering, intrinsic viscosity, GPC
- Transitions in High Polymers, Tg, Tm, factors determining the magnitude of the transitions, dynamic mechanical analysis
- Morphology and polymer science, semi-crystalline polymers, process industry crystallinity
- Mechanical properties of polymers, polymer rheology, viscoelasticity

---

Designation:

Elective