

Lectures: Wed. 5-8 PM. Engineering C-115

Instructor: Prof. Jerry Scheinbeim
Engineering C-164
Busch Campus
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Office Hours: Monday 2:20 -3:40, Wednesday 2:20 -3:40.

Course Description: An introduction to polymers from synthesis to basic properties to structure/properties relationships. Understanding the implications of long chain molecular structures on their often unique set of properties.

Textbook: No required Text

Reference Books: *Contemporary Polymer Chemistry*, Allcock, Lampe, and Mark.
The Science of Polymer molecules, Boyd and Phillips.
Fundamental principals of Polymeric Materials, Rosen.
Textbook of Polymer Science, Billmeyer

Assessment: Midterm Exam, 30%, Final Exam, 40%, Term Paper, 30%

Course Content:

- 1) **Introduction: Overview of Polymer Properties and Thermoplastics, Elastomers and Thermosets.**
- 2) **Bonding Forces in Polymers: Primary and Secondary. Molecular Weight Distributions.**
- 3) **Polymer Synthesis: Homopolymers and Copolymers.**
- 4) **Molecular Models: The Freely Jointed Chain, Chain Statistics, etc.**
- 5) **Polymers in Solution. Measurements of Molecular Weight and Size.**
- 6) **Polymer Testing: Analysis of Thermal and Mechanical Properties.**
- 7) **Midterm Exam.**
- 8) **Semicrystalline Polymers: Polymer Single Crystals, Semi-Crystalline Polymer Morphology, Spherulites, and Crystallization and Melting Behaviors.**
- 9) **Morphology of copolymers.**
- 10) **Elastomers and Thermoplastic Elastomers**
- 11) **Mechanical Properties of Polymers: Viscoelasticity, Rubber Elasticity, Viscous Flow.**
- 12) **Structure/Physical Properties Relationships: Effects of Plastic Deformation.**
- 13) **Applications of Polymers.**
- 14) **Review and (Last) Exam: Term Paper Due.**