

MSE-344 Polymer Science and Engineering

Credit Hours: 3-0

Pre-requisites: Nil

Course Description

This course provides an overview of the structure, properties, and applications of polymeric materials. The discussion will consider the needs of society and industry. The students will learn about various properties (such as thermal, rheological, and mechanical), processing and characterization of such materials.

Course Contents

- Introduction to polymeric materials.
- Molecular structure of polymers. Principles, kinetics and mechanisms of polymerization. Systems and techniques of polymerization.
- Different Additives for polymers. Glass transitioning temperature. Polymers' crystallinity. Liquid crystal polymers.
- Visco-elastic behavior of polymeric materials. Polymer Processing, Polymer testing & Characterization, Smart Polymers, Degradation of polymeric materials.
- Factors effecting mechanical properties of polymers.
- Recycling of polymers. Latest research trends in polymers.

Weekly Plan

Week	Topics
1	Introduction to polymeric materials.
2	Molecular structure of polymers. Principles, kinetics and mechanisms of polymerization. Systems and techniques of polymerization.
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5	Different Additives for polymers. Glass transitioning temperature. Polymers' crystallinity. Liquid crystal polymers
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9	Mid-Semester Exams
10	Visco-elastic behavior of polymeric materials. Polymer Processing, Polymer testing & Characterization, Smart Polymers, Degradation of polymeric materials.
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13	Factors effecting mechanical properties of polymers
14	
15	Recycling of polymers. Latest research trends in polymers.
16	

Course Outcomes

At the end of the course, students will be able to:

- Describe general features including physical, chemical, and mechanical properties of polymers.
- Compare different manufacturing processes used for polymer materials considering their advantages, limitations, and suitability for a given situation.
- Analyze different characterization techniques used to evaluate polymer materials.
- Assess latest research trends in polymer materials.

Suggested Books

- Polymer Science and Technology by J. R. Fried. 3rd ed. Prentice Hall, (2014)
- Foundations of Materials Science and Engineering by W. F. Smith, J. Hashemi. 7th ed. Mc Graw Hill (2022)
- Smart Polymers and their Applications edited by M. R. Aguilar, J. S. Roman. Woodhead Publishing Limited (2014)