

UCH840: POLYMER SCIENCE AND TECHNOLOGY

L	T	P	Cr
3	1	0	3.5

Course Objectives:

To provide fundamental and applied knowledge of polymers and their synthesis, manufacture, processing and characterization.

Introduction: Basic concepts of polymer science, Classification of polymers, Average molecular weight and Molecular weight distribution.

Polymerization: Mechanism and kinetics of: Free radical addition polymerization, Ionic addition polymerization, Coordination polymerization, Step growth polymerization.

Structure and Properties: Thermal transitions, Crystallinity, Molecular weight characterization, Nuclear Magnetic Resonance (NMR) and Fourier Transform Infrared (FTIR) techniques.

Plastic Technology: Introduction, Rheology, Mixing and Compounding, Extrusion, Compression molding, Transfer molding, Injection molding, Blow molding, Calendering, Coating, Casting, Thermoforming.

Fiber Technology: General principles, Spinning, Fiber treatment, Properties.

Elastomer Technology: Natural and synthetic elastomers, Processing, Properties.

Manufacture: Brief description of manufacture, properties and uses of Polyethylene, Polypropylene, Polyvinylchloride, Polystyrene, Nylon, Polyethylene terephthalate.

Polymer Blends: Types, Compatibility, Thermal and Mechanical Properties.

Polymer Composites: Types, Properties, Preparation, Fibre-reinforced composites, In-situ composites.

Polymer Nanocomposites: Basic concepts, Processing, Characterization.

Course Learning Outcomes (CLO):

Upon completion of this course, the students will be able to:

1. understand the polymer synthesis techniques.
2. understand the structure-processing-property relationship of polymers.
3. understand and apply the various processing and manufacturing techniques.
4. understand the basic issues involved in polymer blends, composites and nanocomposites.

Text Books:

1. Billmeyer, F.W. Jr., *Text Book of Polymer Science*, Wiley & Sons (2005).
2. Kumar, A., Gupta, R. K., *Fundamentals of Polymers*, McGraw Hill (1998).

Reference Books:

1. Tadmo, Z; Gogos, C.G., *Principles of Polymer Processing*, Wiley Interscience (2006).
2. Williams, D. J., *Polymer Science and Engineering*, Prentice Hall of India (1971)

Evaluation Scheme:

S. No.	Evaluation Elements	Weightage (%)
1	MST	30
2	EST	50
3	Sessional (may includes assignments/ quiz's etc)	20