

IV Year B.Tech. Textile Technology I - Semester	L	T	P	To	C
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### TT437 TEXTILE POLYMER SCIENCE (ELECTIVE - IV)

**Course Description & Objectives:**

*This objective of course is to learn about polymerization process. The other objective of this course is to know the properties and use of different polymers.*

**Course Outcomes:**

1. Students will able to understand the importance of polymer.
2. They will able to understand different polymerization technique, process chemistry and machine related to the process.
3. They will know the characterization of the polymers.
4. They will also learn the application of polymer blend and composites.

**UNIT I - Introduction And Types Of Polymerization**

Introduction to polymers, Bonding in Polymers, Functionality, Polymerization mechanism & kinetics, chain-polymerization, Free-radical, anionic & cationic Co-ordination polymerization, Step polymerization, Poly-condensation, Mechanism of compensation polymerization, Ziegler natta catalysts, Mechanism of Polly - addition and ring opening polymerization chemical & geometric structures in polymers, growth of polymer industry in India.

**UNIT II - Characterization And Molecular Weight**

Molecular weights and their determination: Number average, weight average and viscosity average molecular weight, principles and calculation of the molecular weights by end group analysis, cryoscopy, Ebulliently osmometry light / scattering methods and viscometer methods, molecular weight distribution, Gel Permeation chromatography, Polymer Morphology and crystallization, Transition in polymers, Thermodynamics of polymer solutions, solubility parameter and its determination, Flory Huggins theory.

**UNIT III - Blend And Special Polymer**

Polymer Blends and alloys, Definitions, Phase diagrams, Reasons for blending, Types of blends, Compatibilization, methods of blending, Technoeconomical consideration for blending, Interpenetrating networks,

Polymer rheology recent application of polymers, Electro-active polymers & Biomedical applications.

#### **UNIT IV - Polymerization Techniques**

Polymerization Techniques (mechanism, merits demerits along with examples of manufacture of polymers), Bulk Polymerization - PET& PBT manufacture, solution polymerization - Poly propylene manufacture, suspension polymerization, PS & PMMA, Emulsion polymerization, SBR; Processing of polymers: Compounding, extrusion, Injection molding, rotational molding, compression molding, blow extension and extrusion blow molding.

#### **UNIT V - Polymer Composites**

Polymer composites: Introduction, applications, constituent materials, details of matrices (polymers) Polymer resins, epoxy resins, vinyl ester resins ,silicone resins, structural aspects influencing properties (Intramolecular, Intermolecular structure) – Reinforcement – glass fibres, general performance, characteristics, fibre production glass compositions, forms of commercial fibres, carbon and carbon fibres: production & properties, Aramid fibres, production & properties, manufacturing techniques of composite materials, hand layup process, bag moulding process, matched die moulding, filament winding, pultrusion, prepregs and moulding compounds, introduction to polymer nano composites.

#### **TEXT BOOKS:**

1. P. Ghosh, "Polymer Science & Technology", Tata McGraw Hill Publishing, New Delhi (2002).
2. B.T. Astron, "Manufacturing of Polymer Composites", Chapman & Hall (1997).

#### **REFERENCE BOOKS:**

1. Harry R. Allcock & Frederick W. Lampe & James E. Mark, "Contemporary Polymer Chemistry", Prentice Hall, New Jersey (2003).
2. L.A. Utracki, "Polymer Blends & Alloys", Hanser Publishers, (1988).
3. J. R. Fried, "Polymer Science & Technology", Prentice Hall Publications (1999).
4. George Lubin, "Handbook of Fibre Glass and Advanced Plastic Components", Van Nostrand Reinhold Company (1969).