PLPC2001 PLASTIC MATERIALS & ITS APPLICATION (3-0-0)

Course Objective: This course aims to equip students with a comprehensive understanding of polymer science and engineering, covering fundamental concepts, classification, properties, and applications of polymers, including commodity and engineering plastics, thermoset materials, polymer blends, alloys, and emerging materials, while emphasizing practical application through case studies.

Syllabus

Module-I (09 hours)

Polymer terminology: History-basic chemistry of polymers-nomenclature of polymers sources for raw materials- methods of manufacturing- general properties-processing behavior.

Classification: Classification of polymer sand applications of different polymers. Natural (Shellac resin and natural rubber) and synthetic polymers.

Module-II (09 hours)

Commodity Plastics - Properties, Characteristics & Applications Polyolefin - Polyethylene, LDPE, HDPE, LLDPE, HMHDPE, Polypropylene Polytyrene& Styrene copolymers - Polystyrene, HIPS, ABS, Styrene Vinyl plastics - Polyvinyl chloride, Polyvinyl Acetate, Polyvinylidene chloride Cellulosics -Cellulose nitrate, cellulose acetate, cellulose acetate butyrate,

Module-III (10 hours)

Engineering Plastics -Properties, Characteristics &Applications UHMHDPE -EVA Polyamides - Nylons 6, 66, 6 10, 11, 12. Acrylic plastics -Polymethyl Methacrylate, Polyacrylonitrile, Polyesters - Polyethylene terephthalate, Polybutylene terephthalate - Polycarbonate – Polyacetals, Aromatic ether - Polypheneylene oxide, Polyphenylene sulphide, Polysulfone, Polyimides Polyvinyl fluoride, Polyvinylidene fluoride, Polytetrafluoroethylene, polychlorotrifluoroethylene.

Module-IV (07 hours)

Thermoset materials - Properties Characteristics & Applications

Phenol formaldehyde - Urea formaldehyde - Melamine formaldehyde – Unsaturated polyesters, Epoxides - Polyurethane – Silicones, end use applications - case studies on applications

Module-V (10 hours)

Polymer blends and Alloys Definition, advantages of polymers, blends and alloys, role of composition, properties and applications of parameters for compatibility, PVC – Nitrile rubber, ABS-PVC and PP-EPDM preliminary concepts of new materials such as electrically active polymers Optoelectronic plastics, Bio-polymers, Reinforced Plastics – principles of composite - reinforcement, effect of reinforcement on strength of plastics, Role and nature of binders and coupling agents, properties and applications of fibres in reinforcement (glass and carbon), Properties and applications of FRP products.

Books:

Plastic Materials Ed 7 - By Brydson, J.A

Hand Book of Plastics Materials & Technology - By Rubin, Irwin, J

Plastics Materials Hand Book - By Athalye, A.S

Plastics Engineering Hand Book Ed. 5 & Society of the Plastic Industry Inc - By SPI.

Plastics Materials and Processing - By Schwartz & Goodman

Course Outcome (CO): ***After the completion of this course, students will be able***

CO1 To understand the structure and manufacturing methods of different types of polymers.

CO2 To analyze the structural molecular level design of each polymer this defines its characteristics.

CO3 To know the basic properties of each type of polymers so that its application can be judged in that particular area.

CO4 To describe in detail the idea about polymer blend and alloys and fabricate modern blending methods.

CO5 To create new polymers for specific applications considering environmental sustainability and advanced application.