

CEPE3009 POLYMER TECHNOLOGY (3-0-0)

Overall course Objective:

The objective of this course is to provide students with a thorough understanding of polymers, including their chemistry, structure, properties, synthesis, and processing techniques and to develop the ability to apply this knowledge in industrial and engineering applications.

Module I: (10 Hrs)

History of polymers, classification and types of polymers, chemistry, kinetics, and methods of polymerization. Introduction to reactor design for polymerization.

Module II: (10 Hrs)

Properties of plastics and macromolecular structure. Polymer degradation. Molecular weight of polymers and its determination by viscometry, light-scattering, and osmotic pressure methods.

Module III: (10 Hrs)

Monomers and their manufacture. Manufacture and uses of important polymers: polyethylene, polypropylene, polystyrene, polyvinyl chloride, nylons, polyesters, polyvinyl alcohol, polyvinyl acetate, polymethyl-methacrylate, polyacrylic acid, polylactic acid, phenol formaldehyde, urea formaldehyde, polycarbonate, and Teflon.

Module IV: (10 Hrs)

Polymer additives, compounding of plastics. Casting and moulding of plastics, equipment's, design of moulds. Plastic materials and elastomers as materials of construction in chemical equipment's.

Course Outcomes:

After the completion of course students will be able to;

CO1: Understand the fundamental concepts of polymer science, including classification, structure, and properties of polymers.

CO2: Explain various polymerization techniques and the chemistry behind polymer synthesis.

CO3: Analyse the physical, mechanical, thermal, and chemical behaviour of polymers and their relation to structure.

CO4: Apply knowledge of polymer processing techniques such as moulding, extrusion, and fibre production.

Text Books:

1. Polymer Science and Technology, 3rd ed. by J R Fried, PHI.
2. Textbook of Polymer Science by F W Billmeyer, Wiley.
3. Polymer Science, 2nd ed. by VR Gowariker, J Sreedhar, and NV Viswanathan, New Age.

Reference Books:

1. Principles of Polymerization, 4th ed. by G Odian, Wiley.
2. Principles of Polymer Engineering, N G McCrum & C B Bucknall, Oxford University Press
3. Contemporary Polymer Chemistry, 3rd ed. by H Allcock, FL Deceased, and J Mark, PHI.
4. Introduction to Polymer Science and Technology by N B Singh and S S Das, New Age.

Digital Learning Resources:

1. Introduction to polymer science by Prof. Dibakar Dhara, Department of Chemistry, IIT Kharagpur. Link: <https://nptel.ac.in/courses/104/105/104105124/>
2. Introduction to polymer Physics by Prof. Pratek Kumar Jha, Department of Chemical Engineering, IIT Roorkee. Link: <https://nptel.ac.in/courses/103/107/103107139/>