

DISCIPLINE SPECIFIC CORE COURSE – 6: POLYMER TECHNOLOGY(PT)

Credit distribution, Eligibility and Pre-requisites of the Course

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
POLYMER TECHNOLOGY(PT)	4	3	0	1	12 th Pass	-

Learning Objectives

- To learn about the production, properties and applications of thermoset and thermoplastic polymers
- To learn about the chemistry and manufacturing of flexible and rigid polyurethane foams
- To understand the modification of unsaturated polymers

Learning outcomes

The Learning Outcomes of this course are as follows:

- Learn preparation of thermoplastic polymers
- Learn preparation of thermosetting polymers
- Apply the knowledge of polymer synthesis to obtain polymers with desired properties

SYLLABUS OF DSC-6

UNIT – I

(27 Hours)

THERMOPLASTIC POLYMERS

Manufacturing process, properties and applications of the following polymers:

- Polyethylene (LDPE,LLDPE,VLDPE, HDPE)
- Polypropylene and related copolymers
- Polystyrene ABS, HIPS and related copolymers
- Poly (vinyl chloride) and related copolymers
- Poly (vinyl acetate) and related polymers
- Acrylic polymers (PMMA,PEA, PAA, PAN, Polyacrylamide)
- Aliphatic polyamides (Nylon 6, Nylon 66, Nylon 6,10)
- Polyester (PET, PBT)

UNIT – II

(18 Hours)

Manufacturing process, curing, properties, and applications of the following polymers:

- Unsaturated polyester resins

- Phenol formaldehyde resins (resols and novolacs)
- Urea and melamine formaldehyde resins
- Epoxides
- Polyurethanes (Flexible & Rigid foams)

Practical -

30 Hours

- Preparation of PMMA bone cement.
- Preparation and testing of epoxy resins
- Preparation of Nylon 6,10 by interfacial polymerization
- Preparation of phenolic resin for adhesive applications.
- Preparation of unsaturated polyester resin and determination of molecular weight by acid value/hydroxyl value.
- Synthesis of copolymer of styrene & maleic anhydride, and styrene & MMA and determination of reactivity ratios.
- To prepare melamine formaldehyde product viz. crockery etc.
- Synthesis of Polyurethane Foams
- Preparation of sodium polyacrylate salt and poly(acrylic acid) from polyacrylamide.

Essential/recommended readings

- Brydson J.A., (2016) *Plastics Materials*, Butterworth Heinemann, 8th Edition.
- Mittal Vikas, (2011) *High Performance Polymers and Engineering Plastics*, Wiley.
- Seymour R.B., Carraher C.E., (2003) *Polymer Chemistry*, Marcel Dekker.
- Billmeyer F.A., (2011) *Textbook of Polymer Science*, John-Wiley & Sons.
- Gowarikar V.R., (2019) *Polymer Science*, New Age International Publishers Ltd, 3rd Edition

Suggestive readings

- Flory P.J., (2007) *Principles of Polymer Chemistry*, Asian Books Private Limited.
- Mark J.E. Erman B., Eirich F.R., (2005) *The Science and Technology of Rubber*, Elsevier Academic Press.
- Sperling, L. H. (2005). *Introduction to physical polymer science*. John Wiley & Sons.
- Crompton R.T., (1989) *Molecular Motions in High Polymers*, Pergamon Press N.Y.
- Crompton T.R., (1989) *Analysis of Polymers*, Pergamon Press N.Y.
- Treloar, L. R. G. (1983). *Mechanical Properties of Solid Polymers*, IM Ward, John Wiley & Sons Ltd, Chichester.

Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.