

**PAPER XII POLYMER TECHNOLOGY**  
**(for the candidates admitted from the academic year 2010-11 onwards)**

**No.of hours: 75 hrs**

**Subject Description :**

This course presents additives used in plastics, fabrication process, fibre technology and elastomer technology.

**Goals :**

To enable the students to understand the fillers and their specific use in the end products of polymers, fabrication process and methods of making plastics, fibres and elastomers.

**Objectives :**

On successful completion of the course the students should have:  
understood plastic materials commonly used, their manufacture and compatibility of polymers and additives added to them,  
learnt the techniques of converting basic polymers into finished products.

**Contents**

**UNIT – I**

Polymerization process: Bulk polymerization, solution polymerization, suspension polymerization, emulsion polymerization, melt polycondensation, interfacial polycondensation. Production of polymers: polythene (HDPE), polystyrene, PVC, ABS plastics, polyvinyl alcohol, polymethyl methacrylate, phenol – formaldehyde, urea formaldehyde and epoxy resins.

**UNIT – II**

Polymer degradation: Degradation of polymers through ageing, thermal, mechanical, high energy radiation, photo degradation, oxidative degradation. Mechanism of degradation involving UV-radiations. Polymer additives –fillers, antioxidants, thermal and UV- stabilizers, colorants, flame retardants, blowing agents and plasticizers – effect of plasticizers on polymer properties , compatibility of plasticizers and polymers

**UNIT – III**

Fabrication process – One-dimensional processes: coatings and adhesives – Two-dimensional processes: Extrusion moulding, flat film extrusion, calendering, blown film extrusion and lamination. Three dimensional processes: Injection moulding, blow moulding, transfer moulding, foaming and forming process.

**UNIT-IV** Fibre technology: Production of natural and synthetic fibres: Regenerated cellulose, nylon 6, nylon 6,6, polyethylene terephthalate, and polyacrylonitrile. Properties of textile fibers, criteria for fiber formation. Spinning processes – melt spinning- dry spinning and wet spinning. Treatment of fibers: sizing, dyeing, finishing and lubrication.

## UNIT – V

Elastomer technology: Raw materials: natural rubber, SBR, butyl rubber, nitrile rubber, urethane rubber, chloroprene rubber, and silicone rubber. Vulcanization – chemistry of vulcanization, accelerators, activators. Mechanism of accelerated S vulcanization, nonsulphur vulcanization using peroxides, phenolic resins, physical aspects of vulcanization. Reinforcement: Carbon as filler and reinforcing agent, properties of carbon black, mechanism of carbon black reinforcement, oxidative ageing of elastomers.

## REFERENCES

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2. Dryden : Outlines of chemical technology, East West Press, 1965
3. L.K. Arnold : Introduction to plastics, George Allen Ltd. 1968
4. E.W. Duck : Plastics and rubbers, Butterworths, London, 1971
5. F.W. Billmeyer : Text books of polymer science, Wiley, Interscience 1971
6. K.K. Walczak : Formation of synthetic fibres
7. M. Morton : Introduction to rubber technology
8. W.C. Wake : The analysis of rubber and rubber-like polymers
9. C.V. Cagle : Hand-book of adhesive bonding, McGraw Hill
10. D.H. Kecalble : Physical chemistry of adhesion, Wiley-Interscience, 1971
11. R.M. Ogorikewiez: Thermoplastics – Properties and design, John Wiley
12. I.I. Rublin : Injection moulding theory and practice, Wiley Inter science