

Course code	Course Name	L-T-P-Credits	Year of introduction
CH365	POLYMER TECHNOLOGY	3-0-0-3	2016
Prerequisite : Nil			
Course Objectives			
<ul style="list-style-type: none"> • To Impart the basic concepts of polymer technology • To develop understanding about polymer as an engineering material • To understand the techniques of polymer processing 			
Syllabus			
<p>Introduction to polymers- classification-kinetics of polymerisation – addition polymerization – free radical polymerization – anionic and cationic polymerization – different types of copolymers. Methods of polymerization – bulk, solution, suspension and emulsion polymerization. Molecular weight of polymers – experimental methods for molecular weight determination –molecular weight distribution curve. Factors affecting polymer properties – types of polymer degradation. Important thermoplastics & thermosetting plastics – properties of polymers – stress strain behaviour of elastomers – viscoelasticity – measurement of rheological properties – melt flow index – capillary rheometers. Processing methods - effect of additives used – compounding methods. Moulding techniques for plastics – injection moulding – compression moulding –calendering – blow moulding – extrusion – thermoforming – spinning methods for fibres – vulcanization of rubber – general study of elastomer processing methods. Introduction to nano-composites.</p>			
Expected Outcome			
<p>The student will be able to:</p> <ol style="list-style-type: none"> i. Classify the types and mechanisms of polymerization ii. Summarize the classes, properties and engineering uses/applications of different polymeric materials. iii. Explain the processing methods and moulding techniques iv. Describe the elastomer processing methods and vulcanization of rubber.. 			
References:			
<ol style="list-style-type: none"> 1. Billmeyer F.W., Text book of polymer science, John Wiley. 2. Gowariker V.R. Polymer Science, New Age. 3. Premamoy Ghosh., Polymer Science and Technology, Tata Mc Graw Hill. 4. Rodrigues F., Principles of polymer systems, Tata Mc Graw Hill 5. Shah V.H., Handbook of plastic testing technology, Wiley, 1998 			

Course Plan			
Module	Contents	Hours	Sem. Exam Marks
I	Introduction to polymers-monomer, functionality, classification of polymer based on source, structure, application, thermal behaviour, mode of polymerization. Kinetics of polymerisation – addition polymerization – free radical polymerization – anionic and cationic polymerization.	7	15%
II	Molecular weight of polymers – weight average and number average molecular weight – sedimentation and viscosity average molecular weights. Experimental methods for molecular weight determination – end group analysis, light scattering method – viscometry (Ostwald viscometer) intrinsic viscosity. Molecular weight distribution curve.	7	15%
FIRST INTERNAL EXAMINATION			
III	Copolymerisation-Different types of copolymers – Characteristic features. Methods of polymerization – bulk, solution, suspension and emulsion polymerization. Factors affecting polymer properties – crystallinity – orientation treatment – solubility of polymers – glass transition temperature – types of polymer degradation – effect of reinforcement on the properties.	7	15%
IV	Thermoplastics – ABS – acrylics – cellulose acetate – fluoropolymers (PTFE) – nylons – polycarbonate – PVC – PE– PP – PS – polyurethanes. Thermosetting plastics – epoxy – phenol formaldehyde – urea formaldehyde – melamine formaldehyde – polyesters – silicones – (raw materials, properties and applications). Properties of polymers – rheology- viscous flow – apparent viscosity – rubber like elasticity – stress strain behaviour of elastomers – viscoelasticity – stress relaxation and creep – measurement of rheological properties – melt flow index (MFI) – capillary rheometers .	7	15%
SECOND INTERNAL EXAMINATION			
V	Additives for polymer processing - effect of additives used – plasticizers – colourants – heat stabilizers - antioxidants – ultraviolet absorbers – antistatic agents – flame retardants – blowing agents – lubricants and fillers – brief description of compounding methods.	7	20%

VI	Moulding techniques for plastics – injection moulding – compression moulding – calendaring – blow moulding – extrusion – thermoforming – wet, dry and melt spinning methods for fibres – vulcanization of rubber – general study of elastomer processing methods. Introduction to nano composites.	7	20%
END SEMESTER EXAMINATION			

Question Paper Pattern:

Maximum Marks: 100

Exam Duration: 3 Hours

Part A : There shall be **Three questions** uniformly covering Modules 1 and 2, each carrying 15 marks, of which the student has to answer any **Two questions**. At the most 4 subdivisions can be there in each main question with a total of 15 marks for all the subdivisions put together. (2 x15= 30 Marks)

Part B: There shall be **Three questions** uniformly covering Modules 3 and 4, each carrying 15 marks, of which the student has to answer any **Two questions**. At the most 4 subdivisions can be there in each main question with a total of 15 marks for all the subdivisions put together. (2 x15= 30 Marks)

Part C: There shall be **Three questions** uniformly covering Modules 5 and 6, each carrying 20 marks, of which the student has to answer any **Two questions**. At the most 4 subdivisions can be there in each main question with a total of 20 marks for all the subdivisions put together. (2 x20= 40 Marks)

Estd.



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