Master of Science – Nano Science & Nano Technology

(M.Sc.) (Nano Science & Nano Technology) Semester –I

Course Code	PS01CNST54	Title of the Course	Basic Concepts in Polymer Science
Total Credits of the Course	4	Hours per Week	4 hrs

Course Objectives:	1. To learn the polymer science starting from basic concepts of polymers, methods used for the synthesis, Characterization methods 2. Properties of polymers – Chemical bond, solubility, degradation behaviour and rheological properties 3. Polymer structures – response of polymer in presence of thermal energy

Course Content		
Unit	Description	Weightage* (%)
1.	Basic concepts of high polymer system, macromolecular concept, structural feature of polymer, length to diameter ratio, classification, structure property relationship. Step reaction polymerization, radical chain polymerization, ionic and co-ordination polymerization, copolymerization, Kinetics of different polymerizations.	25%
2.	Polymerization techniques like bulk polymerization, solution polymerisation. suspension polymerisation, emulsion polymerisation, melt polycondensation, solution poly condensation, solid & gas phase polymerization. Average molecular weights, Polydispersity,molecular weights distributions, measurement principal methods & their range of applications, analytical techniques for molecular weight determination and molecular weight distribution.	25%
3.	Chemical bonds, polymer solubility, chemical reactivity, effect of thermal, photochemical and high energy radiation, aging and weathering, diffusion and permeability, toxicity. Rheoproperties such as stress and strain, ideal elastic solid, newtonian and nonnewtonian fluid, apparent viscosity, the power law, molecular hole concept, waissenberg effect, measurement of flow, melt fracture, time dependent flow, viscoelastic material and its mechanical model, relaxation, hysteresis and creep.	25%
4.	Polymer single crystals, lamellae, disorder & nature of the fold surface, crystallization from melt, degree of crystallisation, crystallits, structural regularity and crystallizability, factors affecting crystallisabillity, helix structure, spherulites. Configuration of polymer chains, crystal structure of polymer, morphology of crystalline polymer, crystallization and melting. Glass transition temperature, melting temperature, measurement methods, factors affecting glass	25%

	transition temp and properties. Heat distortion temperature.	

Teaching-Learning Methodology	Group discussion/ Panel/Presentation

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learnerwill be able to	
1.	Get exposed to wider aspects of polymer science.
2.	Get idea of different methods used for the synthesis and characterization of polymers
3.	Get knowledge to correlate structure and properties of polymer

Suggested References:	
Sr. No.	References
1.	Gowariker, V. R., Viswanathan, N. V., & Sreedhar, J. (2015). *Polymer science*. New Age International.
2.	Ghosh, P.(3rd Ed.) (2010). *Polymer Science and Technology*. McGraw-Hill Education LLC.
3.	Billmeyer, F. W. (2007). *Textbook of polymer science*. Wiley India Pvt. Limited.
4.	Young, R. J., & Lovell, P. A. (2011). *Introduction to polymers*. CRC press.
5.	Brydson, J. A. (6th Ed.) (2013). *Plastics Materials.* Elsevier Science.

On-line resources to be used if available as reference material
On-line Resources
Introduction to Polymer Science, Prof. Dibakar Dhara, Department of Chemistry, IIT Kharagpur https://nptel.ac.in/courses/104/105/104105124/

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