

GUJARAT TECHNOLOGICAL UNIVERSITY

B.E Semester: III

Plastic Technology

Subject Code: **132301**

Subject Name: **Introduction to Plastic Material Science**

Sr.No	Course contents
1	Introduction: Basic concepts-What are polymers-How are they made-Natural & Synthetic polymers-forms of polymers-Copolymerization.
2	Molecular weight and size: Introduction- Mol.wt.averages- Mol.wt.distribution of Mol.Wt.-Mol.Wt. & physical properties-Secondary valency forces. Mol. Wt. & degree of polymerization-Polydispersity & Mol.wt. Distribution in polymers-Practical significance of polymer mol.wt.-size of polymer molecules
3	Glass transition temp. (T_g): What is Glass Transition Temp.- Glassy solids & Glass transition -Transition & Associated properties-Factors influencing the T _g -Mol.wt.& T _g -plasticizers & T _g -T _g . Of copolymers-melting point & T _g -importance of T _g . & HDT
4	Stereochemistry of Polymers: Introduction-Configuration and Confirmation features-Saw horse & Newmann projections-Conformation of n-butane-shape of polymer molecules-Tacticity -General remarks on polymer micro structure-micro structures based on the chemical structure.
5	Types of polymerization (a) Addition polymerization Introduction -Addition poly. of Polyethylene -Kinetics and mechanism of free radical add. Poly - dependence of rate on the initiator and monomer concentration- degree of poly. And kinetics chain length- factors affecting chain poly. Inhibition and retardation- various poly kinetics -ionic addition co-ordination polymerization. (b) Condensation polymerization. Introduction - types of Condensation Polymers-Condensation eactions for manufacture of Thermoset Plastics like UF, MF, PF,etc. Kinetics of Linear Condensation Poly.-three dimensional polymers-Inorganic Poly.-Ring Opening Poly of Nylon plastics (c) Co-polymerization Introduction- Co poly. Composition equation- applications of co polymers composition equation- block and draft copolymers. Determination of reactivity ratios- reactivity ratios and co poly. Behavior-the q-e scheme of alfrey and price-co polymer composition of higher conversion-ionic co poly.

6	Methods of polymerization Bulk - solution - Suspension - Emulsion - Gas phase polymerization techniques in detail with examples – Suspension polymerization of PVC, Bulk method for manufacture of PMMA sheet, etc. factors affecting the poly methods with respects to various parameters..
7	Polymer solution The process of polymer dissolution - Thermodynamics of polymer dissolution - nature of polymer molecules in solution - size and shape of macro molecules in solution.
8	Polymer reactions and polymer reactants Introduction - Hydrolysis - Acidolysis - Aminolysis - Hydrogenation -Reactions of various specific groups. Introduction - cyclization reaction -halogenation - cross linking reactions - polymer reactants
9	Crystallinity in polymers: Introduction: Crystalline solids & their behavior towards x-rays-polymers & x-ray diffraction-degree of crystallinity & its measurement-polymer crystallization -crystallisability -crystallites determination of crystallites size structural regularity & crystallisability-factors affecting crystallisability-spherulites -Folding of chain during crystal formation- Effect of crystallinity on properties of polymers like Nylons, HDPE, PPO,etc.

Reference Books:

1. V.R.Gowarikar and N.V.Viswanathan, "Polymer Science", Willey eastern limited.
2. G.S. Misra, "Introductory Polymer Chemistry", Willey eastern limited.
3. Polymers and Resins by Golding
4. Polymers chemistry by Stevens
5. An Introduction to Polymer Physics: I.I.Perepects.
6. "Polymer Science and Technology" by Premamoy Ghosh