

# GUJARAT TECHNOLOGICAL UNIVERSITY

M.E. Semester: III

## Chemical Engineering

Subject Name: **Introduction to Polymer Science and Technology**

(Major Elective –IV)

Subject Code: **733003**

Sr. No	Course content
1.	<b>Basic concept of polymer :</b>  Concepts of polymers, Classification of polymers based on: structures, configuration, application, tacticity crystalline, mechanism and kinetics of polymerization, mode of formation, Poly dispersity and molecular weight distribution, Concept of $M_n$ (Number average molecular weight), $M_w$ (Weight average molecular weight), $M_v$ (Viscosity average molecular weight) and $M_z$ (Z average molecular weight) and measurement techniques, effect of molecular weight on polymer end use properties Functionality principle, Theory of polymer solutions: solubility parameter, Mark-Houwink-Sakurada equation.
2.	<b>Polymer Structure and Physical Properties:</b>  The Crystalline Melting Point, The glass Transition, Properties Involving Large Deformation, Properties Involving small Deformation, Strength, Physical state of Polymers, Elastic property, Chemical resistance, Solubility, Intermolecular forces in monomers and polymers, Plastics-Elastomers & Fibres, Mechanical behaviour of Polymers. Introduction, Molecular weight & intermolecular forces, The amorphous state rheology, Stereochemistry, Crystallinity, Chemical, Crosslinking, Physical Crosslinking, Polymer blends
3.	<b>Chain growth polymerization:</b>  mechanism and kinetics of free radical, anionic, cationic and co-ordination polymerization, initiator efficiency, types of initiation reactions, auto acceleration chain transfer agents, inhibition and retardation reactions.
4.	<b>Step growth polymerization:</b>  Carothers's equation, kinetics of step growth polymerization, cross-linking and gelation, Comparison between addition and condensation polymerization, Co polymerization: Types of co polymers, monomer reactivity ratio, block and graft copolymers
5.	<b>Polymer Degradation And Techniques Of Polymerization:</b>  Polymer degradation (chain and random), Methods of degradation of polymers such as mechanical, thermal, photo, oxidative and bio degradation, Bulk polymerization, Solution polymerization, Suspension polymerization, Emulsion polymerization and its kinetics, Comparison of bulk, solution ,

	emulsion and suspension polymerization techniques.
6.	<b>Polymerization Reaction Engineering :</b>  Emulsion polymerization, dispersion polymerization etc . Reactors for polymerization: analysis of polymerization reactions, Reactor design applied to polymer system, Average molecular weight of polymer in different reactor, Control of molecular weight
7.	<b>Rheology Of Polymeric System:</b>  Unit operations in polymer industries. Polymer processing: moulding, calendaring, extrusion etc.
8.	Reactor for Industrial polymerization Processes like manufacturing of PS, PBR SBR

### Reference Books:

Sr No.	Book	Publishers	Author
1	Polymer science and technology	PHI	Joel R. Fried
2	Rubber chemistry	Elsevier Appl.	Brydson
3	Principles of polymer system	TMH	Ferdinand &Rodrigues
4	polymer Science	Wiley Eastern	Gowariker