

Polymer Synthesis and Properties

- 1.1 Course Number: CH391
 - 1.2 Contact Hours: 3-0-0 Credits: 9
 - 1.3 Semester-offered: 3rd Year-Odd
 - 1.4 Prerequisite: Organic Synthesis, Chemical Reaction Engineering
 - 1.5 Syllabus Committee Member: Dr M S Balathanigaimani, Dr Umapasana Ojha
2. **Objective:** The course will provide in-depth knowledge about the polymers and various polymerization procedures. Mechanism of different polymerization technique such as step growth and chain growth polymerizations along with the kinetics will be discussed. Advanced polymerization procedures and use of Ziegler-Natta catalyst in polymerization of unsaturated hydrocarbons will be discussed
3. **Course Content:**

Unit-wise distribution of content and number of lectures

Unit	Topics	Sub-topic	Lectures
1	Introduction	Classification, Molecular Weight and Types of Polymerization (Step and chain polymerization)	4
2	Mechanism of polymerization	Step growth, free radical and ionic polymerization	4
3	Kinetics of polymerization	Condensation and free radical polymerization, effect of polymerization condition on molecular weight, distribution via chain transfer mechanism, dean end polymerization	8
4	Coordination Polymerization	Ziegler Natta Catalyst, Composition, Mechanism and Kinetics	3
5	Advanced Polymerization Techniques	NMP, ATRP, RAFT and Living Polymerization, Suspension, Emulsion	6
6	Major Commodity Plastic Materials	LDPE, HDPE, MDPE, LLDPE, PMMA, PET, Urea Formaldehyde	4
7	Polymer in solutions	Criteria for Polymer Solubility, Conformations of Dissolved Polymer Chains, Thermodynamics of Polymer Solutions, Phase Equilibrium in Polymer Solutions, Fractionation of Polymers by Solubility	4
8	Molecular weight	Viscosity, light scattering-Zimm plot, VPO	3

		techniques	
9	Applications	Biomedical, Petroleum, Adhesive, High strength application and transparent coatings	4
		Total	40

4. Readings

4.1 Text Books

1. Introduction to Physical Polymer Science Fourth Edition L.H. Sperling
2. Textbook of Polymer Science Fred W. Billmeyer, Jr. 3rd Ed., Wiley, New York, USA, 1984
3. Principles of Polymerization, G. Odian, 3rd Ed., Wiley, New York, 1991
4. Principles of Polymer Systems, F. Rodriguez, 5th Ed, McGraw Hill, New York, 2003.
5. Introduction to polymer science and chemistry, Manas Chanda, CRC Press

4.2 Reference Books

1. Polymer Reaction Engineering of Dispersed Systems: by Werner Pauer

- 5. Outcome of the Course:** Upon completion of this course, students will be able to rationally arrive at the solutions for corrosion mitigation. They will also be able to select the materials for corrosion control and to analyze the failures caused by corrosion.