GUJARAT TECHNOLOGICAL UNIVERSITY
B. E. SEMESTER: V
PLASTIC TECHNOLOGY

Subject Name: **Physics of Plastics**

Subject Code: **152302**

Teaching Scheme				Evaluation Scheme		
Theory	**Tutorial**	**Practical**	**Total**	**University Exam (Theory) (E)**	**Mid Sem Exam (Theory) (M)**	**Practical (I)**
3	0	3	6	70	30	50

Sr. No.	Course content
1.	Introduction: Polymer molecules their classification, Structure & conformation, A single ideal chain, Mean square end-to-end distance, Radius of gyration.
2.	Gaussian chain, Freely jointed chain, Worm like chain.
3.	Stretching & confinement, Structure factor.
4.	Excluded volume, Solvent quality, Theta temperature.
5.	Mechanical models of visco-elastic fluids, Retardation & relaxation spectrum, Experimental characterization of non-Newtonian fluids, Time dependent and time independent fluids in rotational & capillary tube viscometers, Experimental characterization of visco-elastic materials, Transient experiments & dynamic experiments, Experimental techniques frequency response analysis.
6.	Polymer Solutions: Flory Huggins theory, Osmotic pressure, Scaling lows for good solvents, Concentration fluctuation & co-relation length, Size of a polymer in semi-dilute solutions poor solvents and phase separation, Fractionation, Measurement of polymer size in solution, Osmotic pressure, Light scattering, Intrinsic viscosity, Size emulsion chromatography.
7.	Structure of amorphous phase in bulk polymers, Two phase structure of semi-crystalline polymer and its characterization & co-relation with properties.
8.	Crystal morphologies: Extended chain crystals, chain folding, lamellac, spherlites.
9.	Concept of unit cell, Crystallite size & long period, Crystallizations its kinetics: Avrami equation, melting & determination of melting point, the effect of various parameters on melting.

Reference Books:

1. "Polymer Physics" by Rubin Sterin & R.C. Colby (Oxford university press).
2. "Scaling Concept in Polymer Physics" by P.G. Degennes.
3. "The Theory of Polymer Dynamics" by M. Doi & S.F. Edwards.