GUJARAT TECHNOLOGICAL UNIVERSITY

M.E. Semester: II

Plastic Engineering

Subject Name: **PLASTICS CHARACTERISATION TECHNIQUES (Major Elective-II)**

Sr.No	Course content
1.	**Molecular Weight Determination:** Molecular weight averages - Molecular weight determination techniques like End-group analysis, Colliquative Properties - Ebulliometry, Osmometry and Vapour phase Osmometry, Light scattering techniques, Solution viscometry, and Gel Permeation Chromatography.
2.	**Spectroscopic Characterization:** Introduction to Spectroscopic techniques - Ultraviolet - Visible Spectroscopy - Infra Red and Raman Spectroscopy - Nuclear Magnetic Resonance (NMR) Spectroscopy - Electron Spin Resonance Spectroscopy, X -Ray Diffraction.
3.	**Microscopic And Chromatographic Characterization:** Light Microscopy - Scanning electron microscopy - Transmission electron Microscopy and Scanning transmission electron microscopy. Analysis of residual monomer like VCM, Acetaldehyde, Acrylonitrile and Styrene content in Polymers by Gas Chromatography.
4.	**Thermal Characterization:** The basis of Thermal Analysis - Differential Thermal Analysis (DTA) and Differential Scanning Calorimetry (DSC) - Thermo-mechanical Analysis (TMA) - Thermo gravimetric Analysis (TGA) - Dynamic Mechanical Thermal Analysis (DMA) and Dielectrical Thermal Analysis.
5.	**Rheological Characterization:** Introduction and definitions related to fluid flow - Newtonian and non-Newtonian and visco elastic fluids. Rheological properties - viscosity, melt-flow, relationships describing temperature and shear rate dependence on the rheological behaviour of amorphous and crystalline plastics materials, Simple shear flow and its application for measurement of viscosity as well as normal stresses. Simple elongation flow and its significance. Dynamic flow behaviour, time dependent fluid responses. Viscosity measurements - capillary rheometer, viscometer, torque rheometers, cup flow and spiral flow tests for determination of flow behaviour.

Reference Books:

1. Fred W. Billmeyer, J. R. Text book of Polymer Science, John Wiley & Sons, Singapore, 1994.
2. Seymour/Carraher's Polymer Chemistry An Introduction, Marcel Dekker, Inc., New York, 1996.
3 Campbell and J. R. White, Polymer Characterization Physical Techniques, Chapman and Hall, London, 1989.
4. J. Spells, Characterization of Solid Polymers, Chapman and Hall, London, 1994.
5 Charles L. Rohn, Analytical Polymer Rheology, Hanser Publishers, Munich, 1995.
6. Edith A. Turi, Thermal Characterization of Polymeric Materials, Academic Press, New York, 1981.