

GUJARAT TECHNOLOGICAL UNIVERSITY
B.E. SEMESTER : VII
CHEMICAL TECHNOLOGY

Subject Name: Evaluation of testing Polymers & Rubbers

Subject Code: 173603

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	University Exam(E)	University Exam(P)	Mid Sem Exam(Theory) (M)	Practical (Internal)
4	0	3	7	70	30	30	20

Sr. No	Course contents
1.	Thermal properties of polymers: Glass transition temperature, melting temperature, heat distortion temperature, etc. Sample preparation, standardization, conditioning of sample, processibility test.
2.	Dynamic mechanical analysis, melt flow rate, Vicat softening temperature. Scanning calorimeter & their applications to polymers with suitable examples
3.	Structural evaluation of polymers: Principles, theories & applications to polymers system with suitable illustration of the following techniques: Fourier transform infrared spectrometry, Ultraviolet Visible spectrometry, Nuclear magnetic resonance spectrometry, Mass spectrometry, X-ray diffraction spectrometry, Gas chromatography
4.	Molecular weight determination : Study of the respective principles, theories & application by the following techniques : Gradient elution technique, Gel permeation chromatography, Vapour pressure osmometry, Cryoscopy & ebullioscopy
5.	Determination of viscosity of polymer solutions & polymer melts : Their significance, application to polymers using different viscometers. Determination of viscoelastic properties of polymers & rubbers
6.	Electrical properties : Surface volume resistivity, Breakdown voltage. Arc resistance, Ten Delta, etc. The theory behind these phenomena, application to polymers & evaluation., Mechanical properties : Their principles & applications to polymers, Tensile strength, flexural strength, impact resistance, percentage elongation, Griffin theory, tear test, fatigue & wear, hardness, compressive strength time dependant properties like creep, stress, relaxation, etc
7.	Environmental resistance: Stress cracking, effect of weathering, biological degradation, fire radiation staining., Optical properties: Refractive index, gloss, color matching, haze. Fire test: Ignition of flame & spread, limiting oxygen index, rate of heat release, smoke toxicity test
8.	Testing of flexible films for food applications, Permeability, Adhesion test: Peel test tension test, shear test Microscopy: Scanning electron microscopy, travelling electron microscope, Identification of polymers using chemical methods.

Reference Books:

1. Handbook of Plastics Analysis, H. Lobo & J.V. Bonilla, Marcel Dekker, 2003.
2. Handbook of polymer Testing Roger Brown, Marcel Dekker Inc, 1999.
3. Instrumental Methods. Dyer, Mc Graw Hill, 1997
4. Developments in Polymer Characterization Vol 1-5, J.V. Dawkins, Elsevier Applied Science Publishers, 1978
5. Principles of Polymer Science, Bahadur & Sastry, Narosa Publishing Houses, 2002
6. Polymer Science , Gowarikar, John Wiley & Sons ,1986
7. Encyclopedia of Polymer Science & Technology, John Wiley & Sons, Inc ,1965
8. Encyclopedia of Polymer Science & Engineering, John Wiley & Sons, Inc, 1988
9. Polymer Chemistry , Malcolm P. Stevens, Oxford University Press Inc ., 1990
10. Textbook of Polymer Science, Billmeyer, John Wiley & Sons, 1984.
11. Polymer Science and Technology: Plastics, Rubbers, Blends and Composites, P Ghosh, Mc Graw Hill, 2nd ed.,1990
12. Principles of Polymer Systems, Rodriguez, Hemisphere Publishing Corpn, 5th Ed., 2007
13. Textbook of Polymer Science, P Nayak and S Lenka, Kalyani Publishers, 1986
14. Polymer Chemistry, Seymour and Carraher, Marcel Dekker, 2003
15. Handbook of Rubber Technology, S Blow, Galgotia Publications Pvt. Ltd, 1998