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

Subject Name: **Plastic Testing & Instrumental Analysis**
(Department Elective -1)
Subject Code: **172305**

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	University Exam (E)		Mid Sem Exam (Theory) (M)	Practical (Internal)
				Theory	Practical		
4	0	2	6	70	30	30	20

Sr. No	Course Content	Total Hrs.
1.	**Introduction**: Basic concepts of testing-specifications and standards-purpose of specifications-basic specification format-ion and short term testing of plastics.	03
2.	**Mechanical properties** : Introduction to stress-strain curves-understanding of terms like stress, strain, elongation, yield point, yield strength, proportional limit, toughness, modulus of elasticity, secant modulus, etc. • **Tensile tests** with test specimen preparation and conditioning, apparatus, calculations of tensile strength, modulus, and elongation; factors affecting the test results. • **Flexural tests** with apparatus, specimen, etc. • **Compressive properties** - creep tests like tensile and flexural creep; creep curves and their study calculations of maximum fiber stress - interpretation and applications of creep data-isochronous stress -strain curves- stress relaxation-stress-time curves and application. • **Impact tests** like—Izod and Charpy, factors affecting impact strength, Dart Impact, Tensile impact tests. • Shear strength and abrasion resistance tests in detail. • **Fatigue resistance tests**: flexural fatigue, tensile fatigue; factors affecting test results and applications. • **Hardness tests**: Rockwell hardness, durometer hardness, barcol hardness tests with factors affecting test results and limitations. • Creep-stress relaxation • Influence of temperature on modulus, visco-elasticity, Burgess Model of creep, Maxwell model of stress relaxation	16

3.	**Thermal properties**: Introduction-tests for elevated temp performance-short term tests like HDT, Vicat softening point-torsion pendulum test-long term tests like heat resistance test-all temp index-creep modulus/creep rupture tests-test variables and limitations of all tests with test procedure-specimen preparation, etc. Thermal conductivity and thermal expansion test-coefficient of linear thermal expansion-brittleness temp. etc.	06
4.	**Electrical properties**: Introduction-tests like dielectric strength-dielectric constant-dissipation factor-surface and volume resistance-arc resistance-test procedures with specimen preparation in detail.	06
5.	**Weathering properties**: Introduction-accelerated weathering tests like exposure to carbon arc lamps-exposure to xenon arc lamps-exposure to fluorescent UV lamps-outdoor weathering of plastics.	05
6.	**Optical properties**: Introduction to refractive index-light transmittance and haze-photo elastic properties-color-gloss-tests for each of these.	04
7.	**Material characterization tests**: Melt index test in detail-capillary rheometers test with (1) melt viscosity v/s. shear rate curves (2) shear stress v/s. shear rate curves- viscosity tests in detail-GPC-thermal analysis tech .like DSC, TGA, TMA.	04
8.	**Flammability tests**: Incandescence resistance test-ignition properties-oxygen index test-surface burning characteristics-smoke generation tests.	03
9.	**Chemical properties**: Immersion-stain resistance, solvent stress cracking resistance and ESCR tests in detail.	03
10.	**Plastic identification** Introduction, concept of identification, various tests for thermoplastics and thermosets- flame tests-solution test- density measurement-plastic film identification-selection of plastics-criteria and application, design consideration etc.	03
11.	**Product testing:** Pipe and fittings, film and sheets-container testing and FRP based product	03

Text Book:

1. Testing of plastics by Vishu Shah.

Reference Books:

1. Testing of polymers vol-1, 2, 3 By J.V.Schmitz and W.E.Brown.
2. Handbook of plastics Test Methods By R.P.Brown
3. The Properties and Testing of Plastic Materials By A.E. Lever and J. Rhys