

GUJARAT TECHNOLOGICAL UNIVERSITY

PLASTIC TECHNOLOGY (24) PLASTICS TESTING TECHNOLOGY SUBJECT CODE: 2732404 M.E. 3rd SEMESTER

Type of course: Theoretical + Practical(regular)

Prerequisite: Basic knowledge of plastics materials, strength of materials,

Rationale: Correlate appropriate testing method for identification of plastics and its properties

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P		Theory Marks		Practical Marks				
			ESE (E)	PA (M)	ESE (V)		PA (I)			
					ESE	OEP	PA	RP		
3	2#	2	5	70	30	20	10	10	10	150

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	Concepts of Testing & Identification Of Plastics Basic concepts of testing-Specification and Standards – National and International Standards, Quality Management System (QMC) – Test specimen preparation – Pre-conditioning and test atmosphere. Identification of plastics by simple test: Visual examination – Density – Melting point – Solubility test – Flame test – Chemical tests.	08	10
2	Mechanical Properties: Long-term Mechanical Properties – Creep – Stress relation. Short-term Mechanical Properties: Tensile properties - Flexural properties – Compressive properties - Shear properties - Impact properties - Tear resistance - Hardness tests – Abrasion resistance - Friction test. Specific gravity - Density by Density-gradient technique - Bulk density - Particle size by sieve analysis - Moisture analysis.	10	30
3	Thermal Properties: Melt flow index - Heat deflection temperature - Vicat softening temperature - Brittleness temperature - Specific heat - Glass transition temperature – Thermal conductivity - Co-efficient of thermal expansion - Shrinkage - Thermal stability - Flammability.	08	20
4	Electrical and Optical Properties: Dielectric strength - Dielectric constant and Dissipation factor - Insulation resistance – Volume and Surface resistivity - Arc resistance - Antistatic tests. Refractive index - Luminous transmittance - Clarity and Haze - Photo-elastic properties – Colour measurements and Specular Gloss.	08	20
5	Permanence Properties and Product Testing: Gas and Moisture Vapour Permeability - Water absorption - Chemical Resistance - Environmental Stress Cracking Resistance - Crazeing - UV Resistance - Ozone Resistance - Weathering Resistance - Microbiological attack.	08	20

	Testing of Pipes and Fittings - Films & Sheets - Container - Foam - Laminates and FRP/ composite based products - Failure Analysis.		

Reference Books:

1. Vishu Shah, Hand Book of Plastics Testing Technology, John Wiley & Sons Inc., New York, 1998.
2. J. S. Anand, K. Ramamurthy, K. Palanivelu & C. Brahatheeswaran, How to Identify Plastics by Simple Methods, 1997.
3. R.P. Brown, Hand Book of Plastics Test Methods, George Godwin Ltd., London, 1981.
4. G. C. Ives, J. A. Mead, M. M. Riley, Hand Book of Plastics Test Methods, The Plastics Institute, London, 1971.
5. Frank T. Traceski, Specifications & Standards for Plastics & Composites, ASM International, Metals Park, OH, 1990.
6. J. Hasiam, H. A. Willis, Identification and Analysis of Plastics, London Iliffe Books Ltd., New Jersey, 1980.

Course Outcome:

After learning the course the students should be able to: operate, identify and analyze individual test. Identify the unknown material, can perform the test procedure, calculations, observation, calibration of each test.

List of Experiments:

1	To test the given plastic sample and identify the plastic material.
2	To determine tensile strength of given plastic samples.
3	To determine flexural strength of given plastic samples.
4	To do the Izod/Charpy impact test.
5	To determine the compression strength of a given plastics samples.
6	To determine the hardness of given plastics samples.
7	To determine Melt Flow Index of given polymer sample
8	To determine the Heat deflection temp/ VST of given plastic sample.
10	To determine the dielectric strength of given plastic sample
11	To determine the % Haze and luminous , transmittance of given sample.
12	To determine the ESCR of given sample.
13	To determine the abrasion resistance of given plastics samples.
14	To determine the specific gravity / Density of a given sample.
15	To determine the water absorption of a polymer.

Major Equipments: Universal testing machine with all attachments, impact tester, MFI tester, HDT/VST testing machine, Dielectric tester, ESCR tester, Haze tester,

Open ended problems/ design oriented problems

- Design/Manufacture specimens for Testing.
- Calculations to determine the tensile strength, Modulus, % elongation.
- Calculations to determine the flexural strength, modulus.
- Calculations to determine the load weight in HDT and VST test.
- Calculations to determine the impact strength.

List of Open Source Software/learning website: <http://www.nptel.ac.in/>

Review Presentation (RP): The concerned faculty member shall provide the list of peer reviewed Journals and Tier-I and Tier-II Conferences relating to the subject (or relating to the area of thesis for seminar) to the students in the beginning of the semester. The same list will be uploaded on GTU website during the first two weeks of the start of the semester. Every student or a group of students shall critically study 2 papers, integrate the details and make presentation in the last two weeks of the semester. The GTU marks entry portal will allow entry of marks only after uploading of the best 3 presentations. A unique id number will be generated only after uploading the presentations. Thereafter the entry of marks will be allowed. The best 3 presentations of each college will be uploaded on GTU website.