GUJARAT TECHNOLOGICAL UNIVERSITY

PLASTIC ENGINEERING (23)

BASIC OF PLASTIC MATERIAL TESTING

SUBJECT CODE: 2132303

B.E. SEMESTER III

Type of course: Theoretical + Practical (Regular)

Prerequisite: Basic knowledge of classification of plastics, plastics materials

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

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
				Theory Marks			Practical Marks			
L	T	P	C	ESE (E)	PA (M)		PA (V)		PA (I)	
					PA	ALA	ESE	OEP		
4	0	3	7	70	20	10	20	10	20	150

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1.	INTRODUCTION Basic concept, Purposes of testing, specification and standards, purpose of specifications, test conditions and conditioning of test specimens, precautions required in plastic testing, quality control, list of applicable standards- ASTM, ISO, BS.	7	10
2.	SPECIMEN PREPARATION TECHNIQUE: Introduction, specimen preparation from thermoplastic-Injection molding, compression molding- Specimen preparation from rigid plastic sheet, specimen preparation from soft plastic sheet, specimen preparation from films, specimen preparation from thermo-set materials - for tensile, flexural, impact, compression, abrasion and hardness samples.	10	20
3.	IDENTIFICATION ANALYSIS OF PLASTICS MATERIALS: Miscellaneous observations- Visual, touch, copper wire test, Burning test, Identification of plastics materials- (i) thermoplastic- PE, PP, PVC, PS, PC, Nylon, ABS, fluoropolymers, Acetal, Acrylic, cellulose acetate etc. (ii) thermosetting plastics- Epoxy, PF, UF, MF, Polyesters, silicones etc. Plastic Identification chart.	12	20
4.	ANALYTICAL TESTS: Specific gravity, Density measurement of various plastics-PP, PE, PS, PVC, PMMA, Nylon, ABS, etc., Water absorption. Solubility of plastics- Solvents and non solvents for plastics.	10	20
5.	SHORT TERM MECHANICAL PROPERTIES: Introduction, Tensile properties- stress-strain behaviour, Flexural properties, Impact properties, Compressive properties, Hardness, Abrasion.	13	20
6.	FLOW PROPERTIES Introduction to Flow Properties, Melt Flow Index, Spiral Flow, Cup Flow	4	10

Reference Books:

1. Hand Book of plastic Testing Technology- Vishu Shah
2. Identification and testing of plastics- A.S Athalye
3. Simple methods for identification of plastics- Dietrich Braun (Hanser publications)
4. Testing and evaluation of Plastics- A.B. Mathur & I.S Bhardwaj

Course Outcome:

After learning the course the students should be able to: Perform the tests for plastic raw material and products

List of Practical:

1. Specimen preparation from thermoplastic-Injection molding, compression molding.
2. To test the given plastic sample and identify the plastic material[5 different samples of thermoplastics]
3. To test the given plastic sample and identify the plastic material[5 different samples of thermosets]
4. To determine density of plastic samples.
5. To measure water absorption of plastic samples.
6. To determine solvents and non solvents for plastics.
7. To determine tensile strength of given plastic samples.
8. To determine compressive strength of plastics samples.
9. To determine flexural strength of given plastic samples.
10. To do the Izod/Charpy impact test
11. To determine Melt Flow Index of given polymer sample

Open Ended Problems/Design Oriented Problems:

- Design/Manufacture a specimen for Testing.
- Prepare Solvent/Solution for sink/floatation of material to be identified.
- Determine the ultimate tensile strength.
- Determine the compressive strength.
- Determine the yield point .

Major Equipments: Pycnometer, specific gravity bottle, Izod/Charpy Impact Tester, Tensile Tester With All Attchments

List of Open Source Software/learning website: www.plasticsnet.com / www.mit.edu / www.wikipedia.com

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.