

GUJARAT TECHNOLOGICAL UNIVERSITY

PLASTIC ENGINEERING (23) MANUFACTURING OF PLASTIC MATERIALS-1 SUBJECT CODE: 2132302 B.E. SEMESTER III

Type of course: Theoretical + Practical (Regular)

Prerequisite: Basic knowledge of organic chemistry

Rationale: Manufacturing, properties and applications of individual polymer

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P		Theory Marks			Practical Marks			
			ESE (E)	PA (M)		PA (V)		PA (I)		
PA	ALA	ESE		OEP						
3	0	3	6	70	20	10	20	10	20	150

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1.	Introduction: Monomer, Polymer, Resins, Thermoplastic & Thermoset. Basic Rheological Characteristic of Thermoset Materials.	04	10
2.	FEEDSTOCK OF POLYMERS/PLASTICS: Naphtha-liquefied petroleum gas-ethylene-propylene-cracking of naphtha, urea-ammonia etc.	7	10
3.	MONOMER PRODUCTION FOR THERMOSETS Manufacturing processes for: Phenol, Formaldehyde, Urea, Epoxy, Bis-Phenol-A etc	7	15
4.	MANUFACTURING PROCESS OF THERMOSET RESINS: Phenol Formaldehyde, Melamine Formaldehyde, Urea Formaldehyde, Epoxy, Silicone, Polyester, Polyurethane etc. Layout and arrangement of plastic material manufacturing plant.	10	25
5.	PROPERTIES OF THERMOSET RESINS: Phenol Formaldehyde, Melamine Formaldehyde, Urea Formaldehyde, Epoxy, Silicone, Polyester, Polyurethane etc	7	25
6.	APPLICATION OF THERMOSET RESINS : Phenol Formaldehyde, Melamine Formaldehyde, Urea Formaldehyde, Epoxy, Silicone, Polyester, Polyurethane etc.	7	15

Reference Books:

1. Plastic Materials; J.A.Brydson
2. Polymer Science; Gowarikar
3. Unit process in organic synthesis; P.H.Groggins
4. Polymer material science; J.M.Schultz.
5. Dryden: Outlines of Chemical Technology\
6. Outlines of Polymer Technology : Manufacture of Polymers by R. Sinha

Course Outcome:

After learning the course the students should be able to: to understand the manufacture of thermosetting materials.

List of Practical:

1. To study the Naptha Cracking process
2. To Manufacture Melamine formaldehyde in laboratory
3. To synthesize phenolic resin in laboratory
4. To manufacture alkyd resin in laboratory
5. To synthesize Epoxy resin in laboratory
6. To study manufacture of silicone resins
7. To study the properties and applications of melamine formaldehyde resin
8. To study the properties and applications of Phenol formaldehyde resin
9. To study the properties and applications of Epoxy resins
10. To synthesize polyurethane in laboratory

Open Ended Problems/Design Oriented Problems:

- Prepare charts for naptha cracking.
- Preperation of chart to identify thermoset materials.
- Purification of monomer for Phenol formaldehyde preparation.
- Purification of monomer for epoxy preparation.
- Purification of monomer for melamine formaldehyde preparation.

Major Equipments: THREE NECKED FLASK,S , CONDENSORS, LEIBEG , Thermometers , Reaction kettles, motors,etc

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.