



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3132304

Semester – III

Subject Name: Thermoset Plastics: Materials and Processing Techniques

Type of course: Professional Core Course

Prerequisite:

Rationale: To understand the manufacturing, properties, applications and processing techniques of thermoset plastic materials and apply this knowledge in selection of appropriate thermoset material and right processing technique to produce a thermoset plastic product.

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	4	5	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs
I: Thermoset Materials		
1	Introduction : Basic characteristics of Thermoset Molding materials.	2
2	Monomer Production: Raw material manufacturing process of Phenol, Formaldehyde, Urea, Bisphenol-A, Epichlorhydrin, Melamine, Preparation of Intermediates for Silicons,	4
3	Manufacturing Processes of Thermoset Resins: Layout and arrangement of thermoset plastic material manufacturing plant of : Phenol Formaldehyde, Melamine Formaldehyde, Urea Formaldehyde, Epoxy, Silicon, Polyester, Polyurethanes	8
4	Properties, Applications and Processing characteristics of: Phenol Formaldehyde, Melamine Formaldehyde, Urea Formaldehyde, Epoxy, Silicon, Polyester, Polyurethanes	6
II: Processing of Thermosets		
5	Compression Molding: -Introduction, Advantages & Disadvantages, Process Description, Factors effecting the process, Types of Compression molds, Bulk factor, Preforms, Powder well, Land area & Pressure Pads, Preheating, Heaters for compression mold, Factors affecting compression molding, Applications of Compression Molding, Trouble shooting.	12



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6	Transfer Molding: Introduction, Advantages & Disadvantages, Process Description Transfer Molding Methods: Pot Type, Plunger Type, Screw Type Transfer Types of Transfer Molds: Loose plate, Integral , Auxiliary Ram Molds Comparison between Compression and Transfer Molding, Factors affecting Transfer molding, Vacuum Venting, Applications of Transfer Molding, Trouble Shooting.	10
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Suggested Specification table with Marks (Theory): (For BE only)

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
25	35	20	10	5	5

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

- 1) Plastic Materials by J.A.Brydson
- 2) Plastics: Materials and Processing by A.Brent Strong
- 3) Shreve's Chemical Process Industries by George Austin
- 4) SPI Plastics Engineering Handbook by Micheal L. Berins
- 5) Plastics Materials & Processes by Sidney H.Goodman
- 6) Thermosetting Plastics by J.F.Monk

Course Outcomes: After learning this course students will be able to -

Sr. No.	CO statement	Marks % weightage
CO-1	List the basic characteristics of Thermoset Molding Materials	4
CO-2	Understand and explain the monomer production of thermoset resins.	6
CO-3	Understand and explain the manufacturing process of thermoset resins.	20
CO-4	Identify the properties and applications of different thermoset plastic materials and apply this knowledge in analysing the appropriate parameters for processing them.	20



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CO-5	Understand the basic process & operate the compression molding and calculate height of powder well.	30
CO-6	Understand the basic process and molding methods of transfer molding and differentiate between compression and transfer molding .	20

List of Experiments: As per the above syllabus topics

Major Equipment:

- 1) Compression molding press
- 2) Laboratory set up for monomer and polymer production
- 3) Mixing equipments for processing the thermoset materials with additives.

List of Open Source Software/learning website:

- 1) <https://nptel.ac.in/>
- 2) <https://pslc.ws/>