GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Bachelor of Engineering

Level: UG

Branch: Plastic Technology

Subject Code : BE03023021

Subject Name: Thermoset materials and Processing Techniques

w. e. f. Academic Year:	2024-25
Semester:	3
Category of the Course:	PCC

Prerequisite:	Nil
Rationale:	To understand the preparation, 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.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes
01	List the basic characteristics of Thermoset Molding Materials
02	Understand and explain the monomer preparation and preparation for thermoset resins.
03	Identify the properties and applications of different thermoset plastic materials and apply this knowledge in analyzing the appropriate parameters for processing them.
04	Understand and explain different processing methods of thermoset resins.

Teaching and Examination Scheme:

Teaching - Learning Scheme (in Hours per Semester)					Total Credits = TH/30	Assessment Pattern and Marks					Total Marks
						Theory		Tutorial / Practical			
L	T	P	PBL*	TH		ESE (E)	PA (M)	PA/ (I)	PBL (I)	ESE (V)	
45	0	30	45	120	04	70	30	20	30	50	200

Where L = Lecture, T= Tutorial, P= Practical, TW/SL = Term-Work / Self-Learning, TH = Total Hours, ESE = End-Semester Examination, PA = Progressive Assessment

*** Problem Based Learning (PBL) aims to accommodate learning beyond syllabus as per clause 9.4 of NBA manual.**

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
	I-Thermoset Materials		
1.	Introduction : Basic characteristics of Thermoset Molding materials.	2	5
2..	**Preparation of Monomer:** Preparation of Phenol, Formaldehyde, Urea, Bisphenol-A, Epichlorhydrin, Melamine, Preparation of Intermediates for Silicon	4	10
3..	**Preparation of Thermoset materials:** Phenol Formaldehyde, Melamine Formaldehyde, Urea Formaldehyde, Epoxy, Silicon, Polyester, Polyurethanes	8	15
4.	**Properties and Applications of Thermoset materials:** Phenol Formaldehyde, Melamine Formaldehyde, Urea Formaldehyde, Epoxy, Silicon, Polyester, Polyurethanes	6	20
	II-Processing of Thermosets		
5.	**Compression Molding:** Introduction, Advantages & Disadvantages, Process steps, Factors affecting the process, Types of Compression molds, Bulk factor, Preforms, Powder well, Land area & Pressure Pads, Preheating, Heaters for compression mold, Applications of Compression Molding, Troubleshooting.	12	30
6.	**Transfer Molding:** Introduction, Advantages & Disadvantages, Process Description Transfer Molding Methods: Pot Type, Plunger Type, Screw Type Transfer, Comparison between Compression and Transfer Molding, Factors affecting Transfer molding, Vacuum Venting, Applications of Transfer Molding, Troubleshooting..	10	20
	Total		**100**

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
15	25	15	5	5	5

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per

Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

(a) 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

(b) Open source software and website:

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

Suggested Course Practical List: If any

Practical based on above topics.

List of suggested activities for Problem Based Learning:

Sr. No.	Activity	No. of hours	Total hours claimed	Evaluation Criteria
1	Industry/Research laboratory visit	Visit = 5h, Report preparation = 5h	10	Based on report submitted.
2	Poster/chart/power point preparation on technical topics	Duration = 10 h	10	Based on Poster/Chart/PPT preparation and presentation skills
3	Assignment writing.	5 assignments of 2h each.	10	Based on the assignment submitted.
4	Technical Video based learning related to the subject	Duration of video = 5h Report preparation = 5h	10	Report /presentation based on the video learning outcomes.

5	Group Discussion on emerging/trending technical topics based on subject	Duration = 1 h each	-	Based on performance in group discussion, technical depth, knowledge etc.
6	Attending Expert Lecture/Webinar/Seminar	Duration- 1hr each	--	Based on Short report
7	Self-learning on-line course	Minimum duration of the course should be 10h.	10	Examination based assessment at the end of course. Based on the certificate produced
8	Exhibition/ Conference/ Trade Fair/ Industrial exposure for 2-3 days	Visit- 15 hr Report preparation- 5 hr	20	Based on learning, observations and short report.
9	Working model on technical topics	Working = 15 h	15	Based on design, understanding & presentation of the model
10	Non-working model on technical topics	Non- working = 5 h	5	Based on design, understanding & presentation of the model
11	Videos on Industrial safety aspects based on subject	Duration of video = 5h Report preparation = 5h	10	Based on report submitted

- Above activities are suggestive, faculty can choose any of these activities and cover up the rest of the 45 Self Learning Hours.
- The number of hours is suggestive. Faculty can sub-divide the number of hours based on the activity. However, the total number of hours is fixed.
- All records pertaining to the evaluation and assessment of self-learning activities must be properly maintained and preserved at the institute level. These records should be made available to the university upon request.
- Institutes are encouraged to utilize digital platforms, such as Microsoft Teams, for effective record-keeping and to ensure transparency in the evaluation and assessment of self-learning activities.

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