GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3162308
Semester – VI
Subject Name: Advanced Plastic Processing Techniques

Type of course: Professional Elective Course

Prerequisite: NA

Rationale: At the end of the course, the student will understand various advanced plastic processing techniques. The students will know how to process plastic materials using advanced techniques for production. They can apply this knowledge for operating various machineries used in advanced processing techniques.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs
1	Reaction Injection Molding • Introduction, • Advantages & Disadvantages of RIM, • Process Steps, • Components of Reaction Injection Molding • Applications of RIM	8
2	Foam Processes • Introduction & Definitions related to foam plastics • General Production methods of foam • Introduction to Blowing agents • Specific Foam Materials: Types, Production Methods and Uses - Flexible foams:- Polyurethanes, , Cellular Polyethylene, Cross linked Polyethylene Foams, PE related foams, Foamed Vinyl(Open-cell Vinyl Foams & Closed-Cell Vinyl Foams), Silicone Foam, • Rigid Foams:- - Polyurethanes, Expanded Polystyrene Foam, Expandable Polystyrene • Thermosetting Foams - Phenolic Foams - Epoxy foams	10

	- Urea-Formaldehyde Foams • Syntactic Foams • Structural Foam:- Advantages & Disadvantages of Structural Foams • Structural Foam molding Techniques- Low Pressure Process and High Pressure Process • Sandwich Foam Molding	
3	Calendering • Introduction • Raw Material Selection:- Polymer, Plasticizers, Stabilizers, Lubricants, Colorants, Fillers • Raw Material Preparation:- Premixing, Gelation of Premix • Calenders:- Definitions of important parts of calendar, • Types of Calenders like Superimposed, Offset and Z Calenders • Calendering Process , Calender unit layout • Types of Circulating Systems • Calender Roll composition, Drilled roll, Cored Roll, Roll shapes • Calender Drive Systems • Calender Heating Systems • Calender Faults & Remedies • Post Calendering Processes • Applications of Calendered sheet	9
4	Miscellaneous Processes • Casting • Encapsulation • Radiation Processing:- - Ionization Radiation- Crosslinking Thermoplastic for Wire and Cable, Crosslinking Thermoplastics for Packaging Film, Crosslinked Foamed Resins, Graft Copolymers, Radiation induced Curing of Coatings, Irradiated wood-plastic Composite, Irradiated Concrete-Plastic Composites - Non Ionizing Radiation-Ultraviolet Radiation, Infrared Radiation, Dielectric or Radio-frequency curing, Microwave energy Radiation	7
5	Advanced Injection Molding Techniques • Gas Assisted Injection Molding • Water Assisted Injection Molding • Insert Molding • Multicolor molding • Mucell technology	8

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

20	**20**	**20**	**5**	**3**	**2**

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 & Process by Schwartz & Goodmann
2. SPI Plastics Engineering Handbook by Michael L.Berins
3. Calendering of Plastics by R.A.Elden and A.D.Swan
4. Advanced Injection Molding Technologies, Hanser Publications
5. Reaction Injection Molding by Walter E. Becker

Course Outcomes:

The theory should be taught and practical should be carried out in such a manner that students are able to acquire required learning out comes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

Sr. No.	CO statement	Marks % weightage
CO-1	Identify the application areas of advanced plastic processing techniques	10
CO-2	Understand the working of various advanced plastic processing techniques	25
CO-3	Describe the functions and working of these processing techniques	30
CO-4	Apply the principles of advanced processing techniques in manufacturing specialized products	20
CO-5	Trouble shoot the problems occurring during the operation of processing techniques.	15

List of Experiments: - As per the syllabus topics

List of Open Source Software/learning website:

1. **nptel.ac.in**
2. **bpf.co.uk**