



GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Engineering

Level: Under Graduate

Branch: Plastic Technology

Subject Code : BE04023011

Course / Subject Name : Injection Molding Technology

w. e. f. Academic Year:	2024-25
Semester:	4
Category of the Course:	PCC-04

Prerequisite:	Students should have understanding of the different types of plastics (thermoplastics & thermosets), their molecular structure, properties, and how they behave under heat and pressure.
Rationale:	The Injection molding process is a versatile technique for manufacturing of finished plastic products. The course designed here will help the students to understand basic principle of Injection molding machine and its technology. It will help them to operate injection molding machine and troubleshoot the faults arising during processing.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes
01	Understand the Injection Moulding process.
02	Understand different constructional feature of Injection Machine Component.
03	Set up the different parameters of Injection Moulding machine
04	Operate Injection Moulding Machine and Trouble shoot the Defects.

Teaching and Examination Scheme:

Teaching - Learning Scheme (in Hours per Semester)					Total Credits = TH/30	Assessment Pattern and Marks					Total Marks
L	T	P	PBL*	TH		Theory		Tutorial / Practical			
						ESE (E)	PA (M)	PA (I)	PBL (I)	ESE (V)	
45	00	30	45	120	04	70	30	20	30	50	200

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

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



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Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	INTRODUCTION: Overview of Injection molding Techniques, Injection Machine Operation, Types of Injection Molding, Basic Principles of Reciprocating Screw Machine, Basic Principles of Plunger Machine, Injection Cycle, Cycle time estimation, Different Terminologies, Advantages and Disadvantages of Injection Molding,	8	10
2.	CONSTRUCTIONAL FEATURES : Injection unit: Hopper: Importance of Hopper & Types of Hopper, Barrel: Importance of Barrel & Types of Barrels, Thermocouple: Importance of Thermocouple Screw: Screw Types, Screw Plastification, Characteristics of Screw, Screw Conveying, Screw Tip Assemblies, Screw Drives Nozzle: Definition & Types like: Standard Nozzle, Needle Type Nozzle, Nylon Nozzle, Etc. Clamping Unit: Clamp Mechanisms, Toggle Clamp, Hydraulic Clamps, Comparison of Hydraulic & Toggle Clamp. Calculation related to shot capacity, injection pressure, Projected area and clamping tonnage Specification of Injection Molding Machines.	12	15
3.	PROCESS DETAILS Machine Startup, Running and Shutdown Procedure, Process Variables, Pressure profile in cavity and PVT diagram and its importance.	6	15
4.	INJECTION MOLDING OF THERMOSETS Introduction of the Process, Characteristic features of the thermoset injection molding, Process Operations, Typical Startup, Running and shutdown procedures, Process variables, Materials for Injection Molding of Thermoset. Comparison between Injection Molding of Thermoplastic and Injection Molding of Thermoset	8	25
5.	AUXILIARIES FOR INJECTION MOULDING MACHINE Hopper Dryers, Ovens, Hopper loaders, Granulators, Mold Temperature Controllers : Cooling Towers and chilling Plants and its importance.	7	15
6.	FAULTS AND CORRECTION (TROUBLE SHOOTING) Brittleness -Bubbles and voids-Crazing-Discoloration-Flashing-Flow marks-Silver Streaks-Nozzle Drooling--Short Shots-Sink Marks-Sprue Sticking-Cavity Sticking-Surface Sticking-Warping-Weld Lines	4	20
	Total	45	100



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

Suggested Specification Table with Marks (Theory):

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. Injection Moulding- Irwin I. Rubin
2. SPI Plastics Engineering Handbook of the Society of the Plastics Industry - Michael L. Berins
3. Thermosetting Plastics: Moulding Materials and Processes by John F Monk
4. Injection moulding M/c by Whelan,
5. Plastics Engg. Handbook by Jeol Frados.
6. Plastics material and Processes by Schwartz and Goodman.
7. Injection moulding machine by Johannaber.
8. A Guide to Injection Moulding of Plastics by Bolur

(b) Open source software and website:

1. <https://nptel.ac.in/>

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.



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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.

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