

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

Course Curriculum

BASIC MOULD DESIGN (Code: 3332301)

Diploma Programme in which this course is offered	Semester in which offered
Plastic Engineering	3 rd semester

1. RATIONALE

Mould design is the heart of plastic engineering. The quality of any plastic component lies in the accurate design of plastic mould. Every plastic diploma engineer has to invariably handle different types of moulds and the materials required for their manufacture in small scale or large scale plastic industries. S/he will have to identify, analyse and choose the most relevant mould for different applications. Moreover s/he will also have use different types of hand or machine operated plastic moulding equipment. Hence, this course has been designed to develop such competency and skills.

2. COMPETENCY (Programme Outcome according to NBA Terminology)

The course should be taught and implemented with the aim to develop different types of skills so that students are able to acquire following competency:

- **Select different types of plastic moulds for various applications.**

3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	ESE	PA	ESE	PA	
3	0	4	7	70	30	40	60	200

Legends: L-Lecture; T – Tutorial/Teacher Guided Theory Practice; P - Practical; C – Credit ESE - End Semester Examination; PA - Progressive Assessment.

4. COURSE DETAILS

Unit	Major Learning Outcomes (Course Outcomes in Cognitive Domain according to NBA terminology)	Topics and Sub-topics
Unit – I Hand Injection Mould and Machine Injection Mould	1a. Describe functions various mould components. 1b. Sketch different mould parts as well as mould assembly	1.1 Basic concept of: Part drawing, Parting line, Core and cavity Runner and gate, Ejection Back plate, Dowel, Socket headed screw, Sprue, sprue bush, Runner and gate, Locating ring plate, Knock out rod, Guide pin and guide bush, Venting, Cooling channel, Ejector assembly
	1c. Distinguish the features between hand mould and machine mould	1.2 Assembly sketch of hand mould 1.3 Assembly sketch of machine mould
Unit– II Parting Surfaces	2a. Discriminate between flat parting surface and non-flat parting surface.	2.1 Concepts: Flat parting surface and Non-flat parting surface
	2b. Distinguish between Stepped, Profiled and Angled parting surfaces 2c. For a given situation select the relevant parting surface	2.2 Stepped, Profiled and Angled parting surface. 2.3 Complex edge forms
Unit– III General Mould Construction	3a. Distinguish between integer and core plates 3b. Discriminate between inserts and local inserts 3c. For the given situation, choose the relevant insert	3a. Core and cavity: Integer cavity and core plates, Inserts and local inserts
	3b. Differentiate between solid, strip and chase type bolster plates. 3c. State the features of the guide bush	3c. Types of bolster plates: Solid type, Strip type, Frame type, Chase type 3d. Guide bush and guide pillar: Leader pins, Standard, Spigotted, Surface fitting, Pull-back
Unit – IV Feed System	4a. Explain feeding system 4b. Differentiate between Sprue and runner	4.1 Sprue 4.2 Runner : Runner section and size, Runner layout, Balancing of runner system
	4c. State the function and location of gate	4.3 Types of gate and location of gate
Unit – V Ejection	5a. State the need for the ejector grid	5.1 Ejector grid 5.2 Ejector plate assembly

Unit	Major Learning Outcomes (Course Outcomes in Cognitive Domain according to NBA terminology)	Topics and Sub-topics
System	5b. Distinguish between ejector and retaining plate	Ejector plate, Retaining plate, Ejector rod and bush, Assembly return systems 5.3 Ejector elements and ejection systems
	5c. State the need for sprue puller	5.4 Sprue puller
Unit – VI Cooling system	6a. Justify the need for a cooling system.	6.1 Need for cooling
	6b. Select the most appropriate cooling integer for a given situation with relevant justification	6.2 Cooling integer: Cavity plate cooling - U-circuit, Rectangular circuit , Z-circuit; Core plate cooling - Angle hole system, Baffled hole system, Stepped circuit
	6c. Distinguish between cooling cavity rectangular and circular insert	6.3 Cooling cavity inserts: Rectangular and Circular insert
6d. Differentiate between helical core, Heat pipe and Heat rod and Baffle cooling	6.4 Cooling core insert: Helical core cooling, Deep chamber design, Heat pipe cooling, Heat rod cooling 6.5 Baffle cooling	

5. SUGGESTED SPECIFICATION TABLE FOR THEORY

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1.	Hand Injection and Machine Injection Mould	07	07	03	03	13
2.	Parting Surface	03	02	03	00	05
3.	General Mould Construction	08	07	03	03	13
4.	Feed System	08	06	04	03	13
5.	Ejection System	08	07	03	03	13
6.	Cooling System	08	06	03	04	13
	Total	42	35	19	16	70

Legends: R = Remember; U = Understand; A = Apply and above levels (Bloom's revised 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.

6. SUGGESTED LIST OF EXERCISES/PRACTICAL/EXPERIMENTS

The practical/exercises should be properly designed and implemented with an attempt to develop different types of practical skills (**Course Outcomes in psychomotor and affective**)

domain) so that students are able to acquire the competencies (Programme Outcomes). Following is the list of practical exercises for guidance.

Note: Here only Course Outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.

S. No.	Unit No.	Practical Exercise (Course Outcomes in Psychomotor Domain according to NBA Terminology)	Approx Hours Required
1	I	Draw plan and sectional elevation of different injection moulded parts with actual dimensions	08
2		Draw plan and sectional elevation of various components of different injection mould	08
3		Draw assembly drawing of hand injection mould for given plastic products	08
4		Draw detail drawing of hand injection mould for given plastic products	08
5	II	Sketch various types of parting surfaces	08
6	V	Sketch ejector plate assembly, ejector elements, ejector systems and various types of sprue puller	08
7	VI	Draw different cooling designs	08
Total			56

7. SUGGESTED LIST OF STUDENT ACTIVITIES

- i. Students will collect injection moulded articles and measure its weight and volume.
- ii. Students will collect information related to the experiment through internet.
- iii. Students will visit nearby mould making industry.

8. SPECIAL INSTRUCTIONAL STRATEGIES (If Any)

- i. Visit to nearby plastic industries
- ii. Video/Animation films on working of different type of molding machines may be shown.
- iii. Mini project on study of different type of molding machines and design of moulds may be given to students.

9. SUGGESTED LEARNING ACTIVITIES

A) List of Books

S. No.	Title of Book	Author	Publication
1.	Injection mould design	R.G.W. Pye.	Longman, 1989
2.	Fundamentals of injection mould design	A.B. Glenvil L and Denton	Industrial Press, 1965 (The University of California)
3.	Plastics mould Engineering handbook	Prible and Drebois	Springer (1987)
4.	How to make injection mould	Henser publication	Henser publication

B) List of Major Equipment/ Instrument with Broad Specifications

- i. Hand injection mould – (write broad specifications)
- ii. Machine injection mould – (write broad specifications)
- iii. Injection mould components – (write broad specifications)
- iv. Digital weighing scale – (write broad specifications)
- v. Measuring instruments – (write broad specifications)

C) List of Software/Learning Websites

- i. <http://www.ferris.edu/htmls/academics/course.offerings/hillm/MYWEB7/index.htm>
- ii. <http://mould-technology.blogspot.in/search/label/Mold%20Construction>
- iii. http://webhotel2.tut.fi/projects/caeds/tekstit/mould/mould_structure.pdf
- iv. <http://mould-technology.blogspot.in/2008/02/basic-functions-of-mold-base-parts.html>

10. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof. A. S. Amin**, Lecturer in Plastic Engineering, Govt. polytechnic, Ahmedabad
- **Prof. M. K. Thakarar**, Lecturer in Plastic Engineering, Govt. polytechnic, Valsad
- **Prof. B. I. Oza**, Lecturer in Plastic Engineering Govt. polytechnic, Ahmedabad
- **Prof. N. C. Suvagya**, Lecturer in Plastic Engineering, G.P., Chhotaudepur

Co-ordinator and Faculty Members from NITTTR Bhopal

- **Dr. Anju Rawley**, Professor, Dept. of Applied Sciences
- **Dr. Abhilash Thakur**, Associate Professor, Dept. of Applied Sciences