

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

Course Curriculum

MOULD FABRICATION TECHNOLOGY-I

(Code: 3332303)

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

1. RATIONALE

A plastic diploma engineer has to use various metal alloys and basic machine tools for selected mould materials. This competency requires the knowledge of ferrous metals and alloys and non ferrous metals and alloys- their structures and properties for selection of materials for fabricating machine components and mould used in plastics industries. This may help to understand different heat treatments and other advanced mould fabrication techniques. Hence the course has been designed to develop this competency and its associated cognitive, practical and affective domain learning outcomes. This is an important course for plastic engineers.

2. LIST OF COMPETENCIES (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:

- Operate various basic machine tools for selected mould materials.

3. Teaching and Examination Scheme

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				Total Marks
L	T	P		Theory Marks		Practical Marks		
L	T	P	C	ESE	PA	ESE	PA	150
3	0	2	5	70	30	20	30	

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

4.DETAILED COURSE CONTENT

Unit	Major Learning Outcomes (Course Outcomes in Cognitive Domain according to NBA terminology)	Topics and Sub-topics
Unit – I Introduction to Engineering Materials	1a. Describe various engineering materials	1.1 Introduction 1.2 Classification of engineering materials 1.3 Properties of engineering materials 1.4 Applications of engineering materials
Unit– II Ferrous Metals and Alloys	2a. Describe different types of steel 2b. Explain effect of various alloying elements on properties of steel	2.1 Basics of steel, Types of steels. 2.2 Composition and uses of cast iron. Effect of silicon, sulphur and phosphorus on properties of steels. Effects of alloying elements on steels such as chromium, nickel, manganese, tungsten, vanadium, molybdenum. Composition of tool steels/alloy steels.
Unit– III Non Ferrous Metals and Alloys	3a. Describe the non ferrous metal alloys 3b. Select appropriate non ferrous metals and alloys	3.1 Introduction, Properties of non-ferrous metals, Aluminium & its alloys, Copper & its alloys 3.2 Application of non-ferrous metals & Alloys
Unit – IV Heat Treatment of Steel	4a. State the need of heat treatment 4b. Distinguish different heat treatment processes	4.1 Principle of heat treatment. 4.2 Annealing & process annealing, Normalising Hardening, Tempering, Case hardening (Pack carburising & gas carburising), Nitriding Cyniding (Cabonitriding), Flame hardening
Unit – V Basic Machine Tools	5a. Classify basic machine tools 5b. Describe working principle and various machine tools 5c. Select proper machine tool for mould fabrication	5.1 Classification of basic machine tools. 5.2 Working principle, types, constructional features, operations, advantages and disadvantages, 5.3 applications of: Lathe machine, Drilling machine, Shaping machine, Milling machine, Boring machine

5.SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1.	Introduction to Engineering Materials	05	05	02	00	07
2.	Ferrous Metals and Alloys	08	05	05	04	14
3.	Non Ferrous Metals and Alloys	03	04	03	00	07
4.	Heat Treatment of Steel	08	04	08	02	14
5.	Basic Machine Tools	18	04	20	04	28
	Total	42	22	38	10	70

Legends: R = Remembrance; U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Notes: 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/Experiment (Course Outcomes in Psychomotor Domain according to NBA terminology)	Approx Hours Reqd.
1	I	Collect one sample of each engineering material and list their properties	04
2	IV	Perform hardening of mould steel using oil as quenching media. Measure change in hardness.	04
3		Perform Tempering process for the above hardened component and measure change in properties/hardness.	04
4		Perform Annealing treatment for the given job and measure the change in hardness.	04
5		Perform Normalising treatment for the given job and measure the change in hardness.	04
6		Perform Case hardening treatment for the given component.	04
7	V	Prepare guide pin on lathe machine	04
8		Prepare core insert for given product	04
Total			32

7. SUGGESTED LIST OF STUDENT ACTIVITIES

1. Students will collect information related to the experiment through internet.
2. Students will visit nearby mould making industry.

8. SPECIAL INSTRUCTIONAL STRATEGIES (If Any)

- i. Visit to nearby industries/workshops/metal treatment plants
- ii. Video/animation films on working of different type of machine tools.
- iii. Video/animation film on different treatments of metals.

9. SUGGESTED LEARNING ACTIVITIES

A. List of Books

Sr. No.	Title of Book	Author	Publication
1.	Elements of Workshop Technology	Hajra & Choudhary	
2.	Elements to Metallurgy	Swaroop	
3.	Material Science & Processes	Hajra & Choudhary	
4.	Material Science & Metallurgy	O.P.Khanna	
5.	Basic Engineering Metallurgy	Keyser	
6.	Code of designation of steel	IS 1962-61	
7.	A textbook on Metallurgy	Biley	
8.	Workshop Technology Vol 1 & 2	Hajra Choudhary	
9.	Production Technology	Jain and Gupta	
10.	Production Technology	Rusinoff	
11.	Manufacturing Processes	Began	
12.	Production Technology	Lindsburg	

B. List of Major Equipment/ Instrument

- i. Lathe machine
- ii. Drilling machine
- iii. Shaping machine
- iv. Milling machine
- v. Boring machine
- vi. Grinding machine
- vii. Metallurgical microscope
- viii. Hardness tester
- ix. Induction furnace

C. List of Software/Learning Websites

- i. <http://www.lathemachinesindia.com/lathe-machine.html>
- ii. <http://www.hnsa.org/doc/pdf/lathe.pdf>
- iii. <http://www.hnsa.org/doc/pdf/milling-machine.pdf>
- iv. <http://uhv.cheme.cmu.edu/procedures/machining/CH8.PDF>
- v. http://www.efunda.com/processes/heat_treat/introduction/heat_treatments.cfm
- vi. http://web.iitd.ac.in/~suniljha/MEL120/L4_Heat_Treatment_of_Metals.pdf
- vii. <http://www.technologystudent.com/equip1/heat1.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 Rawlley**, Professor, Dept. of Applied Sciences
- **Dr. Abhilash Thakur**, Associate Professor, Dept. of Applied Sciences