GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Diploma in Engineering

Level: Diploma

Branch: Plastics Engineering

Course Code : DI02C23021(Only for C to D Students)

Course Name : Mould Fabrication Technology-I

w. e. f. Academic Year:	2024-2025
Semester:	2nd
Category of the Course:	Engineering Science Course

Prerequisite:	**NA**
Rationale:	A plastic diploma engineer has to use various metals & its alloys and basic machine tools for selected mould components. This competency requires understanding of ferrous metals & its alloys, non-ferrous metals & alloys along with their structures and properties for selection of materials for fabricating machine components and mould use in plastic industries. This course will help to understand different heat treatments and other basic mould fabrication techniques. Hence the course has been designed to develop competency of selection of appropriate materials, heat treatment techniques as well as machine tools to fabricate suitable mould.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Select engineering materials for mould components.	A
02	Select ferrous metals and alloys for mould components.	A
03	Select non-ferrous metals and alloys for mould components.	A
04	Suggest heat treatment process for moulds.	U
05	Operate machine tools to fabricate moulds.	A

**Revised Bloom's Taxonomy (RBT)*

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
				Theory		Tutorial / Practical		
L	T	PR	C	ESE (E)	PA / CA (M)	PA/CA (I)	ESE (V)	
3	0	2	4	70	30	20	30	150

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
UNIT-1	**Introduction to Engineering Materials** - Introduction - Classification of engineering materials - Properties of engineering materials - Applications of engineering materials	05	10% (07 Marks)
UNIT-2	**Ferrous Metals and Alloys** - Basics of Steel, Types of Steel based on Carbon (Low, Medium and High) - Composition and uses of Iron (Cast Iron and Wrought Iron) - Effect of alloying elements on Steel: • Silicon • Sulphur • Phosphorus • Chromium • Nickel • Manganese • Tungsten • Vanadium • Molybdenum - Composition of tool Steels	08	20% (14 Marks)
UNIT-3	**Non Ferrous Metals and Alloys** - Introduction - Properties and applications of non-ferrous metals • Aluminium & its alloys • Copper & its alloys • Nickel & its alloys • Zinc & its alloys	03	10% (07 Marks)
UNIT-4	**Heat Treatment of Steel** - Introduction of heat treatment. - Principle of heat treatment.	08	20% (14 Marks)

	- Heat treatment processes: • Annealing • Normalizing • Quenching • Tempering • Case hardening : ○ Pack carburizing & Gas carburizing ○ Nitriding ○ Cyaniding ○ Flame hardening		
UNIT-5	**Basic Machine Tools** - Introduction of basic machine tools. - Working principle, types, constructional features, operations, applications, advantages and disadvantages : • Shaping machine • Drilling machine (Bench and Radial) • Lathe Machine (Engine, Bench, Tool room, Capstan & Turret) • Milling machine (Vertical and Horizontal) • Horizontal Boring machine	18	40% (28 Marks)
	Total	**42**	**100% (70 Marks)**

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
35%	**35%**	**30%**	-	-	-

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:

Sr. No.	Title of Book	Author	Publication with place, year and ISBN
1.	Elements of Workshop Technology (Volume I,II and III)	Choudhary Hajra S.K and Choudhary Hajra A.K.	Media Promoters & Pub Pvt Ltd, Mumbai, 2014, 5551234002069
2.	A Textbook of Workshop Technology	Khurmi R.S and Gupta J.K	Sultan Chand & Sons, New Delhi, 2010, 9788121908689
3.	Workshop Technology	Bawa H.S.	Tata McGrow Hill Education Pvt. Ltd, Delhi, 2015, 9780070671195
4.	Elements of Metallurgy	Swarup D.	Rastogi Publications, Meerut, 2005, 9788171338139
5.	Material Science & Processes	Hajra & Choudhary	Media Promoters & Pub Pvt Ltd, Mumbai, 2009, 9780906216002
6.	A Text-Book of Material Science & Metallurgy	Khanna O.P	Dhanpat Rai Publications, New Delhi,2021, 9789383182459
7.	Material Science and Metallurgy	Jindal U.C	Pearson Publications,Delhi,2012, 9788131759110
8.	Mechanical Metallurgy	George E. Dieter	Mcgrawhill Education, Delhi, 2017, 9781259064791
9.	Production Technology Vol. I,II	Jain R.K	Khanna Publishers,New Delhi, 1976, 9788174090997
10.	A Textbook of Production Technology	Sharma P.C	Sultan Chand & Sons, New Delhi, 2021, 9789355010698
11.	Manufacturing Processes for Engineering Materials	Kalpakjian S, Schmid S.R	Pearson Publications,Delhi,2018, 9780134425122

(b) Open source software and website:

1. http://www.lathemachinesindia.com/lathe-machine.html
2. https://learnmechanical.com/lathe-machine
3. https://www.theengineerspost.com/types-of-drilling-machine/
4. https://www.youtube.com/watch?v=JVX70JRihhY
5. https://learnmechanical.com/grinding-machine/
6. http://www.hnsa.org/doc/pdf/lathe.pdf
7. http://www.hnsa.org/doc/pdf/milling-machine.pdf
8. https://sedyono.files.wordpress.com/2015/10/ch-02.pdf
9. http://uhv.cheme.cmu.edu/procedures/machining/CH8.PDF
10. http://www.efunda.com/processes/heat_treat/introduction/heat_treatments.cfm
11. http://web.iitd.ac.in/~suniljha/MEL120/L4_Heat_Treatment_of_Metals.pdf

Suggested Course Practical List:

Sr. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. required
1	Collect one sample of each engineering material and list their properties.	1	04
2	Perform hardness testing of mild steel.	2	02
3	Perform hardness testing of Aluminum.	3	02
4	Perform hardening of mould steel using oil as quenching media.	4	04
5	Perform Tempering process for the above hardened component and measure change in properties/hardness.	4	04
6	Perform Annealing treatment for the given job and measure the change in hardness.	4	04
7	Perform Normalizing treatment for the given job and measure the change in hardness.	4	04
8	Perform Case hardening treatment for the given component.	4	04
9	Perform shaping operation on metal plate.	5	04
10	Perform drilling operation on metal plate.	5	04
11	Prepare guide pin on lathe machine.	5	04
12	Prepare core insert for given product.	5	04
		Total	**44**

List of Laboratory/Learning Resources Required:

Sr. No.	Equipment Name with Broad Specifications
1	Lathe Machine (Laboratory scale)
2	Drilling Machine (Laboratory scale)
3	Shaping Machine (Laboratory scale)
4	Milling Machine (Laboratory scale)
5	Boring Machine (Laboratory scale)
6	Industrial Oven (Laboratory scale)
7	Metallurgical Microscope
8	Hardness Tester
9	Induction Furnace

Suggested Project List:

1. Prepare a chart for types of ferrous metals.
2. Collect samples of ferrous metals.
3. Prepare a chart for types of ferrous metals.
4. Collect samples of non-ferrous metals.
5. Prepare chart for various heat treatment processes.
6. Collect products made by various machine tools.

Suggested Activities for Students:

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

* * * * * * *