GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Engineering

Level: Diploma

Branch: Metallurgy Engineering

Course / Subject Code : DI01C21031(Only for C to D Students)

Course / Subject Name: Metallurgy Engineering Workshop

w. e. f. Academic Year:	2024-2025
Semester:	1st
Category of the Course:	ESC - 02

Prerequisite:	N.A.
Rationale:	To ensure the well-rounded development of diploma engineers, integrating theory with practice is essential. The curriculum includes general workshop practices alongside metallurgical engineering concepts to offer hands-on experience with various tools and measuring instruments. This course is designed to enhance students' manual and machining skills. Workshops enable students to work directly with metals and related equipment, fostering a deeper comprehension of metallurgical principles and techniques. This practical exposure is crucial for developing the technical skills and problem-solving abilities needed for a successful career in metallurgy engineering.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Prepare workshop layout and implement safety measures effectively.	A
02	Identify common metals and perform basic metal shaping techniques.	A
03	Prepare sheet metal jobs and utilize various heat sources.	A
04	Perform joining, pattern making and metallographic technique.	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)	
0	1	4	3	0	0	20	30	50

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	**Workshop Layout and Safety** - Understand the layout of a metallurgical workshop. - Equipment placement, tool storage, workstations, safety zones. - Types of fires (class A, B, C), fire extinguishers, and emergency procedures. - Use of gloves, goggles, aprons, and hearing protection. - Proper handling and disposal of metal scraps, chemicals, and other waste materials. - Create a safety checklist and conduct a mock safety drill.	02	15
2.	**Metal Identification and Shaping Techniques** - Learn to identify common metals by their physical properties. - Bending, hammering, and shearing. - Demonstrate each technique and then practice on metal samples to achieve specific shapes.	04	25
3.	**Sheet Metal Work and Heat Sources** - Punching, edging, and riveting. - Prepare a simple sheet metal project using these techniques, such as a small utility box. - Gas burners and electric furnaces. - Demonstrate the operation of each heat source and conduct a controlled heating experiment.	04	25
4.	**Joining, Pattern making and Metallography** - Soldering, brazing. - Welding machines, safety equipment. - Procedure for arc welding technique. - Preparing patterns and casting metal. - Patterns used in casting. - Sample preparation, cutting, grinding, polishing and etching.	04	35
	Total	**14**	**100**

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
10	10	60	0	0	20

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	Workshop Technology	Bawa H. S.	Tata McGrow Hill Education Pvt. Ltd, Delhi, 2015, 9780070671195
3	A Course in Workshop Technology Vol I	Raghuwansh B. S.	Dhanpat Rai and Co., New Delhi, 2019, 9781020092015
4	Welding Engineering and Technology	Dr. R. S. Parmar	Khanna Publishers, Delhi, 2022, 9788174090287
5	Fundamentals of Metal Forming Processes	B. L. Juneja	New Age International Publishers, Delhi, 2018, 9788122430899
6	Foundry Technology	Peter Beeley	Butterworth-Heinemann Ltd., Oxford, 2001, 9780750645676

(b) Open-source software and website:

1. http://www.fao.org/docrep/012/al360e/al360e.pdf
2. http://www.bspublications.net/downloads/05229cf9b012a3_workshop_Ch_1.pdf
3. https://egyankosh.ac.in/bitstream/123456789/29753/1/Unit-3.pdf
4. https://nt7-mhe-complex-assets.mheducation.com/nt7-mhe-complex-assets/Upload-20190215/9-12PhysicalScienceComplexAssetURLs/E21/index.html
5. https://msvs-dei.vlabs.ac.in/Metal_Forming.php

Suggested Course Practical List:

No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. required
1	Prepare a general layout of metallurgical workshop.	I	08
2	Study basic safety measures in a metallurgy workshop.	I	04
3	Identify common metals (iron, copper, aluminum etc.) based on physical properties like color, luster, and density.	II	04
4	Demonstrate and Practice Basic Metal Shaping and Cutting Techniques	II	08
5	Prepare sheet metal utility job using Punching, Edging and Riveting operations.	III	06
6	Familiarize with different heat sources used in metallurgy (gas burner, electric furnace).	III	04
7	Perform various joining operations like soldering, brazing etc.	IV	04
8	Demonstration of different welding tools/machines and prepare simple job using welding method.	IV	06
9	Prepare Patterns for Casting with Wood.	IV	08
10	Prepare sample using metallography steps.	IV	08
Total		**60**	

List of Laboratory/Learning Resources Required:

Sr. No.	Equipment Name with Broad Specifications
1	Basic work shop tools (hammer, chisel, filing, measuring instruments, Vice fitting, fastening devices etc.)

2	Welding machine (Output current 20-200 Amp DC, V 220, Input current 6.3kVA, Suitable for 2.5mm rod)
3	Muffle furnace
4	Soldering and brazing instrument
5	Metal cutting, grinding and polishing machine
6	Hack saw hand operated and automatic
7	Wooden blocks of various sizes
8	Metal plates & bars of various sizes
9	Hand drill & Taps (No load speed 2600RPM, Power input 350 W, Maximum drill dia 10mm)
10	Safety Consumables like Fire extinguisher, gloves, goggles, aprons etc.

Suggested Project List:

1. Collection of different ferrous and non-ferrous materials.
2. Design and construct a small tool box using sheet metal techniques.
3. Use shaping and joining techniques to create a metal art piece.
4. Prepare a practice board with various types of welds for skill improvement.

Suggested Activities for Students:

1. Conduct a mock safety drill focusing on fire safety and use of protective gear.
2. Collect and sort metal scraps for recycling and discuss the importance of sustainability in metallurgy.
3. Use thermocouples and infrared thermometers to measure temperatures during metal heating processes.

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