GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Engineering

Level: Diploma

Branch: Fabrication Technology

Course / Subject Code: DI03055051

Course / Subject Name: Sheet Metal Fabrication

w. e. f. Academic Year:	2024-25
Semester:	3rd
Category of the Course:	PCC

Prerequisite:	-
Rationale:	This course provides the knowledge and practice regarding different sheet metal fabrication techniques. This course gives hands on practice regarding pattern development, cutting and forming of different sheet metal components. This course gives knowledge and practice of temporary and permanent joining of sheet metal. This course gives knowledge about different major industrial sheet metal work application.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Prepare pattern development for a given job.	A
02	Prepare Gas welding procedure for a given job.	A
03	Prepare soldering and brazing procedure for a given job.	A
04	Use appropriate resistance welding process for a given job.	A
05	Select fastener for making sheet metal joint for given application.	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 (M)	PA(I)	ESE (V)	
2	0	2	3	70	30	20	30	150

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	**Sheet Metal working and operations** 1.1 Importance of sheet metal fabrication 1.2 Knowledge, skill and attitude required for sheet metal fabrication supervisor 1.3 Metal used in sheet metal work 1.4 Sheet metal hand tools 1.5 Sheet metal joints : Hems, seams and notches 1.6 Sheet metal allowance 1.7 Sheet metal working machine 1.8 Sheet Metal Pattern development 1.9 Introduction of press work 1.10 Construction & types of press 1.11 Selection and specification of a press 1.12 Different types of press working dies 1.13 Cutting or shearing process 1.14 Press tool operations 1.15 Spring back 1.16 Stock layout 1.17 Defects in sheet metal formed parts 1.18 Safety while working in sheet metal shop 1.19 Sheet metal work applications	12	40
2.	**Gas Welding** 2.1 Definition & principle of operation 2.2 Types of gas welding flames 2.3 Chemistry of oxy-acetylene flame 2.4 Flame ignition, flame adjustment and flame extinguish 2.5 Gas welding techniques 2.6 Gas welding filler metal and fluxes 2.7 Gas welding equipment 2.8 Advantages, disadvantages and applications of gas welding 2.9 Gas welding safety recommendations	6	20
3.	**Soldering and Brazing Process** 3.1 Soldering process 3.1.1 Definition & principles of good soldering process 3.1.2 Soldering joint design 3.1.3 Soldering alloys (solders) and fluxes	5	17

	3.1.4 Cleaning the base metal surface 3.1.5 Soldering methods 3.1.6 Soldering of various metals 3.2 Brazing Process 3.2.1 Definition and principle of operations 3.2.2 Brazing procedure 3.2.3 Brazing joint design 3.2.4 Brazing of various metals 3.2.5 Brazing filler metals and fluxes 3.2.6 Advantages, limitation and applications of brazing 3.3 Comparison of soldering, brazing and welding		
4.	**Resistance Welding processes** 4.1 Definition and fundamentals of electric resistance welding 4.2 Variable in resistance welding 4.3 Advantages, disadvantages and applications of resistance welding. 4.4 Spot welding 4.5 Seam welding 4.6 Projection Welding 4.7 Upset butt welding 4.8 Percussion welding 4.9 Resistance welding of tubes (ERW) 4.10 High frequency welding of tubes 4.11 Resistance welding defects	4	13
5.	**Mechanical Fastening of sheet Metal** 5.1 Types of fasteners 5.2 Riveting: introduction, advantages, application of riveting, types of rivets, types of riveted joints, defects in riveted joints. 5.3 Screwed joints 5.4 Bolted joints 5.5 Compare riveting and welding	3	10
	Total	**30**	**100**

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
24%	**66%**	**10%**	-	-	-

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks and marks at different taxonomy levels (of R, U and A) in the question paper may vary slightly from above table.

References/Suggested Learning Resources:

(a) Books:

1. Production technology vol. 1 & 2 by O.P.Khanna & M.Lal
2. Manufacturing Technology by P.N.Rao Tata mcgrawhill publishing co. ltd
3. Sheet metal practice by Audels AUDEL Series
4. Welding Technology by O.P.Khanna
5. Machine design by R.S.Khurmi
6. Workshop Technology vol 1 & 2 by Hajra chaudhri Media promoters & publishers pvt. Ltd.

(b) Open source software and website:

1. https://nptel.ac.in/courses/112103263
2. https://nptel.ac.in/courses/113106087
3. https://www.youtube.com/watch?v=95rgHM58dgw
4. https://www.youtube.com/watch?v=UbliMiADZ40
5. https://www.youtube.com/watch?v=Pw02sYZVEac
6. https://www.youtube.com/watch?v=L0YgSmfwzWY
7. https://www.youtube.com/watch?v=jhBBEBDk4P4
8. https://www.youtube.com/watch?v=R5A93IAEyXo
9. https://www.youtube.com/watch?v=O7WvzU3FQ5c
10. https://www.youtube.com/watch?v=pG3UFnIYSeI
11. https://www.youtube.com/watch?v=ghPfvIPWVNQ
12. https://www.youtube.com/watch?v=uDidTD2pdK0

Suggested Course Practical List:

1. Study safety precaution for sheet metal workshop.
2. Identify and draw different hand tools used in sheet metal work.
3. Prepare Pattern Development of Box using drawing sheet.
4. Prepare Pattern Development of Hopper using drawing sheet.
5. Prepare Pattern Development of Funnel using drawing sheet.
6. Prepare Pattern Development of Litre Cane using drawing sheet.
7. Prepare Pattern Development of AC Duct using drawing sheet.

8. Prepare one Sheet Metal job from galvanized sheet for object from exercise 1 to 6 (individually or in a group) as per given specification.
9. Demonstrate Soldering operation on a given job.
10. Demonstrate Brazing process on a given job.
11. Demonstrate Gas welding operation on a given job.
12. Perform Resistance Spot welding operation on given job.
13. Demonstrate riveting of sheet metal joint on a given job.

Note

i. *More **Practical Exercises** can be designed and offered and can be changed by the respective course teacher to develop the industry relevant skills/outcomes to match the COs. The above table is only a suggestive list.*
ii. *Boiler suit, safety shoes, other safety items& hand tools are compulsory while attending laboratory and has to be brought by students.*

List of Laboratory/Learning Resources Required:

1. Drawing set, fevicol (glue), scissor, ruler etc.
2. Hand gloves, Safety goggles, Hand sleeve, Leg guard etc.
3. Tri square, Scriber, Bench vice, calliper, Fix spanners, Ring spanner, Adjustable spanner, Plyer, Lock Player, Adjustable player, Compass, Divider, Snipes, Steel rule, mallet, riveting hammer, Chisel, Punch etc.
4. Oxygen cylinder, Acetylene cylinder, Oxygen cylinder regulator, Acetylene cylinder regulator, Hose pipe, Oxy fuel gas welding torch, Igniters, Back fire arrestor etc.
5. Resistance spot welding machine, Resistance seam welding machine, Resistance upset butt welding machine, and Resistance percussion welding machine.
6. Soldering iron, soldering consumable, heater to melt soldering consumable, soldering torch kit, Electric soldering iron, Riveting gun, Bench drilling machine, Hand drilling machine .

Suggested Project List:

1. Prepare charts of different screw threads.
2. Collect samples of different fasteners used for sheet metal work and prepare its chart.
3. Prepare chart of different sheet metal hand tools.
4. Draw different riveted joints.
5. Prepare chart of safety rules to be followed for gas welding and handling of gas cylinders.
6. Prepare the chart of different oxy acetylene flames.
7. Prepare the chart of forward and backward gas welding.
8. Prepare a model of shell in which make a nozzle cut out and enlist the procedure of it.
9. Prepare a video of making pattern development of any object.
10. Make a list of the any ten products and enlist the sheet metal operation performed on it.

11. Prepare chart of different sheet metal jobs.

Suggested Activities for Students:

1. Prepare solutions of different assignments given by subject faculty.
2. Prepare a list of specifications for various tools/equipment/machines used in sheet metal work.
3. Visit the local gas welder and make a report on it / sheet metal working industry.
4. Collect videos, animation showing sheet metal operation.
5. Prepare power point presentation on soldering, brazing and gas welding.

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ANNEXURE-1: SAMPLE SAFETY CONTRACT

(To be filled by the students and submitted to concerned faculty/staff)

-- Use for reference purposes only --

1. You have to read and sign the safety contract.
2. The safety contract says that you understand that safety is your responsibility.
3. The safety contract to be signed before you carry out any work in the laboratory and if you don't observe and obey the safety rules, you will not be allowed in the laboratory.

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Safety Contract

Date: _____

Name of Institute: _____

Name of Course with Code: Sheet Metal Fabrication. (_____)

Name of Faculty/Staff with Designation: 1. _____

2. _____

3. _____

I RECOGNIZE THAT:

1. Safety is my responsibility when using a tool.
2. Safety regulations have been provided to me.
3. The possibility of accident and injury increases if I do not follow all the safety guidelines.
4. I must act responsibly to ensure my own safety & the safety of others in the work area.

I AGREE TO:

1. Never work in the shop without my faculty's/ Instructor's supervision.
2. Read and practice all the safety regulations that have been distributed to me in this course or have been posted in the work areas.
3. Act in a responsible manner at all times in the laboratory.
4. Follow all instructions given by the faculty/Instructor.
5. Immediately report any unsafe condition or activity to my faculty/Instructor.
6. Wear eye protection at all times when working with tools or working anywhere near someone who is using tools.
7. Cut or Tie back long hair, remove jewellery, secure loosed clothing, and wear boiler suit & safety shoes in the laboratory.
8. Clean all work areas and put equipment away before leaving the laboratory.

I, _____, have read and agree with all the safety instructions.

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Particulars:

Programme : _____

Batch No. : _____

Enrollment No. : _____

Student Signature

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