GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM
COURSE TITLE: SHEET METAL FABRICATION
(Code: 345502)

Diploma Programme in which this course is offered	Semester in which offered
Fabrication Technology	4th Semester

1. RATIONALE

This course provides the knowledge and practice regarding different sheet metal fabrication techniques. This course gives hands on practice regarding development, cutting and forming of different sheet metal components. This course gives practice for soldering, brazing, gas welding and resistance welding of sheet metal. This course gives knowledge about different major industrial sheet metal application.

2. COMPETENCY

The course content should be taught and curriculum should be implemented with the aim to develop required skills in the students so that they are able to acquire following competency:

- **"Fabricate different sheet metal components by using appropriate sheet metal joining process"**

3. COURSE OUTCOMES (CO's)

The theory should be taught and practical should be carried out in such a manner that students are able to acquire different learning out comes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

i. Describe different sheet metal operations.
ii. Perform sheet metal pattern development for given job.
iii. Perform different thermal sheet metal joining operations.
iv. Describe different sheet metal fastening methods.
v. Explain applications of sheet metal work.

4. 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	150
4	-	2	6	70	30	20	30	

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

5. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit – I Sheet Metal Working	1a. Develop qualities of good sheet metal fabrication shop supervisor 1b. Describe Sheet metal hand tools, joints and allowances. 1c. Prepare sheet metal pattern development of simple objects	1.1 Need, Scope and Importance of sheet metal fabrication 1.2 Profile of sheet metal fabrication supervisor 1.3 Sheet metal use in sheet metal work 1.4 Sheet metal hand tools 1.5 Sheet metal joints 1.6 Sheet metal allowance 1.7 Sheet metal working machine 1.8 Pattern development
Unit– II Sheet Metal Operation	2a. Describe press tool assembly 2b. Describe press tool operations and identify the defects in sheet metal formed parts.	2.1 Construction & types of press 2.2 Press tool assembly 2.3 Different types of press tool dies 2.4 Press tool operations 2.5 Spring back effect 2.6 Stock layout 2.7 Defects in sheet metal formed parts 2.8 Shearing process
Unit– III Soldering Process	3a. Describe soldering process and its advantages. 3b. Prepare a job by using soldering process	3.1 Definition, concept & classification 3.2 Soldering mechanism 3.3 Fluxes & filler metal 3.4 Principle, procedure & joint design 3.5 Advantages, limitation and application
Unit– IV Brazing Process	4a. Describe brazing process and its advantages. 4b. Prepare a job by using soldering process	4.1. Definition, concept & classification 4.2. Brazing mechanism 4.3. Fluxes & filler metal 4.4. Principle, procedure & joint design 4.5. Advantages, limitation and application
Unit– V Gas Welding	5a. Explain Oxy-acetylene gas welding process, equipment & types of flames and limitations. 5b. Compare soldering & brazing. 5c. Prepare job by using Gas welding technique.	5.1 Definition & principle of operation 5.2 Oxy-acetylene gas welding process & techniques 5.3 Types of welding flames 5.4 Chemistry of oxy-acetylene flame 5.5 Flame ignition and flame adjustment 5.6 Gas welding equipment 5.7 Gas welding torch 5.8 Base Metal penetration 5.9 Gas welding filler metal and fluxes 5.10 Gas welding safety 5.11 Comparison of soldering, brazing and gas welding

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
		5.12 Advantages/ Applications and limitations of gas welding
Unit– VI Resistance Welding	6a. Describe procedure, advantages, limitations and application of resistance welding. 6b. Prepare sheet metal job by using different resistance welding processes	6.1. Definition 6.2. Resistance welding joint 6.3. Variable in resistance welding 6.4. Definition, sketch, techniques, procedure, equipment, advantages, limitation and application of : 1) Spot welding 2) Seam welding 3) Upset butt welding 4) Percussion welding 5) Projection welding
Unit– VII Mechanical Fastening of Sheet Metal	7a. Describe different mechanical fastening techniques suitable for sheet metal work.	7.1 Riveted joints 7.2 Screwed joints 7.3 Bolted joints 7.4 Types of fasteners (Riveted, Screwed, Bolted)
Unit– VIII Sheet Metal Work Application	8a. Select suitable sheet metal fabrication process and apply in a given situation.	8.1 Vehicle body building 8.2 Refrigeration and air-condition 8.3 Furniture fabrication 8.4 Domestic appliances 8.5 Coolers, chillers, visi-coolers/ducts 8.6 Air craft industries 8.7 Food processing

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

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total
1	Sheet Metal Working	12	0	7	7	14
2	Sheet Metal Operation	6	0	4	4	8
3	Soldering Process	6	4	4	0	8
4	Brazing Process	6	4	4	0	8
5	Gas Welding	10	0	6	6	12
6	Resistance Welding	8	0	5	5	10
7	Mechanical Fastening of Sheet Metal	4	2	3	0	5
8	Sheet Metal Work Application	4	0	0	5	5
	Total	**56**	**10**	**33**	**27**	**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.

7. SUGGESTED LIST OF EXERCISE/PRACTICAL

The practical/exercises should be properly designed and implemented with an attempt to develop different types of skills **(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 outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of certain outcomes in affective domain which would in turn lead to development of **Course Outcomes** related to affective domain. Thus over all development of **Programme Outcomes (**as given in a common list at the beginning of curriculum document for this programme) would be assured.*

Faculty should refer to that common list and should ensure that students also acquire outcomes in affective domain which are required for overall achievement of Programme Outcomes/Course Outcomes.

S. No.	Unit No.	Practical/Exercise (Outcomes' in Psychomotor Domain)	Approx Hrs. Required
1	I	Prepare Sheet Metal Pattern Development of Box	02
2	I	Prepare Sheet Metal Pattern Development of Hopper	02
3	I	Prepare Sheet Metal Pattern Development of Funnel	02
4	I	Prepare Sheet Metal Pattern Development of Liter Cane	02
5	I	Prepare Sheet Metal Pattern Development of AC Duct	02
6	I	Prepare Sheet Metal Pattern Development of Three Piece Elbow	02
7	I	Prepare Sheet Metal Pattern Development from galvanized sheet	02
8	III	Perform Soldering operation on given job	02
9	IV	Perform Brazing operation on given job	02
10	IV	Perform Gas welding operation on given job (Two jobs of different type)	04
11	VI	Perform Spot welding operation on given job	02
12	VI	Perform Upset butt welding operation on given jobs (Two jobs of different type)	04
		Total	28

8. SUGGESTED LIST OF PROPOSED STUDENT ACTIVITIES

Following is the list of proposed student activities:

i. Prepare sheet metal pattern development of different objects in drawing sheet
ii. 10 min PPT presentation from the topic of syllabus and beyond the syllabus
iii. Report writing on various topics from syllabus and beyond syllabus

9. SPECIAL INSTRUCTIONAL STRATEGIES (if any)

i. Show video/animation films of different sheet metal operations to explain proper procedures and to make concepts more clear.
ii. Arrange a visit to nearby sheet metal works and discuss different operations being carried out there.

10. SUGGESTED LEARNING RESOURCES

A. List of Books

S.No.	Title of Books	Author	Publication
1	Production technology vol 1 & 2	O.P.Khanna & M.Lal	Dhanpat rai & sons
2	Manufacturing Technology	P.N.Rao	Tata mcgrawhill publishing co. ltd
3	Sheet metal practice	Audels	AUDEL Series
6	Welding Technology	O.P.Khanna	Dhanpat rai & sons
6	Machine design	R.S.Khurmi	Eurasia publication house
6	Workshop Technology vol 1 & 2	Hajra chaudhri	Media promoters & publishers pvt. Ltd.

B. List of Major Equipment/ Instrument

i. Sheet metal working hand tools
ii. Spot welding machine
iii. Seam welding machine
iv. Projection welding machine
v. Upset butt welding machine
vi. Gas welding equipment set
vii. Soldering equipments
viii. Riveting gun
ix. Guillotine cutting machine
x. Sheet metal hand press

11. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- **Prof. P. B. Pathak,** Convener & HOD**,** Dept of Fabrication Technology, Sir B.P.I., Bhavnagar
- **Prof. B. K. Gandhi,** Sr. Lecturer, Department of Fabrication Technology, Sir B.P.I., Bhavnagar
- **Prof. S. Y. Merchant**, Sr. Lecturer, Department of Fabrication Technology, Sir B.P.I., Bhavnagar

Coordinator and Faculty Members from NITTTR Bhopal

- **Dr. A. K. Sarathe,** Associate Professor, Department of Mechanical Engineering.
- **Dr K. K. Jain, Dean and** Professor, Department of Mechanical Engineering.