

GOVERNMENT OF THE PUNJAB

**TECHNICAL EDUCATION & VOCATIONAL
TRAINING AUTHORITY**



**CURRICULUM FOR
WELDING METHODS AND PLASMA CUTTING**

(3 – Months Course)
(July 2024)

**CURRICULUM SECTION
ACADEMICS WING**

96-H, GULBERG-II, LAHORE

Ph # 042-99263055-9, 99263064

gm.acad@tevta.gop.pk, manager.cur@tevta.gop.pk

TRAINING OBJECTIVES

This curriculum is designed specifically for cutlery industry to impart skills along with necessarily required theoretical knowledge to the students keeping in view their entrants' level and as per need of Cutlery industry in order to fill the gap of skilled work force. New and enhanced methods are introduced by more focusing on Cutlery and knife ware items manufacturing techniques, by ensuring specific condition and working environment, proper safety precautions and cleanliness.

CURRICULUM SALIENT

Name of the Course	:	Welding Methods & Plasma Cutting
Entry level	:	Middle preferably Matric
Duration of course	:	3-Months.
Total training hours	:	400 Contact hours
Training Methodology	:	Practical 80%
		Theory 20%
Medium of Instruction	:	Urdu / English

SKILL COMPETENCY DETAILS

On successful completion of this course, the trainee should be able to: -

1. Use different hand and measuring tools properly.
2. Perform brazing operation on cutlery and knife items.
3. Perform Gas welding and cutting techniques on cutlery and knife items.
4. Perform Arc welding on kitchen ware and knife ware items.
5. Perform Argon welding operation on cutlery and knife items.
6. Understand Laser welding technique on table wares.
7. Perform Plasma welding and cutting method on cutlery and knife ware items.

KNOWLEDGE PROFICIENCY DETAILS

On successful completion of this course, the trainee will be able to:

1. Define the use of different personal protective equipment, clothing and devices.
2. Explain the use of different hand tools and measuring tools.
3. Explain brazing operation for cutlery items.
4. Explain gas welding and cutting techniques for cutlery and knife items.
5. Describe the procedure of arc welding for cutlery and knife items.
6. Define and explain argon welding and its use for cutlery items.
7. Understand laser welding method for cutlery and knife items.
8. Brief plasma welding and cutting process for kitchen and knife wares.

SCHEME OF STUDIES
Welding Methods and Plasma Cutting
(3–Months Course)

S.No	Main Topics	Theory Hours	Practical Hours	Total Hours
1.	Comply Health & Safety guidelines	10	4	14
2.	Introduction to Hand tools and Measuring tools	7	19	26
3.	Brazing	7	26	33
4.	Gas Welding and Cutting	7	53	60
5.	Arc Welding	13	70	83
6.	Argon Welding	13	74	87
7.	Laser Welding	7	0	7
8.	Plasma Welding and Cutting	16	74	90
Total		80	320	400

DETAIL OF COURSE CONTENTS
Welding Methods & Plasma Cutting
(3 – Months Course)

Sr.No	Detail of Topics	Theory Hours	Practical Hours
1.	Comply Health & Safety guidelines 1.1 Identification of hazards at workplace 1.2 Use of Personal Protective and safety Equipment (PPEs) 1.3 Safe handling of tools, machines, equipment and materials.	10	4
2.	Introduction to Hand Tools and Measuring tools 2.1. Hammer 2.1.1. Chipping Hammer 2.2. Hand & Bench vice 2.3. Jamboor 2.4. Combination Pliers 2.5. Measuring Tools 2.5.1 Steel Foot Rule / Measuring Tape 2.5.2 Caliper Inside / Out Side 2.5.3 Jigs & Fixtures 2.6. Identify standard alphabet of lines and sketches 2.7. Welding Symbols	7	19
3.	BRAZING 3.1 Brazing 3.1.1 Brazing Process 3.1.2 Tools & Equipment 3.2 Solder & Brazing filler metals and fluxes. 3.3 Temperature	7	26

	3.3.1 Melting temperature of splatter 3.4 Brazing on different metals and joints. 3.4.1 Lap Joint Brazing 3.4.2 Butt Joint 3.4.3 Double Lap Joint 3.5 Brazing of Dissimilar Metal in Different shape 3.5.1 Preparation of Job 3.5.2 Practice on different metals 3.5.3 Proper disposal of wastage material.		
4.	Gas Welding & Cutting 4.1 Introduction of Welding 4.1.1 Definition 4.1.2 Advantages and Disadvantages 4.1.3 Kinds of Welding 4.2 Oxyacetylene Equipment & Tools 4.2.1 Oxyacetylene cylinders and its parts 4.2.2 Oxyacetylene pressure regulators and gauges 4.2.3 Rubber hose pipes 4.2.4 Welding Torch 4.2.5 Spark Lighter 4.2.6 Welding Pliers 4.2.7 Welding Goggle 4.3 Gas welding blind weld flat 4.3.1 Preparation of job 4.3.2 Marking 4.3.3 Center punching	7	53

	4.3.4 Gas Welding 4.4 Double Flanged Butt Weld (Introduction) 4.5 Welding Joint (Introduction) 4.6 Acetylene Generator 4.6.1 Types of Generator 4.6.2 Source Cylinder 4.7 Square Butt Weld on Pipe (Fix) 4.7.1 Tacking 4.7.2 Fix the Pipe 4.7.3 Weld in Oh/v/FI position 4.7.4 Keep Proper Penetration 4.7.5 Safety 4.8 Back Fire 4.8.1 Definition 4.8.2 Causes 4.8.3 Protection 4.9 Welding Defect 4.9.1 Gas Pocket 4.9.2 Poor Penetration 4.9.3 Undercuts 4.9.4 Improper Speed 4.9.5 Crack 4.10 Proper disposal of wastage material.		
5.	Arc Welding 5.1 Basic Electricity and welding machines 5.1.1 Welding Power Source 5.1.2 Welding Machine 5.1.3 Transformer 5.1.4 Rectifier	13	70

	5.1.5 Safety Rule 5.2 Welding polarities, classification of electrode, care and storage. 5.2.1 Straight Polarity 5.2.2 Reverser Polarity 5.3 Arc welding tools, equipment and accessories. 5.3.1 Welding Screen / Helmet 5.3.2 Leather Apron 5.3.3 Leather Gloves 5.3.4 Chipping Hammer 5.3.5 Goggles 5.3.6 Sleeves 5.3.7 Tong 5.3.8 Wire Brush 5.4. Relationship among the size of electrode, Current setting and job thickness. 5.5. Arc welding practice on different joints and positions. 5.5.1 Flat, 5.5.2 Horizontal 5.6 Proper disposal of wastage material.		
6.	Argon Welding 6.1 Introduction to Argon Welding 6.1.1 Overview 6.1.2 Importance and role of Argon welding in cutlery industry 6.2 Fundamentals of Argon Welding 6.2.1 Tools and Equipment	13	74

	6.3 Welding Steps and Techniques 6.3.1 TIG / MIG Welding 6.3.2 Torch Handling 6.3.3 Arc length controlling 6.4 Welding Variables and Parameters 6.4.1 Current / Voltage / Polarity 6.4.2 Gas flow rate 6.5 Joint Design in Welding Process 6.5.1 Butt Joint 6.5.2 Lap Joint 6.5.3 T joint 6.5.4 Corner joint 6.5.5 Edge joint 6.5.6 Welding of dissimilar material 6.6 Filler Material Selection and Application 6.6.1 Types of filler material 6.6.2 Rods / Wires / Alloys 6.7 Quality Control		
7.	Laser Welding 7.1 Introduction to Laser Welding 7.2 Principles of Laser Welding	7	0
8.	Plasma Welding and Cutting 8.1 Introduction to Plasma welding and Cutting 8.1.1 Overview / Advantages / Applications 8.2 Plasma Welding Equipment 8.2.1 Power source 8.2.2 Torch and its types 8.2.3 Gas supply 8.3 Plasma Cutting Equipment	16	74

	8.3.1 Power Source 8.3.2 Cutting Torch 8.4 Welding Techniques and Parameters 8.4.1 Current 8.4.2 Voltage 8.4.3 Gas flow rate 8.4.4 Travel speed 8.4.5 Torch angle 8.4.6 Welding profile 8.5 Cutting Techniques and Parameters 8.5.1 Ampere 8.5.2 Gas flow rate 8.5.3 Cutting Speed 8.6 Plasma Welding Flaws 8.7 Proper disposal of wastage material.		
Total		80	320

LIST OF LABS / WORKSHOP

- Brazing workshop
- Gas welding and cutting workshop
- Arc Welding workshop
- Argon Welding Workshop
- Plasma welding and cutting workshop

Note: Single hall with separate workstation for different types of welding processes can be used as per space availability.

LIST OF TOOLS / MACHINERY / EQUIPMENT ETC(For a Class of **25** Students)

Name of Trade	Welding Methods & Plasma Cutting
Duration of Course	3 Months

S. No	Names of Equipment / Tools / Items	Quantity
1.	Steel rule 30 cm	15 Nos.
2.	Steel Tape 5 meter	10 Nos.
3.	Sprit level 12 inch/30 Cm	05 Nos.
4.	Work benches	10 Nos.
5.	Bench vice 5"	05 Nos.
6.	Chipping Hammer 250 grams and 500 grams	05 Nos Each
7.	Jamboor	10 Nos.
8.	Outside Caliper 6"/15 Cm	10 Nos.
9.	Tri square 8"	05 Nos.
10.	Combination Pliers 8"	10 Nos.
11.	Screw driver straight 8" & 12"	03 Nos. each
12.	Screw driver Philips 8" & 12"	03 Nos. each
13.	Spanner adjustable 8"	03 Nos
14.	Allen key set 3mm to 12mm	03 No.
15.	Chisel flat & crosscut	05 nos. each
16.	Centre punch	05 Nos.
17.	C-Clamp	05 Nos.

18.	Line scribe	10 Nos.
19.	Angle plate	01 No.
20.	Electric Hand drill machine	01 No.
21.	Hand disc grinder 7"	01 Nos.
22.	Hand disc grinder 4"	01 Nos.
Gas Welding Equipment and Accessories		
23.	Gas welding working stations	1 Nos.
24.	Cylinder trolley or Manifold system (one)	1 Nos.
25.	Cylinder for Oxygen gas with key and regulator	1 N0s.
26.	Cylinder for Acetylene gas with key and regulator	1 Nos.
27.	Flashback arrester acetylene	1 Nos.
28.	Flashback arrester oxygen	1 Nos.
29.	Hose pipe (oxygen and acetylene)	4 meter each
30.	Oxy-acetylene welding and cutting set (Injector type) complete with tip Cleaner needles.	1 Nos.
31.	Steel table with fire bricks top	1 Nos.
32.	Spark lighter	1 Nos.
33.	Welding goggles	25 Nos.
34.	Gloves	25 Nos
35.	Burner pliers or Tong	1 Nos.
36.	Stool	1 Nos.
37.	Table for gas cutting	01 N0.
Arc Welding Equipment and Accessories		
38.	Welding face shield complete	25 Nos.
39.	Welding helmet complete	05 Nos.
40.	Steel wire brush	10 Nos.

41.	Apron	10 Nos.
42.	Welding Table	05 Nos.
43.	Stool	10 Nos.
Argon Welding Equipment and Accessories		
44.	Regulator Argon Cylinder	03 Nos
4 in 1 Welding Station		
45.	4 in 1 Multifunctional welding station (200 watt to 300 watt) (MIG, Argon, Arc, Plasma cutting and welding)	03

LIST OF PRACTICAL

1	Perform brazing operation on similar and dissimilar metals by different joint types
2	Perform gas welding by different joint types
3	Perform gas cutting operation
4	Apply Arc welding on different joint types and positions
5	Perform Argon welding using different joint designs
6	Apply plasma welding operation
7	Perform plasma cutting operation

LIST OF CONSUMABLES
(For a class of 25 students)

Sr.No	ITEM	QUANTITY
1	Welding electrodes/ wire/ rods / filler metal	30 boxes
2	Oxygen gas in cylinder	01
3	Acetylene gas cylinder	01
4	Argon gas cylinder	03

MINIMUM QUALIFICATION OF INSTRUCTOR

- B.Sc Engineering Technology or B.Tech (hons) in Mechanical with one year experience, preferably in the relevant field

OR

- D.A.E Mechanical / Welding with two year experience preferably in the relevant field.

OR

- Certified welder with two year experience

OR

- Welding short course with three year experience

MINIMUM QUALIFICATION OF LAB TECHNICIAN

- 05 years industrial Welding experience with matric qualification

OR

- 10 years industrial Welding experience

REFERENCE BOOKS

- Modern Welding by Althouse - Turnquist - Bowditch. b
- Welding Skills and Practices by Giachino - Weeks.
- Welding Skills by Giachino - Weeks.
- Welding Principles & Practices by Sacks.
- Practical Welding Technology by Rudy Mohler.
- Principles of Welding Technology by L. M. Gourd.
- Oxy-Acetylene Welding basic fundamentals by Ronald J. Baird.
- Brazing and soldering of Metals by N. Lashko - S. Lashko
- Technology of the Metal Trade (GTZ) by Appold - Feiler - Reinhard - Schmith.
- Oxy-Acetylene handbook, by LINDE

EMPLOYABILITY OF PASSOUTS

The pass outs of this course may find job / employment opportunities in the following areas / sectors: -

1. Cutlery Industry
2. Steel manufacturing industry.
3. Construction industry.
4. Industrial projects.
5. Shipyards.
6. Railway.
7. Pakistan Ordinance Factory Wah.
8. Heavy Mechanical Complex Taxila.
9. Heavy Forge and Foundry Taxila.
10. Tractor and Agricultural Equipment Industry.
11. Automobile industry.
12. Local industry.
13. Local metal fabrication shops.
14. Self employment.

OCCUPATIONS & Job Designations in various Industries/ Market

- Assistant Welding Technician
- Welding Technician

Curriculum Development Committee

1.	Mr. Zeeshan, Instructor, TEVTA, CSTISC, Wazirabad.	Convener
2.	Mr. Zafar Iqbal Bhutta, M/S Sahar Industries, Behind Darson Rubber Works, G.T Road, Wazirabad.	Member
3.	Mr. Rahat Nazar, M/S Rahat Stainless Steel, Gali Saleem Market Wali, Arif Shaheed Road, Wazirabad.	Member