



GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT & ENTREPRENEURSHIP
DIRECTORATE GENERAL OF TRAINING

COMPETENCY BASED CURRICULUM

WELDER

(Duration: One Year)

CRAFTSMEN TRAINING SCHEME (CTS)

NSQF LEVEL- 4



SECTOR – CAPITAL GOODS AND MANUFACTURING



Directorate General of Training

WELDER

(Engineering Trade)

(Revised in 2019)

Version: 1.2

CRAFTSMEN TRAINING SCHEME (CTS)

NSQF LEVEL - 4

Developed By

Ministry of Skill Development and Entrepreneurship

Directorate General of Training

CENTRAL STAFF TRAINING AND RESEARCH INSTITUTE

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7. TRADE SYLLABUS

SYLLABUS - WELDER

DURATION: ONE YEAR

Duration	Reference Learning Outcome	Process code	Professional Skills (Trade Practical) With Indicative Hrs.	Professional Knowledge (Trade Theory)
Professional Skill 50 Hrs; Professional Knowledge 14 Hrs	<p>Set the gas welding plant and join MS sheet in different position following safety precautions. <i>[Different position: - 1F, 2F, 3F, 1G, 2G, 3G.]</i></p> <p>Set the SMAW machine and perform different type of joints on MS in different position observing standard procedure. <i>[different types of joints- Fillet (T-joint, lap & Corner), Butt (Square & V); different position - 1F, 2F, 3F,4F, 1G, 2G, 3G, 4G]</i></p>		<ol style="list-style-type: none"> Demonstration of Machinery used in the trade. (6 hrs.) Identification to safety equipment and their use etc. (4 hrs.) Hack sawing, filing square to dimensions. (7 hrs.) Marking out on MS plate and punching. (8 hrs.) 	<ul style="list-style-type: none"> Importance of trade Training. General discipline in the Institute Elementary First Aid. Importance of Welding in Industry Safety precautions in Shielded Metal Arc Welding, and Oxy-Acetylene Welding and Cutting. (07 hrs)
		OAW-01 SMAW-01	<ol style="list-style-type: none"> Setting of oxy-acetylene welding equipment, Lighting and setting of flame. (5 hrs.) Perform fusion run without filler rod on MS sheet 2mm thick in flat position. (5 hrs.) Setting up of Arc welding machine & accessories and striking an arc. (5 hrs.) Deposit straight line bead on MS plate in flat position. (10 hrs.) 	<ul style="list-style-type: none"> Introduction and definition of welding. Arc and Gas Welding Equipments, tools and accessories. Various Welding Processes and its applications. Arc and Gas Welding terms and definitions. (07 hrs)

Professional Skill 25 Hrs; Professional Knowledge 07 Hrs	Set the gas welding plant and join MS sheet in different position following safety precautions. <i>[Different position: - 1F, 2F, 3F, 1G, 2G, 3G.]</i>	OAW-02 OAW-03	9. Depositing bead with filler rod on M.S. sheet 2 mm thick in flat position. (10 hrs.) 10. Edge joint on MS sheet 2 mm thick in flat position without filler rod. (15 hrs.)	- Different process of metal joining methods: Bolting, riveting, soldering, brazing, seaming etc. - Types of welding joints and its applications. Edge preparation and fit up for different thickness. - Surface Cleaning (07 hrs)
Professional Skill 25 Hrs; Professional Knowledge 07 Hrs	Set the SMAW machine and perform different type of joints on MS in different position observing standard procedure. <i>[different types of joints- Fillet (T-joint, lap & Corner), Butt (Square & V); different position - 1F, 2F, 3F,4F, 1G, 2G, 3G, 4G]</i>	SMAW-02 SMAW-03	11. Straight line beads on M.S. plate 10 mm thick in flat position. (10 hrs.) 12. Weaved bead on M. S plate 10mm thick in flat position. (15 hrs.)	- Basic electricity applicable to arc welding and related electrical terms & definitions. - Heat and temperature and its terms related to welding - Principle of arc welding. And characteristics of arc. (07 hrs)
Professional Skill 25 Hrs; Professional Knowledge 07 Hrs	Set the oxy- acetylene cutting plant and perform different cutting operations on MS plate. <i>[Different cutting operation – Straight, Bevel,</i>	OAGC-01 OAGC-02	13. Setting up of oxy-acetylene and make straight cuts (freehand) (2 hrs.) 14. Perform marking and straight line cutting of MS plate 10 mm thick	- Common gases used for welding & cutting, flame temperatures and uses. - Chemistry of oxy-acetylene flame. - Types of oxy-acetylene flames and uses.

	<i>circular]</i>	OAGC-03	by gas. Accuracy within ± 2 mm. (4 hrs.) 15. Beveling of MS plates 10 mm thick, cutting regular geometrical shapes and irregular shapes, cutting chamfers by gas cutting. (7 hrs.)	- Oxy-Acetylene Cutting Equipment principle, parameters and application. (07 hrs)
		OAGC-04	16. Circular gas cutting on MS plate 10 mm thick by <i>profile cutting machine</i> . (7 hrs.)	
		OAGC-05	17. Marking and perform radial cuts, cutting out holes using oxy-acetylene gas cutting. (3 hrs.)	
		OAGC-06	18. Identify cutting defects viz., distortion, grooved, fluted or ragged cuts; poor draglines; rounded edges; tightly adhering slag. (2 hrs.)	
Professional Skill 150 Hrs; Professional Knowledge 42 Hrs	Set the gas welding plant and join MS sheet in different position following safety precautions. [Different position: - 1F, 2F, 3F, 1G, 2G, 3G.] Set the SMAW machine and perform different type of joints on MS in different position observing	OAW-04	19. Square butt joint on M.S. sheet 2 mm thick in flat Position. (1G) (9 hrs.)	- Arc welding power sources: Transformer, Motor Generator set, Rectifier and Inverter type welding machines and its care & maintenance..
		SMAW-04	20. Fillet "T" joint on M.S. Plate 10 mm thick in flat position. (1F) (7 hrs.)	- Advantages and disadvantages of A.C. and D.C. welding machines (06 hrs)
		OAW-05	21. Open corner joint on MS sheet 2 mm thick in flat Position (1F) (9 hrs.)	
		SMAW-05	22. Fillet lap joint on M.S. plate 10 mm thick in flat position. (1F) (7 hrs.)	- Welding positions as per EN & ASME: flat, horizontal, vertical and over head position.
		OAW-06	23. Fillet "T" joint on MS	

standard procedure. <i>[different types of joints- Fillet (T-joint, lap & Corner), Butt (Square & V); different position - 1F, 2F, 3F,4F, 1G, 2G, 3G, 4G]</i>	SMAW-06	sheet 2 mm thick in flat position. (1F) (7 hrs.) 24. Open Corner joint on MS plate 10 mm thick in flat position. (1F) (8 hrs.)	<ul style="list-style-type: none"> - Weld slope and rotation. - Welding symbols as per BIS & AWS. (06 hrs)
	OAW-07	25. Fillet Lap joint on MS sheet 2 mm thick in flat position. (1F) (08 hrs.)	<ul style="list-style-type: none"> - Arc length – types – effects of arc length. - Polarity: Types and applications. - Weld quality inspection, common welding mistakes and appearance of good and defective welds - Weld gauges & its uses. (06 hrs)
	SMAW-07	26. Single “V” Butt joint on MS plate 12 mm thick in flat position (1G) . (11 hrs.)	
	I&T-01	27. Testing of weld joints by visual inspection. (1 hr.) 28. Inspection of welds by using weld gauges. (1 hr.)	
	OAW-08	29. Square Butt joint on M.S. sheet. 2 mm thick in Horizontal position. (2G) (8 hrs.)	<ul style="list-style-type: none"> - Calcium carbide properties and uses. - Acetylene gas properties and generating methods. - Acetylene gas Purifier, Hydraulic back pressure valve and Flash back arrestor. (06hrs)
	SMAW-08	30. Straight line beads and multi layer practice on M.S. Plate 10 mm thick in Horizontal position. (4 hrs.)	
	SMAW-09	31. Fillet “T” joint on M.S. plate 10 mm thick in Horizontal position. (2F) (7 hrs.)	
	OAW-09	32. Fillet Lap joint on M.S. sheet 2 mm thick in horizontal position (2F) (10 hrs.)	<ul style="list-style-type: none"> - Oxygen gas and its properties - Production of oxygen by Air liquefaction. - Charging process of oxygen and acetylene gases - Oxygen and Dissolved Acetylene gas cylinders
	SMAW-10	33. Fillet Lap joint on M.S. plate 10 mm thick in horizontal position. (11 hrs.) (2F)	

				<p>and Color coding for different gas cylinders.</p> <ul style="list-style-type: none"> - Gas regulators, types and uses. <p>(06 hrs)</p>
		OAW-10	34. Fusion run with filler rod in vertical position on 2mm thick M.S sheet. (7 hrs.)	<ul style="list-style-type: none"> - Oxy acetylene gas welding Systems (Low pressure and High pressure). Difference between gas welding blow pipe(LP &HP) and gas cutting blow pipe - Gas welding techniques. Rightward and Leftward techniques. <p>(06 hrs)</p>
		OAW-11	35. Square Butt joint on M.S. sheet. 2 mm thick in vertical position (3G) (7 hrs.)	
		SMAW-11	36. Single Vee Butt joint on M.S. plate 12 mm thick in horizontal position (2G) . (8hrs.)	
		SMAW- 12	37. Weaved bead on M.S Plate 10mm in vertical position.(7 hrs.)	<ul style="list-style-type: none"> - Arc blow – causes and methods of controlling. - Distortion in arc & gas welding and methods employed to minimize distortion - Arc Welding defects, causes and Remedies. <p>(06 hrs)</p>
		OAW-12	38. Fillet “T” joint on M.S sheet 2 mm thick in vertical position. (3F) (7 hrs.)	
		SMAW-13	39. Fillet “T” joint on M.S. plate 10 mm thick in vertical position. (3F) (8 hrs.)	
Professional Skill 100 Hrs; Professional Knowledge 28 Hrs	Set the SMAW machine and perform different type of joints on MS in different position observing standard procedure. <i>[different types of joints- Fillet (T-joint, lap & Corner), Butt (Square & V); different</i>	OAW-13	40. Structural pipe welding butt joint on MS pipe Ø 50 and 3mm WT in 1G position. (15 hrs.)	<ul style="list-style-type: none"> - Specification of pipes, various types of pipe joints, pipe welding all positions, and procedure. - Difference between pipe welding and plate welding. <p>(07 hrs)</p>
		SMAW-14	41. Fillet Lap joint on M.S. Plate 10 mm in vertical position. (3G) (10 hrs.)	
		SMAW-15	42. Open Corner joint on MS plate 10 mm thick in	

	<p><i>position - 1F, 2F, 3F,4F, 1G, 2G, 3G, 4G]</i></p> <p>Perform welding in different types of MS pipe joints by Gas welding (OAW). [Different types of MS pipe joints – Butt, Elbow, T-joint, angle (45°) joint, flange joint]</p>	OAW-14	43. Pipe welding - Elbow joint on MS pipe Ø 50 and 3mm WT. (1G) (15 hrs.)	vertical position. (2F) (10 hrs.)	joint and branch joint - Manifold system (07 hrs)
		OAW-15	44. Pipe welding “T” joint on MS pipe Ø 50 and 3mm WT. (1G) (10 hrs.)		- Gas welding filler rods, specifications and sizes. - Gas welding fluxes – types and functions.
		SMAW-16	45. Single “V” Butt joint on MS plate 12 mm thick in vertical position (3G). (15 hrs.)		- Gas Brazing & Soldering : principles, types fluxes & uses - Gas welding defects, causes and remedies (07 hrs)
		OAW-16	46. Pipe welding 45 ° angle joint on MS pipe Ø 50 and 3mm WT. (1G) (15 hrs.)		- Electrode : types, functions of flux, coating factor, sizes of electrode Coding of electrode as per BIS, AWS, - Effects of moisture pick up.
Professional Skill 75 Hrs; Professional Knowledge 21 Hrs	Set the SMAW machine and perform different type of joints on MS in different position observing standard procedure. [different types of joints- Fillet (T-joint, lap & Corner), Butt (Square & V); different position - 1F, 2F,	SMAW-17	47. Straight line beads on M.S. plate 10mm thick in over head position. (10 hrs.)		- Storage and baking of electrodes. - Special purpose electrodes and their applications. (07 hrs)
		SMAW-18	48. Pipe Flange joint on M.S plate with MS pipe Ø 50 mm X 3mm WT (1F) (15 hrs.)		- Weldability of metals, importance of pre heating, post heating and maintenance of inter pass temperature. (07 hrs)
		SMAW-19	49. Fillet “T” joint on M.S. plate 10 mm thick in over head position. (4F) (10 hrs.)		
		SMAW-20	50. Pipe welding butt joint on MS pipe Ø 50 and 5 mm WT. in 1G position.		- Classification of steel. - Welding of low, medium and high carbon steel and

	<p><i>3F,4F, 1G, 2G, 3G, 4G]</i></p> <p>Set the SMAW machine and perform welding in different types of MS pipe joints by SMAW. <i>[Different types of MS pipe joints – Butt, Elbow, T-joint, angle (45°) joint, flange joint]</i></p>	<p>SMAW-21</p> <p>SMAW-22</p> <p>SMAW-23</p>	<p>(15 hrs.)</p> <p>51. Fillet Lap joint on M.S. plate 10 mm thick in over head position. (4G). (10 hrs.)</p> <p>52. Single “V” Butt joint on MS plate 10mm thick in over head position(4G) (15 hrs.)</p> <p>53. Pipe butt joint on M. S. pipe Ø 50mm WT 6mm (1G Rolled).(10 hrs.)</p>	<p>alloy steels. (07 hrs)</p> <p>- Effects of alloying elements on steel</p> <p>- Stainless steel types- weld decay and weldability. (07 hrs)</p>
<p>Professional Skill 25 Hrs;</p> <p>Professional Knowledge 07 Hrs</p>	<p>Choose appropriate welding process and perform joining of different types of metals and check its correctness. <i>[appropriate welding process – OAW, SMAW; Different metal – SS, CI, Brass, Aluminium]</i></p>	<p>OAW-17</p> <p>SMAW -24</p> <p>OAW-18</p>	<p>54. Square Butt joint on S.S. sheet. 2 mm thick in flat position. (1G)(8 hrs.)</p> <p>55. Square Butt joint on S.S. Sheet 2 mm thick in flat position. (1G)(8 hrs.)</p> <p>56. Square Butt joint on Brass sheet 2 mm thick in flat position. (1G)(9 hrs.)</p>	<p>- Brass – types – properties and welding methods.</p> <p>- Copper – types – properties and welding methods. (07 hrs)</p>
<p>Professional Skill 25 Hrs;</p> <p>Professional Knowledge 07 Hrs</p>	<p>Choose appropriate welding process and perform joining of different types of metals and check its correctness. <i>[appropriate welding process – OAW, SMAW; Different metal – SS, CI, Brass, Aluminium]</i></p> <p>Demonstrate arc gauging operation to</p>	<p>OAW-19</p> <p>SMAW-25</p> <p>AG-01</p>	<p>57. Square Butt & Lap joint on M.S. sheet 2 mm thick by brazing in flat position. (11 hrs.)</p> <p>58. Single “V” butt joint C.I. plate 6mm thick in flat position. (1G)(11 hrs.)</p> <p>59. Arc gouging on MS plate 10 mm thick. (3 hrs.)</p>	<p>- Aluminium and its alloys, properties and weldability, Welding methods</p> <p>- Arc cutting & gouging, (07 hrs)</p>

	rectify the weld joints.			
Professional Skill 25 Hrs; Professional Knowledge 07 Hrs	Choose appropriate welding process and perform joining of different types of metals and check its correctness. <i>[appropriate welding process – OAW, SMAW; Different metal – SS, CI, Brass, Aluminium]</i>	OAW-20 OAW-21	60. Square Butt joint on Aluminium sheet. 3 mm thick in flat position. (12 hrs.) 61. Bronze welding of cast iron (Single “V” butt joint) 6mm thick plate (1G) .(13 hrs.)	- Cast iron and its properties types. - Welding methods of cast iron. (07 hrs)
Professional Skill 25 Hrs; Professional Knowledge 07 Hrs	Test welded joints by different methods of testing. <i>[different methods of testing- Dye penetration test, Magnetic particle test, Nick break test, Free band test, Fillet fracture test]</i>	I&T-02 I&T-03 I&T-04 I&T-05 I&T-06	62. Dye penetrant test. (5 hrs.) 63. Magnetic particle test. (5 hrs.) 64. Nick- break test. (5 hrs.) 65. Free bend test. (5 hrs.) 66. Fillet fracture test. (5 hrs.)	- Types of Inspection methods - Classification of destructive and NDT methods - Welding economics and Cost estimation. (07 hrs)
Professional Skill 200 Hrs; Professional Knowledge 56 Hrs	Set GMAW machine and perform welding in different types of joints on MS sheet/plate by GMAW in various positions by dip mode of metal transfer. <i>[different types of joints- Fillet (T-joint, lap, Corner), Butt (Square & V); various positions- 1F, 2F, 3F,4F, 1G, 2G, 3G]</i>	GMAW- 01 GMAW - 02	67. Introduction to safety equipment and their use etc. (2 hrs.) 68. Setting up of GMAW welding machine & accessories and striking an arc. (4 hrs.) 69. Depositing straight line beads on M.S Plate. (10 hrs.) 70. Fillet weld – “T” joint on M.S plate 10mm thick in flat position by	- Safety precautions in Gas Metal Arc Welding and Gas Tungsten Arc welding. - Introduction to GMAW - equipment – accessories. - Various other names of the process. (MIG/MAG/CO ₂ welding.) (05 hrs)

			Dip transfer. (1F) (4 hrs.)	
		GMAW -03	71. Fillet weld – Lap joint on M.S. sheet 3mm thick in flat position by Dip transfer. (1F) (5 hrs.)	<ul style="list-style-type: none"> - Advantages of GMAW welding over SMAW , limitations and applications - Process variables of GMAW. - Modes of metal transfer – dip or short circuiting transfer, spray transfer (free flight transfer) and globular transfer (intermittent transfer) and Pulsed metal transfer. (05 hrs)
		GMAW -04	72. Fillet weld – “T” joint on M.S. sheet 3mm thick in flat position by Dip transfer. (1F) (5hrs.)	
		GMAW -05	73. Fillet weld – corner joint on M.S. sheet 3mm thick in flat position by Dip transfer. (1F) (5 hrs.)	
		GMAW -06	74. Butt weld – Square butt joint on M.S sheet 3mm thick in flat position (1G) (07 hrs.)	<ul style="list-style-type: none"> - Wire feed system – types – care and maintenance. - Welding wires used in GMAW, standard diameter and codification as per AWS. (05 hrs)
		GMAW -07	75. Butt weld – Single “V” butt joint on M.S plate 10 mm thick by Dip transfer in flat position. (1G) (8 hrs.)	
		GMAW -08	76. Fillet weld – “T” joint on M.S plate 10mm thick in Horizontal position by Dip transfer. (2F) (10 hrs.)	<ul style="list-style-type: none"> - Types of shielding gases and gas mixtures used in GMAW and its applications. - Flux cored arc welding – description, advantage, welding wires, coding as per AWS. (06 hrs)
		GMAW -09	77. Fillet weld – corner joint on M.S plate 10mm thick in Horizontal position by	

			Dip transfer. (2F) (15 hrs.)	
		GMAW -10	78. Fillet weld – “T” joint on M.S. sheet 3mm thick in Horizontal position by Dip transfer. (2F) (10 hrs.)	<ul style="list-style-type: none"> - Edge preparation of various thicknesses of metals for GMAW. - GMAW defects, causes and remedies (07 hrs)
		GMAW -11	79. Fillet weld – corner joint on M.S. sheet 3mm thick in Horizontal position by Dip transfer. (2F) (15 hrs.)	
		GMAW -12	80. Fillet weld – “T” joint on M.S plate 10mm thick in vertical position by Dip transfer. (3F) (10 hrs.)	<ul style="list-style-type: none"> - Heat input and techniques of controlling heat input during welding. - Heat distribution and effect of faster cooling (07 hrs)
		GMAW -13	81. Fillet weld – corner joint on M.S plate 10mm thick in vertical position by dip transfer. (3F) (15 hrs.)	
		GMAW -14	82. Fillet weld – Lap joint on M.S. sheet 3mm thick in vertical position by Dip transfer. (3F) (10 hrs.)	<ul style="list-style-type: none"> - Pre heating & Post Weld Heat Treatment - Use of temperature indicating crayons. (07 hrs)
		GMAW -15	83. Fillet weld – corner joint on M.S. sheet 3mm thick in vertical position by Dip transfer. (3F) (15 hrs.)	

		GMAW -16	84. Fillet weld – Lap and “T” joint on M.S sheet 3mm thick in over head position by Dip transfer. (4F) (15 hrs.)	- Submerged arc welding process –principles, equipment, advantages and limitations
		GMAW -17	85. Tee Joints on MS Pipe Ø 60 mm OD x 3 mm WT 1G position – Arc constant (Rolling) (10 hrs.)	- Electro slag and Electro gas welding processes– principles, equipments, advantages and limitations. (07 hrs)
		GMAW -18	86. Depositing bead on S.S sheet in flat position. (10 hrs.)	- Thermit welding process- types, principles, equipments, Thermit mixture types and applications.
		GMAW -19	87. Butt joint on Stainless steel 2 mm thick sheet in flat position by Dip transfer. (15 hrs.)	- Use of backing strips and backing bars (07 hrs)
Professional Skill 100 Hrs; Professional Knowledge 28 Hrs	Set the GTAW machine and perform welding by GTAW in different types of joints on different metals in different position and check correctness of the weld. <i>[different types of joints- Fillet (T-joint, lap, Corner), Butt (Square & V) ; different metals- Aluminium, Stainless Steel; different position- 1F & 1G]</i>	GTAW -01	88. Depositing bead on Aluminium sheet 2 mm thick in flat position. (10 hrs.)	- GTAW process - brief description. Difference between AC and DC welding, equipments, polarities and applications.
		GTAW -02	89. Square butt joint on Aluminium sheet 1.6mm thick in flat position. (15 hrs.)	- Various other names of the process (TIG, Argonarc) - Power sources for GTAW - AC &DC (07 hrs)
		GTAW -03	90. Fillet weld – “T” joint on Aluminium sheet 1.6 mm thick in flat position. (1F) (10 hrs.)	- Tungsten electrodes – types & uses, sizes and preparation
		GTAW -04	91. Fillet weld – Outside corner joint on Aluminium sheet 2 mm thick in flat position. (1F) (15 hrs.)	- GTAW Torches- types, parts and their functions - GTAW filler rods and selection criteria. (07 hrs)

		GTAW -05	92. Butt weld - Square butt joint on Stainless steel sheet 1.6 mm thick in flat position with purging gas (1G) (25 hrs.)	<ul style="list-style-type: none"> - Edge preparation and fit up. - GTAW parameters for welding of different thickness of metals - Pulsed TIG welding - brief description, pulse parameters slope up and slope down. (07 hrs)
		GTAW -06	93. Fillet weld – “T” joint on Stainless steel sheet 1.6 mm thick in flat position. (1F) (25 hrs.)	<ul style="list-style-type: none"> - Argon / Helium gas properties – uses. - GTAW Defects, causes and remedy. (07 hrs)
Professional Skill 25 Hrs; Professional Knowledge 07 Hrs	Perform Aluminium & MS pipe joint by GTAW in flat position.	GTAW -07	94. Pipe butt joint on Aluminium pipe \varnothing 50 mm x 3 mm WT in Flat position. (1G) (25 hrs.)	<ul style="list-style-type: none"> - Friction welding process-equipment and application - Laser beam welding (LBW)and Electron beam welding(EBW) (07 hrs)
Professional Skill 25 Hrs; Professional Knowledge 07 Hrs	Perform Aluminium & MS pipe joint by GTAW in flat position. Set the Plasma Arc cutting machine and cut ferrous & non-ferrous metals.	GTAW -08 PAC-01	95. “T” Joints on MS Pipe \varnothing 50 mm OD x 3 mm WT, position – Flat (1F) (15 hrs.) 96. Straight cutting on ferrous and non ferrous (10 hrs.)	<ul style="list-style-type: none"> - Plasma Arc Welding (PAW) and cutting (PAC) process – equipments and principles of operation. - Types of Plasma arc, advantages and applications. (07 hrs)
Professional Skill 25 Hrs; Professional Knowledge 07 Hrs	Set the resistance spot welding machine and join MS & SS sheet.	RW-01 RW-02	97. Lap joint on Stainless steel sheet by Resistance Spot welding. (10 hrs.) 98. MS sheets joining by Resistance Spot welding (15 hrs.)	<ul style="list-style-type: none"> - Resistance welding process -types, principles, power sources and welding parameters. - Applications and limitations. (07 hrs)
Professional	Perform joining of different similar and	OAW-01	99. Square butt joint on Copper sheet 2mm	<ul style="list-style-type: none"> - Metalizing – types of metalizing principles,

Skill 50 Hrs; Professional Knowledge 14 Hrs	dissimilar metals by brazing operation as per standard procedure. <i>[different similar and dissimilar metals- Copper, MS, SS]</i>	OAW-02	100. "T" joint on Copper to MS sheet 2mm thick in flat position by Brazing (1F) (10 hrs.)	<p>equipments, advantages and applications</p> <p>- Manual Oxy – acetylene powder coating process-principles of operation and applications (07 hrs)</p>
		OAW-03	101. Silver brazing on S.S Sheet with copper sheet "T" joint. (10 hrs.)	- Welding codes and standards
		OAW-04	102. Silver brazing on copper tube to tube. (15 hrs.)	- Reading of assembly drawing - Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) (07 hrs)
Professional Skill 25 Hrs; Professional Knowledge 07 Hrs	<p>Repair Cast Iron machine parts by selecting appropriate welding process. <i>[Appropriate welding process- OAW, SMAW]</i></p> <p>Hard facing of alloy steel components / MS rod by using hard facing electrode.</p>	OAW - 05	103. Repair welding of broken C.I. machine parts by oxy-acetylene welding with C.I and bronze filler rod. (10 hrs.)	- Hard facing/ surfacing necessity, surface preparation, various hard facing alloys and advantages of hard facing. (06 hrs)
		SMAW-01	104. Repair welding of broken C.I machine parts by C.I. electrode. (8 hrs.)	
		SMAW-02	105. Hard surfacing practice on M.S round rod Ø 25 mm by using Hard facing electrode in flat position. (7 hrs.)	

In-plant training / Project work

Broad area:

- a) Universal welding manipulator
- b) Metal rack
- c) Cylinder trolley with chain provision for locking
- d) Welding fixture for TIG- butt/ corner joint with purging facility

SYLLABUS FOR CORE SKILLS

1. Workshop Calculation & Science (Common for one year trades) (80 hrs)
2. Engineering Drawing (80 hrs)
3. Employability Skills (Common for all CTS trades) (160 hrs)

Learning outcomes, assessment criteria, syllabus and Tool List of Core Skills subjects which is common for a group of trades, provided separately in www.bharatskills.gov.in.