

COMPETENCY BASED CURRICULUM

FOR THE TRADE OF

WELDER

UNDER

CRAFTSMAN TRAINING SCHEME (CTS)

IN SEMESTER PATTERN

BY



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

CONTENTS

Sl. No.	Topics	Page No.
1.	Introduction	3-4
2.	Job roles: reference NOS& NCO	5-7
3.	NSQF level compliance	8
4.	Learning outcome	9-10
5.	General information	11
6.	Course structure	12
7.	General Training Plan, Examination & Pass regulation	13
8.	Assessable outcome	14-15
9.	Assessable outcome with assessment criteria	16-22
10.	Syllabus content with time structure 10.1 Syllabus content for Professional Skill & Knowledge 10.2 Syllabus content of core skills	23-34
11.	Employability skills 11.1 General information 11.2 Distribution of topics between semesters for employability skill 11.3 Syllabus content of Employability Skill	35-41
12.	Infrastructure	42
13.	Assessment standard 13.1 Assessment guideline 13.2 Internal assessments (Formative assessment) 13.3 Final assessment- All India Trade Test (Summative assessment)	43-46
14.	List of trade committee members	47
15.	List of Tools & Equipments-Annexure-I	48-51
16.	Guidelines for instructors and paper setters- Annexure-II	52

1. INTRODUCTION

India is one of the youngest nations in the world. Our youth are our strength. However, a challenge facing the country is that of skilling our youth as per the demands of the industry. Recognizing the need for quickly coordinating the skill development and entrepreneurship efforts of all concerned stakeholders, the Government of India created the Ministry of Skill Development and Entrepreneurship on 9th November, 2014. To create further convergence between the Vocational Training System through Industrial Training Institutes (ITIs) and the new skill initiatives of the Government, the Training and Apprenticeship Training divisions from the Directorate General of Employment and Training (DGET) under the Ministry of Labour and Employment stand transferred to the Ministry of Skill Development and Entrepreneurship (MSDE) with effect from 16th April, 2015. This move brings over 11000 ITIs and scores of other institutions, and the Apprenticeship and Training divisions, under the Ministry.

The Ministry of Skill Development and Entrepreneurship is an apex organization for the development and coordination of the vocational training including Women's Vocational Training in our country. The Ministry conducts the vocational training programmes through the Craftsmen Training Scheme (CTS), Apprenticeship Training Scheme (ATS), Modular Employable Scheme (MES) under the Skill Development Initiative (SDI) Scheme, and Craftsmen Instructor Training Scheme (CITS) to cater the needs of different segments of the Labour market. The National Council for Vocational Training (NCVT) acts as a central agency to advise Government of India in framing the training policy and coordinating vocational training throughout India. The day-to-day administration of the ITIs rests with the State Governments/ Union Territories.

- Training courses under the CTS is being offered through a network of more than 11000 Government and Private Industrial Training Institutes (ITIs) located all over the country with a total seating capacity of more than 16 Lakhs with an objective to provide skilled workforce to the industry in 126 trades. Skill development courses exclusively for women are also being offered under CTS and other schemes through Government and Private ITIs and Regional Vocational Training Institutes (RVTIs) for Women.
- The Apprentices Act, 1961 was enacted with the objective of regulating the program of apprenticeship training in the industry by utilizing the facilities available within for imparting on-the-job training. The Act makes it obligatory for employers in specified industries to engage apprentices in designated trades to impart on the job training for school leavers, and ITI passed outs to develop skilled manpower for the industry.
- The Ministry is implementing the Employable Scheme (MES) under the Skill Development Initiative Scheme to provide vocational training to people to develop skilled manpower for the industry through a network of Vocational Training Providers (VTPs) located across the country.

Central Staff Training and Research Institute (CSTARI), Kolkata is the nodal institute for the development/revision of curricula under all vocational training schemes of the

Ministry. National Instructional Media Institute (NIMI), Chennai is to make available instructional material in various trades for the use of trainees and trainers to ensure overall improvement in the standard of institutional training under the CTS and ATS schemes. The institute is actively involved in the development, production and dissemination of instructional media Packages (IMPs) comprising of books on Trade Theory, Trade Practical, Test/Assignment, and Instructor's Guide.

The National Skills Qualification Framework (NSQF), published in the Gazette of India on 27th December, 2013, is a national framework that aims to integrate general and vocational streams of education and training. The main goal of the NSQF is to focus on competency-based qualifications, which in turn facilitate and enhance transparency, both within and between general and vocational streams. The National Skill Development Agency (NSDA) under the Ministry is responsible for anchoring and implementation of the Framework, by bringing together the key stakeholders through the National Skill Qualifications Committee (NSQC).

The competency-based framework organizes qualifications into ten levels, with the entry level being 1, and the highest level being 10. Each level of the NSQF is described by a statement of learning outcomes in five domains, known as level descriptors. These five domains are (1) Process, (2) Professional knowledge, (3) Professional skill, (4) core skill, and (5) Responsibility. The paradigm shift from learning focused on inputs to an outcome/competency-based education would help in the Recognition of Prior Learning (RPL), and simultaneously enable the alignment of the Indian qualifications with international ones. Government funding is expected to be on a preferential basis for NSQF compliant courses. The NSQF notification provides a Qualification Register, which is the official national database of all qualifications aligned to NSQF levels. Through this Register, learners can expect access to all NSQF compliant qualifications.

The Ministry has set up Mentor Councils to focus on courses under NCVT in various sectors with representation from thought leaders among different stakeholders viz., industries, innovative entrepreneurs who have proved to be game-changers, academic/professional institutions, and champion ITIs for each of the sectors. The Mentor Council for each sector reviews curriculum, admission criteria, course duration, and requirement of trainers and assessment/evaluation systems for the sector on a continuous basis and make recommendations regarding the same. Sector-wise Core Groups are formed to plan and prepare the documentation for the competency-based curricula for the courses under each sector.

2. JOB ROLES: Reference NOS & NCO

Brief description of Job roles:

Welder while doing gas welding, fuses metal parts together using welding rod and oxygen acetylene flame. Examines parts to be welded, cleans portion to be joined, holds them together by some suitable device and if necessary makes narrow groove to direct flow of molten metal to strengthen joint. Selects correct type and size of welding rod, nozzle etc. and tests welding, torch. Wears dark glasses and other protective devices while welding. Releases and regulates valves of oxygen and acetylene cylinders to control their flow into torch. Ignites torch and regulates flame gradually. Guides flame along joint and heat it to melting point, simultaneously melting welding rod and spreading molten metal along joint shape, size etc. and rectifies defects if any.

Welder while doing Arc welding, fuses metals using arc-welding power source and electrodes. Examines parts to be welded, cleans them and sets joints together with clamps or any other suitable device. Starts welding power source and regulates current according to material and thickness of welding. Connect one lead to part to be welded, selects required type of electrode and clamps other lead to electrode holder. May join parts first at various points for holding at specified angles, shape, form and dimension by tack welding. Establish arc between electrode and joint and maintain it throughout the length of the joint.

Welder, operatesspot welding machine to joint metal sheet by resistance welding method. Feeds metal sheets to be welded according to type of machine and welds them by pressing paddle, or by automatic arrangements.

Welder while doing gas cutting, cuts metal to require shape and size by gas flame either manually or by machine. Examines material to be cut and marks it according to instruction of specification. Makes necessary connections and fits required size of nozzle in welding torch. Releases and regulates flow of gas in nozzle, ignites and adjusts flame. Guides flame by hand or machine along cutting line at required speed and cuts metal to required size.

Welder while doing gas brazing, joints metal parts by heating using flux and filler rods. Cleans and fastens parts to be joined face to face by wire brush. Apply flux on the joint and heats by torch to melt filler rods into joint. Allows it to cool down. Clean and examines the joint.

Welderwhile doing Gas Tungsten Arc welding also known as Tungsten Inert Gas (TIG) welding reads fabrication drawing, examines parts to be welded, cleans them and sets joints with clamps or any other suitable device. Selects suitable tungsten electrode, grinds the edges and fit in to the GTA welding torch. Selects gas nozzle and fit in to the GTA welding torch. Selects suitable filler rods and cleans them. Connects work piece with earth cable, Connects the machine with Inert gas Cylinder, regulator and flow meter. Starts the Constant current GTA welding machine, sets suitable welding current & polarity and inert gas flow. Establish arc through across a column of highly ionized inert gas between work piece and Tungsten electrode. Melts the metal and deposit weld beads on metal surfaces by passing the suitable filler rod in to the weld puddle. Joins metal pieces such as Steel, Stainless steel and Aluminium metals.

Welderwhile doing Gas Metal Arc welding also known as MIG/MAG Welding, reads fabrication drawing, examines parts to be welded, cleans them and sets joints with clamps or any other suitable device. Connects work piece with earth cable. Connects the machine with suitable gas Cylinder, regulator and flow meter. Connects preheater when CO₂ is used as shielding gas. Selects suitable wire electrode, feed it to welding GMA Welding torch through wire feeder. Selects contact tip gas nozzle and fit in to the GMA welding torch. Preheats joints as required. Starts the Constant Voltage GMA welding machine, sets suitable welding voltage & wire feed speed and shielding gas flow, produces arc between work piece and continuously fed wire electrode. Melts the metal and deposit weld beads on the surface of metals or joins metal pieces such as Steel, and Stainless steel metals.

Plan and organize assigned work and detect & resolve issues during execution in his own work area with in defined limit. Demonstrate possible solutions and agree tasks within the team. Communicate with required clarity and understand technical English. Sensitive to environment, self-learning and productivity.

Reference NCO & NOS:

- i)NCO-2004: 7212.10**
- ii) NCO-2004: 7212.20**
- iii)NCO-2004: 7212.65**
- iv)NCO-2004: 7212.40**
- v)NCO-2004: 7212.50**

NOS:-

- i) Oxy Fuel Gas Cutter
Qualification Pack Code: CSC/Q 0203
- ii)Senior Manual Metal Arc Welder/Shielded Metal Arc Welder
Qualification Pack Code: CSC/Q 0204
- iii) MIG-MAG/GMAW Welder

Qualification Pack Code: CSC/Q 0209

iv) Tungsten Inert Gas Welder (GTAW)

Qualification Pack Code: CSC/Q 0213

v) Resistance Spot Welding Machine Operator

Qualification Pack Code: CSC/Q 0206

3. NSQF LEVEL COMPLIANCE

NSQF level for Welder trade under CTS: Level 3

As per notification issued by Govt. of India dated- 27.12.2013 on National Skill Qualification Framework total 10 (Ten) Levels are defined.

Each level of the NSQF is associated with a set of descriptors made up of five outcome statements, which describe in general terms, the minimum knowledge, skills and attributes that a learner needs to acquire in order to be certified for that level.

Each level of the NSQF is described by a statement of learning outcomes in five domains, known as level descriptors. These five domains are:

- a. Process
- b. professional knowledge,
- c. professional skill,
- d. core skill and
- e. Responsibility.

The Broad Learning outcome of Welder trade under CTS mostly matches with the Level descriptor at Level- 3.

The NSQF level-3 descriptor is given below:

LEVEL	Process required	Professional knowledge	Professional skill	Core skill	Responsibility
Level 3	Person may carry out a job which may require limited range of activities routine and predictable	Basic facts, process and principle applied in the trade of employment	Recall and demonstrate practical skill, routine and repetitive in narrow range of application	Communication written and oral, with minimum required clarity, skill to basic Arithmetic and algebraic principles, personal banking, basic understanding of social and natural environment	Under close supervision Some Responsibility for own work within defined limit.

4. Learning outcome

The following are minimum broad general learning outcome after completion of the Welder course of one year duration:

A. GENERIC OUTCOME

1. Recognize & comply safe working practices, environment regulation and housekeeping.
2. Work in a team, understand and practice soft skills, technical English to communicate with required clarity.
3. Demonstrate knowledge of concept and principles of basic arithmetic & algebraic and apply knowledge of specific area to perform practical operations.
4. Understand basic science in the field of study including.
5. Read and understand engineering drawing for different application in the field of work
6. Understand the concept in productivity, quality tools, and labour welfare legislation.
7. Explain energy conservation, global warming and pollution.
8. Explain time management, entrepreneurship and manage/organize related task in day to day work for personal & societal growth.
9. Understand and apply basic computer working, basic operating system and uses internet services to get accustomed & take benefit of IT developments in the industry.

B. SPECIFIC OUTCOME

10. Carry out routine jobs for setting the components for cutting, welding, brazing and allied operations.
11. Plan and organize the work in familiar predictable/routine environment for different types of welding and allied operations.
12. Explain working principle of welding to perform Arc welding, Gas welding, Brazing, GMAW, GTAW and Resistance Spot welding in different position.

13. Demonstrate practical skills to cut/ fabricate components/ assemblies in different positions by different welding processes viz., Arc welding, Gas welding, Brazing, GMAW, GTAW and Spot welding with appropriate equipments/ consumables with close supervision
14. Repair damaged mechanical components or assemblies by suitable welding process & ensures the same for appropriate quality.
15. Perform manual Arc gauging operation for carrying out repair works or stock removal.
16. Demonstrate joining of dissimilar metals by selecting appropriate brazing process.
17. Perform inspection/ testing of welded joint by visual inspection, Dye penetrant & Magnetic particle testing method.

NOTE: Learning outcomes are reflection of total competencies of a trainee. Each learning outcome may include multiple assessment components. However assessment will be carried out as per assessable outcome and assessment criteria

5. GENERAL INFORMATION

1. **Qualification** : **WELDER**
2. **Ref. N.C.O./NOS Code No.** : **NCO-2004: 7212.10, 7212.20, 7212.65,7212.40, 7212.50, CSC/Q 0203, CSC/Q 0204, CSC/Q 0206, CSC/Q 0209, CSC/Q 0213**
3. **NSQF Level** : **Level-3**
4. **Duration of Craftsmen Training** : **One year (Two semesters each of six months duration).**
5. **Entry Qualification** : **Passed 8th Class Examination**
6. **Trainees per unit** : **16 (Max. supernumeraries seats: 5)**

Distribution of training on Hourly basis :

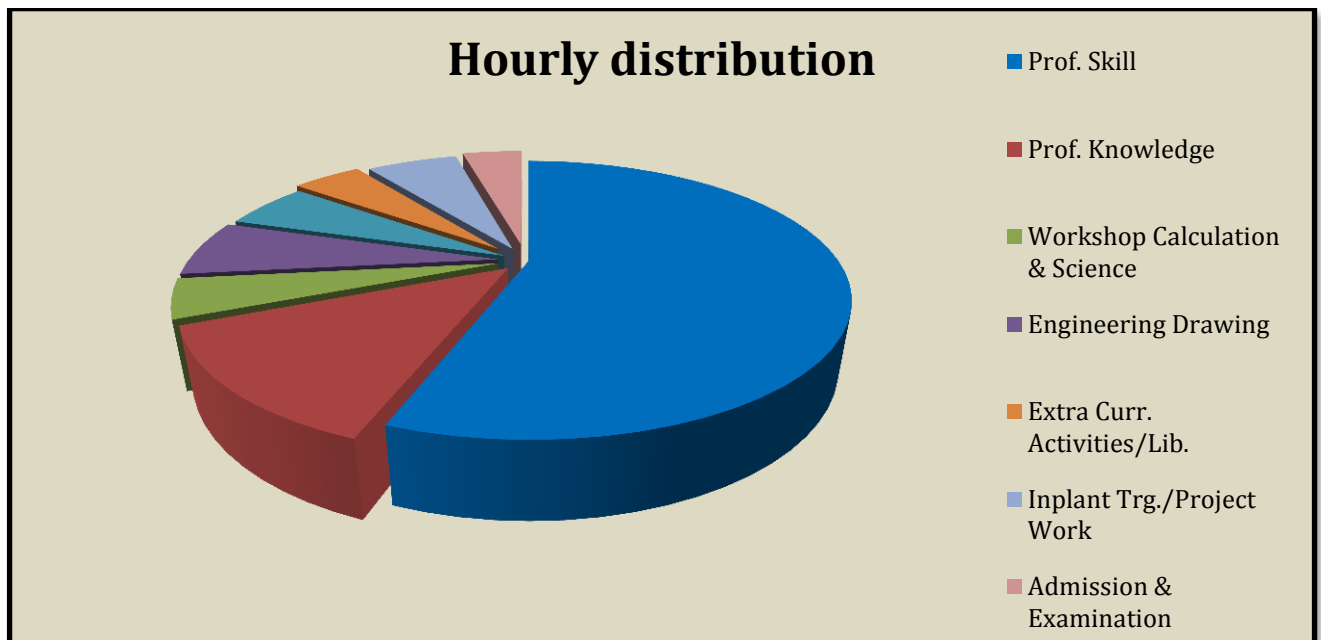
Total hours /week	Trade practical	Trade theory	Work shop Cal. &Sc.	Engg. Drawing	Employability skills	Extra curricular activity
40 Hours	25 Hours	6 Hours	2 Hours	3 Hours	2 Hours	2 Hours

6. COURSE STRUCTURE

- 1. Name of the Qualification :-WELDER**
- 2. Total duration of the course: - 12Months**
- 3. Training duration details : -**

	COURSE ELEMENTS	HOURLY DISTRIBUTION
A	PROFESSIONAL SKILL	1100HRS
B	PROFESSIONAL KNOWLEDGE	260 HRS
C	WORKSHOP CALCULATION & SCIENCE	90 HRS
D	ENGINEERING DRAWING	130 HRS
E	EMPLOYABILITY SKILLS	110 HRS
F	EXTRA CURRICULAR ACTIVITIES/LIB.	90 HRS
G	INPLANT TRG./PROJECT WORK	120 HRS
H	ADMISSION & EXAMINATION	80 HRS

PIE-CHART



7. General Training Plan, Examination & Pass regulation

General Training Plan

The skills stated in assessment outcome are to be imparted in accordance with the instructions contained within Section 10 in respect of the content and time structure of the vocational education and training (General Training Plan).

Examination

Each Semester examination is to take place after the end of the six months of training. The each semester examination encompasses such skills as are listed for that period of training (Detail in Section -10) and also includes theoretical knowledge, Core skills & Employability Skills.

Candidates are to demonstrate that they are able to:

1. read& interpret technical parameters/documentation, plan and organize work processes, identify necessary materials and tools;
2. perform task with due consideration to safety rules, accident prevention regulations and environmental protection stipulations;
3. apply professional knowledge, core skills & employability skills while performing the task.
4. check the job as per drawing/assembly for functioning, identify and rectify errors in job/assembly.
5. document the technical parameters related to the task undertaken.

The details of the examination and assessment standard are as per section-11.

Pass regulation

For the purposes of determining the overall result, weighting of 50 percent is applied to each semester examination. The minimum pass percent for Practical is 60% & minimum pass percent for Theory subjects 40%.

8. ASSESSABLE OUTCOME

Assessable outcome after completion of one year Welder course

I. Generic

1. Apply safe working practices.
2. Comply environment regulation and housekeeping
3. Interpret & use Company terminology and technical communication
4. Demonstrate knowledge of concept and principles of basic arithmetic, algebraic calculations and apply knowledge of specific area to perform practical operations.
5. Understand and explain basic science in the field of study including basic electrical.
6. Read and apply engineering drawing for different application in the field of work.
7. Understand and explain the concept in productivity, quality tools, and labour welfare legislation and apply such in day to day work to improve productivity & quality.
8. Explain energy conservation, global warming and pollution and contribute in day to day work by optimally using available resources.
9. Explain personnel finance, entrepreneurship and manage/organize related task in day to day work for personal & societal growth.
10. Understand and apply basic computer working, basic operating system and uses internet services to get accustomed & take benefit of IT developments in the industry.

II. Specific

11. Join MS sheet by Gas welding in different positions.
12. Join MS plate by SMAW in different positions.
13. Perform straight, bevel & circular cutting on MS plate by Oxy-acetylene cutting process.
14. Perform different type of MS pipe joints by Gas welding (OAW).
15. Weld different types of MS pipe joints by SMAW.
16. Weld Stainless steel, Cast iron, Aluminium and Brass by OAW or SMAW.
17. Perform Arc gauging on MS plate.
18. Join MS sheets/plates by GMAW in various positions using different modes of metal transfer.
19. Join Aluminium & Stainless Steel sheets by GTAW in different position.
20. Weld pipe joints by GTAW.

21. Cut ferrous and nonferrous metal using plasma Arc cutting.
22. Join MS / Stainless Steel sheets by resistance spot welding.
23. Join Copper sheets by OAW in flat position.
24. Join similar & dissimilar metals by Brazing operation.
25. Repair Cast Iron machine parts by welding.
26. Test welded joints by visual inspection, Dye penetrant & Magnetic particle testing methods.

9. ASSESSABLE OUTCOME WITH ASSESSMENT CRITERIA

ASSESSABLE OUTCOME ALONGWITH ASSESSMENT CRITERIATO BE ACHIEVED AFTER EACH SEMESTER & COMPLETION OF QUALIFICATION

- i) The training shall be conducted as per syllabus defined in reference no: Section 10.
- ii) The trainee shall demonstrate the competencies which are defined below in assessable outcome and assessment criteria.
- iii) All the assessable outcomes are to be tested during formative assessment, Theory & Practical examinations, various observation and viva-voce.
- iv) Assessable outcome of Employability Skills, Workshop Calculation & Science and Engineering Drawing shall be tested separately and also be applied in Theory and Practical examinations.
- v) These assessable outcomes and assessment criteria will serve as guide lines for Trainers, Paper setters, Moderators and Assess

GENERIC ASSESSABLE OUTCOME:

ASSESSABLE OUTCOMES	ASSESSMENT CRITERIA
1. Apply safe working practices	1.1 Follow and maintain procedures to achieve a safe working environment in line with occupational health and safety regulations and requirements and according to site policy.
	1.2 Recognize and report all unsafe situations according to site policy.
	1.3 Identify and take necessary precautions on fire and safety hazards and report according to site policy and procedures.
	1.4 Identify, handle and store / dispose off dangerous goods and substances according to site policy and procedures following safety regulations and requirements.
	1.5 Identify and observe site policies and procedures in regard to illness or accident.
	1.6 Identify safety alarms accurately.
	1.7 Report supervisor/ Competent of authority in the event of accident or sickness of any staff and record accident details correctly according to site accident/injury procedures.
	1.8 Identify and observe site evacuation procedures according to site policy.
	1.9 Identify Personal Productive Equipment (PPE) and use the same as per related working environment.
	1.10 Identify basic first aid and use them under different circumstances.
	1.11 Identify different fire extinguisher and use the same as per requirement.

2. Comply with environmental regulation and housekeeping	2.1 Identify environmental pollution & contribute to the avoidance of instances of environmental pollution.
	2.2 Deploy environmental protection legislation & regulations
	2.3 Take opportunities to use energy and materials in an environmentally friendly manner
	2.4 Avoid waste and dispose waste as per procedure
	2.5 Recognize different components of 5S and apply the same in the working environment.
3. Interpret & use company and technical communication	3.1 Obtain sources of information and recognize information.
	3.2 Use and draw up technical drawings and documents.
	3.3 Use documents and technical regulations and occupationally related provisions.
	3.4 Conduct appropriate and target oriented discussions with higher authority and within the team.
	3.5 Present facts and circumstances, possible solutions & use English special terminology.
	3.6 Resolve disputes within the team
	3.7 Conduct written communication.
4. Demonstrate knowledge of concept and principles of basic arithmetic, algebraic calculations and apply knowledge of specific area to perform practical operations	4.1 Semester examination to test basic skills on arithmetic, and algebra.
	4.2 Their applications will also be assessed during execution of assessable outcome and also tested during theory and practical examination.
5. Understand and explain basic science in the field of study including basic electrical,	5.1 Semester examination to test basic skills on science in the field of study including basic electrical
	5.2 Their applications will also be assessed during execution of assessable outcome and also tested during theory and practical examination.
6. Read and apply engineering drawing for different application in the field of work.	6.1 Semester examination to test basic skills on engineering drawing.
	6.2 Their applications will also be assessed during execution of assessable outcome and also tested during theory and practical examination.
7. Understand and explain the concept in productivity, quality tools, and labour welfare legislation and apply such in day to day work to improve productivity & quality.	7.1 Semester examination to test the concept in productivity, quality tools and labour welfare legislation.
	7.2 Their applications will also be assessed during execution of assessable outcome.
8. Explain energy	8.1 Semester examination to test knowledge on energy

conservation, global warming and pollution and contribute in day to day work by optimally using available resources.	conservation, global warming and pollution. 8.2 Their applications will also be assessed during execution of assessable outcome.
9. Explain personnel finance, entrepreneurship and manage/organize related task in day to day work for personal & societal growth.	9.1 Semester examination to test knowledge on personnel finance, entrepreneurship. 9.2 Their applications will also be assessed during execution of assessable outcome.
10. Understand and apply basic computer working, basic operating system and uses internet services to get accustomed & take benefit of IT developments in the industry.	10.1 Semester examination to test knowledge on basic computer working, basic operating system and uses internet services. 10.2 Their applications will also be assessed during execution of assessable outcome.

SPECIFIC ASSESSABLE OUTCOME:

Semester-I

11. Join MS sheets by Gas welding in different positions.	11.1 Plan and select the nozzle size, working pressure type of flame, filler rod as per requirement.
	11.2 Prepare, set and tack the pieces as per drawing.
	11.3 Setting up the tacked joint in specific position.
	11.4 Deposit the weld following proper welding technique and safety aspect.
	11.5 Carry out visual inspection to ascertain quality weld joint.
12. Join MS plates by SMAW in different positions.	12.1 Plan and select the type & size of electrode, welding current, type of edge preparation etc. as per requirement.
	12.2 Prepare, set and tack the pieces as per drawing.
	12.3 Set up the tacked pieces in specific position.
	12.4 Deposit the weld maintaining appropriate arc length, electrode angle, welding speed, weaving technique and safety aspects.
	12.5 Clean the welded joint thoroughly.

	12.6 Carry out visual inspection for appropriate weld joint.
	12.7 Inspect the weld using DPT/MPT.
13. Perform straight, bevel & circular cutting on MS plate by Oxy-acetylene cutting process.	13.1 Plan and mark on MS plate surface for straight/bevel/circular cutting.
	13.2 Select the nozzle size and working pressure of gases as per requirement.
	13.3 Set the marked plate properly on cutting table.
	13.4 Perform the cutting operation maintaining proper techniques and all safety aspects.
	13.5 Clean the cutting burrs and inspect the cut surface for soundness of cutting.
14. Perform different type of MS pipe joints by Gas welding (OAW).	14.1 Plan and prepare the development for a specific type of pipe joint.
	14.2 Mark and cut the MS pipe as per development.
	14.3 Select the size of filler rod, size of nozzle, working pressure etc.
	14.4 Set and tack the pieces as per drawing.
	14.5 Deposit the weld bead maintaining proper technique and safety aspects.
	14.6 Inspect the welded joint visually for poor penetration, uniformity of bead and surface defects.
15. Weld different types of MS pipe joints by SMAW.	15.1 Plan and prepare the development for a specific type of pipe joint.
	15.2 Mark and cut the MS pipe as per development.
	15.3 Select the electrode size and welding current for welding.
	15.4 Set and tack the pieces as per drawing.
	15.5 Deposit the weld bead maintaining proper technique and safety aspects.
	15.6 Inspect the welded joint visually for root penetration, uniformity of bead and surface defects.
16. Weld Stainless steel, Cast iron, Brass & Aluminum by OAW or SMAW.	16.1 Plan and prepare the pieces for welding.
	16.2 Select the type and size of filler rod and flux/electrode, size of nozzle and gas pressure/welding current, preheating method and temperature as per requirement.

		16.3 Set and tack plates as per drawing.
		16.4 Deposit the weld maintaining appropriate technique and safety aspects.
		16.5 Cool the welded joint by observing appropriate cooling method. Use post heating, peening etc. as per requirement.
		16.6 Clean the joint and inspect the weld for its uniformity and different types of surface defects.
17. Perform gauging on MS.	Arc	17.1 Plan and select the size of electrode for Arc gouging.
		17.2 Select the polarity and current as per requirement.
		17.3 Perform gouging adapting proper gouging technique.
		17.4 Clean and check to ascertain the required stock removed.

Semester-II

18. Join MS sheets/plates by GMAW in various positions using different modes of metal transfer.		18.1 Select size of electrode wire, welding voltage, gas flow rate, wire feed rate as per requirement.
		18.2 Prepare, set and tack the pieces as per drawing.
		18.3 Set up the tacked joint in specific position.
		18.4 Deposit the weld adapting proper welding technique and safety aspects.
		18.5 Carry out visual inspection to ensure quality of welded joint.
		18.6 Inspect the weld using Dye-penetration Test (DPT)/Magnetic particle Test (MPT).
19. Join Aluminum & Stainless Steel sheets by GTAW in different position.		19.1 Select power source as per material, size and type of Tungsten electrode, welding current, gas nozzle size, gas flow rate and filler rod size as per requirement.
		19.2 Prepare, set and tack the pieces as per drawing.
		19.3 Set up the tacked joint in specific position.
		19.4 Deposit the weld by adapting proper welding technique and safety aspects.

	19.5 Carry out visual inspection to ensure quality of welded joint.
	19.6 Inspect the weld using Dye-penetration Test (DPT)/Magnetic particle Test (MPT).
20	20.1 Plan and prepare development or edge preparation for specific type of pipe joint.
	20.2 Mark and cut the MS pipe as per development.
	20.3 Select the type of welding current, size and type of tungsten electrode, size of nozzle, gas flow rate and welding current as per requirement.
	20.4 Set and tack the piece as per drawing.
	20.5 Deposit the weld bead maintaining proper technique and safety aspects.
	20.6 Inspect the welded joint visually for root penetration, bead uniformity and surface defects.
21. Cut ferrous and nonferrous metal using plasma Arc cutting.	21.1 Plan and mark on Ferrous/Non ferrous metal plates surface for plasma cutting.
	21.2 Select the torch/nozzle size, current and working pressure of gas as per requirement.
	21.3 Set the marked plate properly on cutting table.
	21.4 Perform the cutting operation by adapting proper techniques and safety aspects.
	21.5 Clean and inspect the cut surface for quality of cutting.
22. Join MS & Stainless Steel sheets by resistance spot welding.	22.1 Plan and select the material and clean the surface thoroughly.
	22.2 Set the spot welding parameters on machine.
	22.3 Spot weld the joint adapting appropriate techniques and safety.
	22.4 Inspect the joint for soundness of weld.
23. Join Copper sheets by OAW in flat position.	23.1 Plan and select the nozzle size, working pressure type of flame, filler rod and flux as per requirement.
	23.2 Prepare, set and tack the pieces as per drawing.
	23.3 Set up the tacked joint in specific position.
	23.4 Deposit the weld following proper welding technique and safety aspect.

	23.5 Carry out visual inspection to ascertain quality weld joint.
24. Join similar & dissimilar metals by Brazing operation.	24.1 Plan and select the nozzle size, working pressure, type of flame, filler rod and flux as per requirement.
	24.2 Prepare, set the pieces as per drawing.
	24.3 Braze the joint adapting proper brazing technique and safety aspect.
	24.4 Carry out visual inspection to ascertain quality weld joint.
25. Repair Cast Iron machine parts by welding.	25.1 Plan and prepare the job as per requirement.
	25.2 Select the type & size of electrode, power source, polarity, welding current as per requirement
	25.3 Set the pieces as per drawing.
	25.4 Deposit the weld adapting appropriate welding technique and safety aspects.
	25.5 Clean the welded joint thoroughly.
	25.6 Carry out visual inspection to ascertain quality of weld joint.
26. Test welded joint by visual inspection Dye penetrant & Magnetic particle testing methods.	26.1 Plan and select the job and clean the surface thoroughly.
	26.2 Select the appropriate testing methods.
	26.3 Perform testing of welded joints adapting standard operating procedure.
	26.4 Accept/reject the job based on test result.

10. SYLLABUS CONTENT WITH TIME STRUCTURE

10.1 SYLLABUS CONTENT FOR PROFESSIONAL SKILL & KNOWLEDGE

First Semester
(Semester Code no.WLD - 01)
Duration: Six Month

LEARNING OBJECTIVES OF 1ST SEMESTER

1. Join MS sheet by Gas welding in different positions.
2. Join MS plate by SMAW in different positions.
3. Perform straight, bevel & circular cutting on MS plate by Oxy-acetylene cutting process.
4. Perform different type of MS pipe joints by Gas welding (OAW).
5. Weld different types of MS pipe joints by SMAW.
6. Weld Stainless steel, Cast iron, Brass & Aluminium by OAW or SMAW.
7. Perform Arc gauging on MS.
8. Apply safe working practices.
9. Comply environment regulation and housekeeping
10. Interpret & use Company terminology and technical communication

Week No	Professional Skills		Professional Knowledge
		Trade Practical	Trade Theory
1	F-01 F-02	<ul style="list-style-type: none"> - Induction training: - Familiarisation with the Institute. - Importance of trade Training - Machinery used in the trade. - Introduction to safety equipment and their use etc. - Hack sawing, filing square to dimensions. - Marking out on MS plate and punching . 	<ul style="list-style-type: none"> - 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.
2		<ul style="list-style-type: none"> - Setting up of Arc welding machine & accessories and Striking an arc - Setting of oxy-acetylene welding equipment, Lighting and setting of flame. 	<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.
3	OAW-01 OAW-02 OAGC-01	<ul style="list-style-type: none"> - Fusion run without and with filler rod on M.S. sheet 2 mm thick in flat position. - Edge joint on MS sheet 2 mm thick in flat position with out filler rod. - Marking and straight line cutting of MS plate. 10 mm thick by gas. 	<ul style="list-style-type: none"> - 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
4	SMAW-01	<ul style="list-style-type: none"> - Straight line beads on M.S. plate 10 mm thick in flat position. 	<ul style="list-style-type: none"> - Basic electricity applicable to arc welding and related electrical terms

	SMAW-02	- Weaved bead on M. S plate 10mm thick in flat position.	&definitions. - Heat and temperature and its terms related to welding - Principle of arc welding. And characteristics of arc .
5	OAW-03 SMAW-03	- Square butt joint on M.S. sheet 2 mm thick in flat Position . - Fillet “T” joint on M.S. Plate 10 mm thick in flat position.	- Common gases used for welding & cutting, flame temperatures and uses. - Chemistry of oxy-acetylene flame. - Types of oxy-acetylene flames and uses. - Oxy-Acetylene Cutting Equipment principle, parameters and application.
6	OAGC-02 OAW-04 SMAW-04	- Beveling of MS plates 10 mm thick. By gas cutting. - Open corner joint on MS sheet 2 mm thick in flat Position - Fillet lap joint on M.S. plate 10 mm thick in flat position.	- Arc welding power sources: Transformer, Motor Generator set, Rectifier and Inverter type welding machines and its care & maintenance.. - Advantages and disadvantages of A.C. and D.C. welding machines
7	OAGC-03 OAW-05 SMAW-05	- Circular gas cutting on MS plate 10 mm thick by profile cutting machine. - Fillet “T” joint on MS sheet 2 mm thick in flat position - Open Corner joint on MS plate 10 mm thick in flat position.	- Welding positions as per EN &ASME : flat, horizontal, vertical and over head position. - Weld slope and rotation. - Welding symbols as per BIS & AWS.
8	OAW-06 SMAW-06	- Fillet Lap joint on MS sheet 2 mm thick in flat position. - Single “V” Butt joint on MS plate 12 mm thick in flat position (1G) .	- Arc length – types – effects of arc length. - Polarity: Types and applications.
9	OAW-07 SMAW-07 SMAW-08	- Square Butt joint on M.S. sheet. 2 mm thick in Horizontal position . - Straight line beads and multi layer practice on M.S. Plate 10 mm thick in Horizontal position. - Fillet “ T” joint on M.S. plate 10 mm thick in Horizontal position.	- Calcium carbide properties and uses. - Acetylene gas properties and generating methods. - Acetylene gas Purifier, Hydraulic back pressure valve and Flash back arrestor
10	OAW-08 SMAW-09	- Fillet Lap joint on M.S. sheet 2 mm thick in horizontal position . - Fillet Lap joint on M.S. plate 10 mm thick in horizontal position .	- Oxygen gas and its properties - Production of oxygen by Air liquefaction . - Charging process of oxygen and acetylene gases - Oxygen and Dissolved Acetylene gas cylinders and Color coding for different gas cylinders. - Gas regulators, types and uses.
11	OAW-09 OAW-10 SMAW-10	- Fusion run with filler rod in vertical position on 2mm thick M.S sheet - Square Butt joint on M.S. sheet. 2 mm thick in vertical position - Single Vee Butt joint on M.S. plate 12 mm thick in horizontal position (2G).	- 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.
12	SMAW-11 OAW-11 SMAW-12	- Weaved bead on M.S Plate 10mm in vertical position. - Fillet “T” joint on M.S sheet 2 mm thick in vertical position . - Fillet “T” joint on M.S. plate 10 mm thick in vertical position.	- Arc blow – causes and methods of controlling. - Distortion in arc & gas welding and methods employed to minimize distortion - Arc Welding defects, causes and Remedies.
13	OAW-12 SMAW-13	- Structural pipe welding butt joint on MS pipe Ø 50 and 3mm WT in 1G position. - Fillet Lap joint on M.S. Plate 10 mm in vertical position.	- Specification of pipes, various types of pipe joints, pipe welding positions, and procedure. - Difference between pipe welding and plate welding.
14	SMAW-14 OAW-13	- Open Corner joint on MS plate 10 mm thick in vertical position. - Pipe welding - Elbow joint on MS pipe Ø 50 and 3mm WT.	- Pipe development for Elbow joint, “T” joint, Y joint and branch joint - Manifold system
15	OAW-14 SMAW-15	- Pipe welding “T” joint on MS pipe Ø 50 and 3mm WT. - Single “V” Butt joint on MS plate 12 mm thick in vertical position (3G) .	- Gas welding filler rods, specifications and sizes. - Gas welding fluxes – types and functions. - Gas Brazing & Soldering : principles, types fluxes & uses - Gas welding defects, causes and remedies.
16	OAW-15 SMAW-16	- Pipe welding 45 ° angle joint on MS pipe Ø 50 and 3mm WT. - Straight line beads on M.S. plate 10mm thick in over head position.	- Electrode : types, functions of flux, coating factor, sizes of electrode Coding of electrode as per BIS, AWS, - Effects of moisture pick up. - Storage and baking of electrodes. - Special purpose electrodes and their applications.
17	SMAW-17 SMAW-18	- Pipe Flange joint on M.S plate with MS pipe Ø 50 mm X 3mm WT - Fillet “T” joint on M.S. plate 10 mm thick in over head position.	- Weldability of metals, importance of pre heating, post heating and maintenance of inter pass temperature.
18	SMAW-19 SMAW-20	- Pipe welding butt joint on MS pipe Ø 50 and 5 mm WT. in 1G position. - Fillet Lap joint on M.S. plate 10 mm thick in over head position.	- Classification of steel. - Welding of low, medium and high carbon steel and alloy steels.
19	SMAW-21 SMAW-22	- Single “V” Butt joint on MS plate 10mm thick in over head position(4G) - Pipe butt joint on M. S. pipe Ø 50mm WT 6mm (1G Rolled).	- Effects of alloying elements on steel - Stainless steel : types- weld decay and weldability.
20	OAW-16 SMAW -23 OAW-17	- Square Butt joint on S.S. sheet. 2 mm thick in flat position. - Square Butt joint on S.S. Sheet 2 mm thick in flat position. - Square Butt joint on Brass sheet 2 mm thick in flat position.	- Brass – types – properties and welding methods. - Copper – types – properties and welding methods.

21	OAW-18 SMAW-24 AG-01	- Square Butt & Lap joint on M.S. sheet 2 mm thick by brazing. - Single “V” butt joint C.I. plate 6mm thick in flat position. - Arc gouging on MS plate 10 mm thick.	- Aluminium and its alloys, properties and weldability, Welding methods - Arc cutting & gouging,
22	OAW-19 OAW-20	- Square Butt joint on Aluminium sheet. 3 mm thick in flat position . - Bronze welding of cast iron (Single “V” butt joint) 6mm thick plate	- Cast iron and its properties types. - Welding methods of cast iron.
23	Industrial Training / Project Work		
24	Industrial Training / Project Work		
25	Revision		
26	Examination		

Abbreviations:

SMAW - Shielded Metal Arc Welding
OAW - Oxy-Acetylene gas Welding
OAGC - Oxy-Acetylene Gas Cutting
F - Fitting
WT - Wall Thickness.

Second Semester
(Semester Code no.WLD - 02)
Duration: Six Month

LEARNING OBJECTIVES OF 2ND SEMESTER

1. Apply safe working practices.
2. Comply environment regulation and housekeeping
3. Interpret & use Company terminology and technical communication
4. Join MS sheets/plates by GMAW in different positions using different modes of metal transfer.
5. Join Aluminium, Stainless Steel sheets by GTAW in different position.
6. Weld different type of pipe joints by GTAW.
7. Cut ferrous and nonferrous metal using plasma Arc cutting.
8. Join MS & Stainless Steel sheets by resistance spot welding.
9. Join Copper sheets by OAW in flat position.
10. Join similar & dissimilar metals by brazing operation.
11. Repair Cast Iron machine parts by welding.
12. Test welded joint by Dye penetrant & Magnetic particle testing methods.

Week No	Professional Skills		Professional Knowledge
	Trade Practical		Trade Theory
1	GMAW- 01 GMAW - 02	<ul style="list-style-type: none"> - Machinery used in the trade. - Introduction to safety equipment and their use etc. - Setting up of GMAW welding machine & accessories and Striking an arc - Depositing straight line beads on M.S Plate. - Fillet weld – “T” joint on M.S plate 10mm thick in flat position by Dip transfer. 	<ul style="list-style-type: none"> - 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/CO₂ welding.)
2	GMAW -03 GMAW -04 GMAW -05	<ul style="list-style-type: none"> - Fillet weld – Lap joint on M.S. sheet 3mm thick in flat position by Dip transfer. - Fillet weld – “T” joint on M.S.sheet 3mm thick in flat position by Dip transfer. - Fillet weld – corner joint on M.S.sheet 3mm thick in flat position by Dip transfer. 	<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.

3	GMAW -06 GMAW -07	- Butt weld – Square butt joint on M.S sheet 3mm thick in flat position - Butt weld – Single “V” butt joint on M.S plate 10 mm thick by Dip transfer in flat position..	- Wire feed system – types – care and maintenance. - Welding wires used in GMAW, standard diameter and codification as per AWS.
4	GMAW -08 GMAW -09	- Fillet weld – “T” joint on M.S plate 10mm thick in Horizontal position by Dip transfer. - Fillet weld – corner joint on M.S plate 10mm thick in Horizontal position by Dip transfer.	- 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.
5	GMAW -10 GMAW -11	- Fillet weld – “T” joint on M.S. sheet 3mm thick in Horizontal position by Dip transfer. - Fillet weld – corner joint on M.S.sheet 3mm thick in Horizontal position by Dip transfer.	- Edge preparation of various thicknesses of metals for GMAW. - GMAW defects, causes and remedies
6	GMAW -12 GMAW -13	- Fillet weld – “T” joint on M.S plate 10mm thick in vertical position by Dip transfer. - Fillet weld – corner joint on M.S plate 10mm thick in vertical position by dip transfer.	- Heat input and techniques of controlling heat input during welding. - Heat distribution and effect of faster cooling
7	GMAW -14 GMAW -15	- Fillet weld – Lap joint on M.S. sheet 3mm thick in vertical position by Dip transfer. - Fillet weld – corner joint on M.S. sheet 3mm thick in vertical position by Dip transfer.	- Pre heating & Post Weld Heat Treatment - Use of temperature indicating crayons
8	GMAW -16	- Fillet weld – Lap and “T” joint on M.S sheet 3mm thick in over head position by Dip transfer.	- Submerged arc welding process – principles, equipment, advantages and limitations
9	GMAW -17	- Tee Joints on MS Pipe Ø 60 mm OD x 3 mm WT 1G position – Arc constant (Rolling)	- Electro slag and Electro gas welding processes–principles, equipments, advantages and limitations
10	GMAW -18 GMAW -19	- Depositing bead on S.S sheet - Butt joint on Stainless steel 2 mm thick sheet in flat position by Dip transfer.	- Thermit welding process- types, principles, equipments, thermit mixture types and applications. - Use of backing strips and backing bars
11	GTAW -01 GTAW -02	- Depositing bead on Aluminium sheet 2 mm thick in flat position. - Square butt joint on Aluminium sheet 1.6mm thick in flat position.	- GTAW process - brief description Difference between AC and DC welding, equipments , polarities and applications. - Various other names of the process (TIG, Argonarc) - Power sources for GTAW - AC

			&DC
12	GTAW -03 GTAW -04	- Fillet weld – “T” joint on Aluminium sheet 1.6 mm thick in flat position. - Fillet weld – Outside corner joint on Aluminium sheet 2 mm thick in flat position.	- Tungsten electrodes –types & uses, sizes and preparation - GTAW Torches- types, parts and their functions - GTAW filler rods and selection criteria
13	GTAW -05	- Butt weld - Square butt joint on Stainless steel sheet 1.6 mm thick in flat position with purging gas	- 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.
14	GTAW -06	- Fillet weld – “T” joint on Stainless steel sheet 1.6 mm thick in flat position.	- Argon / Helium gas properties – uses. - GTAW Defects, causes and remedy.
15	GTAW -07	- Pipe butt joint on Aluminium pipe Ø 50 mm x 3 mm WT in Flat position.	- Friction welding process- equipment and application - Laser beam welding (LBW)and Electron beam welding(EBW)
16	GTAW -08 PAC-01	- “T” Joints on MS Pipe Ø 50 mm OD x 3 mm WT, position – Flat - Straight cutting on ferrous and non ferrous metals	- Plasma Arc Welding (PAW) and cutting (PAC) process – equipments and principles of operation. - Types of Plasma arc, advantages and applications.
17	RW-01 RW-02	- Lap joint on Stainless steel sheet by Resistance Spot welding - MS sheets joining by Resistance Spot welding	- Resistance welding process -types, principles, power sources and welding parameters. - Applications and limitations.
18	OAW-01 OAW-02	- Square butt joint on Copper sheet 2mm thick in flat position. - “T” joint on Copper to MS sheet 2mm thick in flat position by Brazing	- Metalizing – types of metalizing principles, equipments, advantages and applications - Manual Oxy – acetylene powder coating process- principles of operation and applications
19	OAW-03 OAW-04	- Silver brazing on S.S Sheet with copper sheet “T” joint. - Silver brazing on copper tube to tube’	- Welding codes and standards - Reading of assembly drawing - Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR)
20	SMAW-01 SMAW-02	- Repair welding of broken C.I machine parts . - Hard surfacing practice on M.S round rod Ø 25 mm by using Hard facing electrode.	- Hard facing/ surfacing necessity, surface preparation, various hard facing alloys and advantages of hard facing .
21	I&T-01	- Testing of weld joints by	- Weld quality inspection, common

	I&T-02 I&T-03	visualinspection . - Inspection of welds by using weld gauges. - Dye penetrant test, - Magnetic particle test.	welding mistakes and appearance of good and defective welds - Weld gauges & its uses
22	I&T-04 I&T-05 I&T-06	- Nick- break test. - Free bend test. - Fillet fracture test.	- Types of Inspection methods - Classification of destructive and NDT methods - Welding economics and Cost estimation.
23	Industrial training / Project work		
24	Industrial training / Project work		
25	Revision		
26	Examination		

Abbreviations:

SMAW	- Shielded Metal Arc Welding
OAW	- Oxy-Acetylene Gas Welding
OAGC	- Oxy-Acetylene Gas Cutting
GMAW	- Gas Metal Arc Welding
GTAW	- Gas Tungsten Arc Welding
PAC	- Plasma Arc Cutting
RW	- Resistance Welding
I&T	- Inspection & Testing
WT	- Wall Thickness.

10.2 SYLLABUS CONTENT OF CORE SKILLS

First Semester
(Semester Code no. WLD - 01)
Duration: Six Month

LEARNING OBJECTIVES OF 1ST SEMESTER

1. Apply basic arithmetic for day to day work.
2. Understand & apply engineering material, their type, and applications in the day to day technical application.
3. Understand & explain importance of engineering drawing, drawing instruments, their uses.
4. Draw lines and free hand drawing of geometrical figures.
5. Understand and apply sizes & layout of drawing sheet, method of presentation of engineering drawing & symbolic representation as per BIS standards

Sl. No.	Professional Knowledge	Professional Knowledge & Skills
	Workshop Calculation and Science	Engineering Drawing
1.	Unit: Systems of unit- FPS, CGS, MKS/SI unit, unit of length, Mass and time, Conversion of units	Introduction to Engineering Drawing and Drawing Instruments : <ul style="list-style-type: none"> - Conventions - Viewing of engineering drawing sheets. - Method of Folding of printed Drawing Sheet as per BIS SP:46-2003 - Drawing board, T-Square, Drafter (Drafting M/c), Set Squares, Protractor, Drawing Instrument Box (Compass, Dividers, Scale, Diagonal Scales etc.), Pencils of different Grades, Drawing pins / Clips.
2.	Basic Mathematics - BODMAS rule Fraction-Addition, Subtraction, multiplication and Division-Problem solving, Decimal-Addition. Simple calculation using Scientific Calculator.	Lines : <ul style="list-style-type: none"> - Definition, types and applications in Drawing as per BIS SP:46-2003 - Classification of lines (Hidden, centre, construction, Extension, Dimension, Section) - Drawing lines of given length (Straight, curved) - Drawing of parallel lines, perpendicular line - Methods of Division of line segment

3.	Conversion of Fraction to Decimal and vice-versa.	Free hand drawing of <ul style="list-style-type: none"> - Lines, polygons, ellipse, etc. - geometrical figures and blocks with dimension Transferring measurement from the given object to the free hand sketches.
4.	Ratio & Proportion: Simple calculations & related problems solving.	Lettering and Numbering as per BIS SP46-2003: <ul style="list-style-type: none"> - Single Stroke, Double Stroke, inclined,
5.	Percentage: Introduction, Simple calculation. Changing percentage to fraction and decimal & vice-versa.	Drawing of Geometrical Figures: Definition, nomenclature and practice of <ul style="list-style-type: none"> - Angle: Measurement and its types, method of bisecting. - Triangle -different types - Rectangle, Square, Rhombus, Parallelogram. - Circle and its elements.
6.	Material Science : Definition, properties (physical & mechanical) and uses of Metal, Non-metal, Alloy & Insulator. Types of ferrous and Non-ferrous metals. Difference between Ferrous and Non-Ferrous metals.	Sizes and Layout of Drawing Sheets <ul style="list-style-type: none"> - Selection of sizes - Title Block, its position and content - Item Reference on Drawing Sheet (Item List)
7.	Mass, Weight and Density: Mass, Unit of Mass, Weight, difference between mass and weight. Density, unit of density. Relation between mass, weight & density. Simple problems related to mass, weight, and density.	Method of presentation of Engineering Drawing <ul style="list-style-type: none"> - Pictorial View - Orthographic View - Isometric view
8.	-----	Symbolic Representation used in the related trade (as per BIS SP:46-2003) of : <ul style="list-style-type: none"> - Fastener (Rivets, Bolts and Nuts) - Bars and profile sections - Weld, brazed and soldered joints. - Electrical and electronics element - Piping joints and fittings

Second Semester
(Semester Code no. WLD - 02)
Duration: Six Month

LEARNING OBJECTIVES OF 2ND SEMESTER

1. Demonstrate basic algebraic and mensuration formulas to derive value of unknown quantity / variable.
2. Apply the factual knowledge of basic heat & temperature, Elasticity and basic electricity for day to day practical application.
3. Draw & practice dimensioning, construction of solid figures and projections as per IS specifications.

Sl. No.	Professional Knowledge	Professional Knowledge & Skills
	Workshop Calculation and Science	Engineering Drawing
1.	Basic Algebra: Addition, Subtraction, Multiplication, Division, Algebraic formula, Linear equations (with two variables).	Dimensioning practice: <ul style="list-style-type: none"> - Position of dimensioning (unidirectional, aligned, as per BIS SP:46-2003) - Types of arrowhead - Leader Line with text - Symbols preceding the value of dimension and dimensional tolerance.
2.	Mensuration : Area and perimeter of square, rectangle, parallelogram, triangle, circle, semi circle, Volume of solids – cube, cuboid, cylinder and Sphere. Surface area of solids – cube, cuboid, cylinder and Sphere.	<ul style="list-style-type: none"> - Drawing of Solid figures (Cube, Cuboids, Cone) with dimensions.
3.	Elasticity: Elastic & Plastic material. Stress & strain and their units. Young's modules. Ultimate stress and breaking stress.	Free hand Drawing of Solid figures (Prism, Pyramid, Frustum of Cone and Pyramid.) with dimensions.
4.	Heat & Temperature: Heat and temperature, their units, difference between heat and temperature, boiling point, melting point, Scale of temperature, relation between different scale of temperature. Thermometer, pyrometer. Transmission of heat, conduction, convection, radiation.	Free Hand sketch of hand tools and measuring tools used in respective trades.

5.	Basic Electricity: Introduction and use of Electricity. AC, DC & their comparisons. Current, Voltage, Resistance & their units. Power, Energy & their units. Insulator and conductors & their uses.	Projections: - Concept of axes plane and quadrant. - Orthographic projections - Method of first angle and third angle projections (definition and difference) - Symbol of 1 st angle and 3 rd angle projection as per IS specification.
6.	-----	Drawing of Orthographic projection in 3 rd angle.
7.	-----	Free hand Drawing of simple fastener (Rivet, Bolts, Nuts & Screw)
8.	-----	Free hand sketching of simple objects related to trade.
9.	-----	Reading of fabricated engineering drawing

11. Employability Skills

11.1 GENERAL INFORMATION

1. **Name of the subject** : **EMPLOYABILITY SKILLS**
2. **Applicability** :
 - CTS- Mandatory for all trades
 - ATS- Mandatory for fresher only
3. **Hours of Instruction** : 110 Hrs.
4. **Examination** : The examination will be held at the end of semesters.
5. **Instructor Qualification** :

MBA OR BBA with two years experience OR Graduate in Sociology/ Social Welfare/ Economics with Two years experience OR Graduate/ Diploma with Two years experience and trained in Employability Skills from DGET institutes

AND

Must have studied English/ Communication Skills and Basic Computer at 12th / Diploma level and above

OR

Existing Social Studies Instructors duly trained in Employability Skills from DGET institutes

6. **Instructor** :
 - One full time instructor is required for 1000 seats and above
 - For seats less than 1000, the instructor may be out sourced/ hired on contract basis.

11.2 DISTRIBUTION OF TOPICS BETWEEN SEMESTERS FOR EMPLOYABILITY SKILL

Course Duration	Semester1	Semester2	Examination
	Topics	Topics	
01 Year (Two semesters)	1. English Literacy 2. I.T. Literacy 3. Communication Skills	4. Entrepreneurship Skills 5. Productivity 6. Occupational safety , Health and Environment Education 7. Labour Welfare Legislation 8. Quality Tools	Final examination at the end of second semester

11.3 SYLLABUS CONTENT OF EMPLOYABILITY SKILLS

SEMESTER-I

LEARNING OBJECTIVES OF 1ST SEMESTER

1. Read, write and communicate in English language for day to day work.
2. Communicate in written and oral and with required clarity ensuring that the information communicated is clear, concise and accurate.
3. Understand and apply basic computer working, basic operating system and uses internet services to get accustomed & take benefit of IT developments in the industry.

1. English Literacy	
Hours of Instruction: 20 Hrs.	
Marks Allotted: 09	
Pronunciation	Accentuation (mode of pronunciation) on simple words, Diction (use of word and speech)
Functional Grammar	Transformation of sentences, Voice change, Change of tense, Spellings.
Reading	Reading and understanding simple sentences about self, work and environment
Writing	Construction of simple sentences Writing simple English
Speaking / Spoken English	Speaking with preparation on self, on family, on friends/ classmates, on know, picture reading gain confidence through role-playing and discussions on current happening job description, asking about someone's job habitual actions. Cardinal (fundamental) numbers ordinal numbers. Taking messages, passing messages on and filling in message forms Greeting and introductions office hospitality, Resumes or curriculum vita essential parts, letters of application reference to previous communication.
2. I.T. Literacy	
Hours of Instruction: 20 Hrs.	
Marks Allotted: 09	
Basics of Computer	Introduction, Computer and its applications, Hardware and peripherals, Switching on-Starting and shutting down of computer.
Computer Operating System	Basics of Operating System, WINDOWS, The user interface of Windows OS, Create, Copy, Move and delete Files and Folders, Use of External memory like pen drive, CD, DVD etc, Use of Common applications.
Word processing and Worksheet	Basic operating of Word Processing, Creating, opening and closing Documents, use of shortcuts, Creating and Editing of Text, Formatting the Text, Insertion & creation of Tables. Printing document. Basics of Excel worksheet, understanding basic commands, creating simple worksheets, understanding sample worksheets, use of simple formulas and functions, Printing of simple excel sheets

Computer Networking and INTERNET	<p>Basic of computer Networks (using real life examples), Definitions of Local Area Network (LAN), Wide Area Network (WAN), Internet, Concept of Internet (Network of Networks), Meaning of World Wide Web (WWW), Web Browser, Web Site, Web page and Search Engines. Accessing the Internet using Web Browser, Downloading and Printing Web Pages, Opening an email account and use of email. Social media sites and its implication.</p> <p>Information Security and antivirus tools, Do's and Don'ts in Information Security, Awareness of IT – ACT, types of cyber crimes.</p>
-----------------------------------------	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

3. Communication Skills
Hour of Instruction: 15 Hrs. Marks Allotted: 07

Topic	Contents
Introduction to Communication Skills	Communication and its importance
	Principles of Effective communication
	Types of communication – verbal, nonverbal, written, email, talking on phone.
	Nonverbal communication –characteristics, components-Para-language
	Body – language
	Barriers to communication and dealing with barriers. Handling nervousness/ discomfort.
Listening Skills	Listening-hearing and listening, effective listening, barriers to effective listening guidelines for effective listening.
	Triple- A Listening – Attitude, Attention & Adjustment.
	Active Listening Skills.
Motivational Training	Characteristics Essential to Achieving Success
	The Power of Positive Attitude
	Self-awareness
	Importance of Commitment
	Ethics and Values
	Ways to Motivate Oneself Personal Goal setting and Employability Planning.
Facing Interviews	Manners, Etiquettes, Dress code for an interview
	Do's & Don'ts for an interview
Behavioural Skills	Problem Solving
	Confidence Building
	Attitude

SEMESTER-II

LEARNING OBJECTIVES OF 2ND SEMESTER

1. Knowledge of business activities, ability to interact with consumers for development of businesses.
2. Understand and apply productivity, its benefits and factors affecting the productivity.
3. Follow and maintain procedures to achieve a safe working environment in line with occupational health, safety, environment regulations and Labour welfare legislation and requirements.
4. Understand and apply quality concepts as per ISO and BIS system and its importance.
5. Recognize different components of 5S and apply the same in the working environment.

4. Entrepreneurship skill Hour of Instruction: 15 Hrs. Marks Allotted: 06	
Topic	Content
Business & Consumer:	Types of business in different trades and the importance of skill, Understanding the consumer, market through consumer behavior, market survey, Methods of Marketing, publicity and advertisement
Self Employment:	Need and scope for self-employment, Qualities of a good Entrepreneur (values attitude, motive, etc.), SWOT and Risk Analysis
Govt Institutions :	Role of various Schemes and Institutes for self-employment i.e. DIC, SIDBI, MSME, NSIC, Financial institutions and banks
Initiation Formalities :	Project Formation, Feasibility, Legal formalities i.e., Shop Act, Estimation & Costing, Investment Procedure - Loan Procurement - Agencies - banking Process
5. Productivity Hour of Instruction: 10Hrs.Marks Allotted: 05	
Productivity	Definition, Necessity, Meaning of GDP.

Benefits	Personal / Workman – Incentive, Production linked Bonus, Improvement in living standard. Industry Nation.
Affecting Factors	Skills, Working Aids, Automation, Environment, Motivation How improves or slows down.
Comparison with developed countries	Comparative productivity in developed countries (viz. Germany, Japan and Australia) in selected industries e.g. Manufacturing, Steel, Mining, Construction etc. Living standards of those countries, wages.
Personal Finance Management	Banking processes, Handling ATM, KYC registration, safe cash handling, Personal risk and Insurance.
6. Occupational Safety, Health & Environment Hour of Instruction: 15 Hrs. Marks Allotted: 06	
Safety & Health :	Introduction to Occupational Safety and Health and its importance at workplace
Occupational Hazards :	Occupational health, Occupational hygiene, Occupational Diseases/ Disorders & its prevention
Accident & safety :	Accident prevention techniques- control of accidents and safety measures
First Aid :	Care of injured & Sick at the workplaces, First-aid & Transportation of sick person
Basic Provisions :	Idea of basic provisions of safety, health, welfare under legislation of India
7.Labour Welfare Legislation Hour of Instruction: 05 Hrs. Marks Allotted: 03	
Labour Welfare Legislation	Benefits guaranteed under various acts- Factories Act, Apprenticeship Act, Employees State Insurance Act (ESI), Payment Wages Act, Employees Provident Fund Act, The Workmen “ s Compensation Act
8.Quality Tools	

Hour of Instruction: 10Hrs.Marks Allotted: 05	
Quality Consciousness :	Meaning of quality, Quality Characteristic
Quality Circles :	Definition, Advantage of small group activity, objectives of Quality Circle, Roles and Functions of Quality Circles in organisation, Operation of Quality Circle, Approaches to Starting Quality Circles, Steps for Continuation Quality Circles
Quality Management System:	Idea of ISO 9000 and BIS systems and its importance in maintaining qualities.
House Keeping :	Purpose of Housekeeping, Practice of good Housekeeping.5S Principles of Housekeeping: SEIRI – Segregation, SEITON – Arrangement, SEISO – Cleaning, SEIKETSU – maintenance of Standards, SHITSUKE - Discipline

12. INFRASTRUCTURE

1. INSTRUCTORS' QUALIFICATION : Degree in Mechanical / Metallurgy / Production Engineering/Mechatronics with on year experience in relevant field.
OR
Diploma in Mechanical and allied with two years experience in relevant field.
OR
10th Class Pass + NTC/NAC in the Trade of “Welder” With 3 years post qualification experience in the relevant field.
2. DESIRABLE QUALIFICATION : Preference will be given to a candidate with CIC (Craft Instructor Certificate) in Welder trade.
3. SPACE NORMS : Workshop: 80 Square meters. (5 Sq. m/trainee)
4. POWER NORMS : 16 KW
5. TOOLS, EQUIPMENT& GENERAL MACHINERY : (AS PER ANNEXURE-II)

Note:

(i) Out of two Instructors required for the unit of 1+1, one must have Degree/Diploma and other must have NTC/NAC qualifications.

(ii) Instructor qualification for W/shop Calculation, Engg Drawing & Employability Skill would be as per the training manual.

13. ASSESSMENT STANDARD

13.1 Assessment guideline:

Appropriate arrangements should be made to ensure that there will be no artificial barriers to assessment. The nature of special needs should be taken into account while undertaking assessment. Due consideration to be given while assessing for team work, avoidance/reduction of scrap/wastage and disposal of scarp/wastage as per procedure, behavioral attitude, sensitive to environment and regularity in training. The sensitivity towards OSHE and self-learning attitude to be considered while assessing competency.

Assessment will be evidence based comprising the following:

- i) Job carried out in labs/workshop
- ii) Record book/ daily diary
- iii) Answer sheet of assessment
- iv) Viva-voce
- v) Progress chart
- vi) Attendance and punctuality
- vii) Assignment
- viii) Project work

Evidence of internal assessment to be preserved until forthcoming semester examination for audit and verification by examination body.

The following marking pattern to be adopted while assessing:

a) Weightage in the range of 60-75% to be allotted during assessment under following performance level:

For performance in this grade, the candidate with occasional guidance and showing due regard for safety procedures and practices, has produced work which demonstrates attainment of an acceptable standard of craftsmanship.

In this work there is evidence of:

- demonstration of good skill in the use of hand tools, machine tools and workshop equipment
- below 70% tolerance dimension achieved while undertaking different work with those demanded by the component/job.
- a fairly good level of neatness and consistency in the finish
- occasional support in completing the project/job.

b) Weightage in the range of above 75%- 90% to be allotted during assessment under following performance level:

For this grade, the candidate, with little guidance and showing due regard for safety procedures and practices, has produced work which demonstrates attainment of a reasonable standard of craftsmanship.

In this work there is evidence of:

- good skill levels in the use of hand tools, machine tools and workshop equipment
- 70-80% tolerance dimension achieved while undertaking different work with those demanded by the component/job.
- a good level of neatness and consistency in the finish
- little support in completing the project/job

c) Weightage in the range of above 90% to be allotted during assessment under following performance level:

For performance in this grade, the candidate, with minimal or no support in organization and execution and with due regard for safety procedures and practices, has produced work which demonstrates attainment of a high standard of craftsmanship.

In this work there is evidence of:

- high skill levels in the use of hand tools, machine tools and workshop equipment
- above 80% tolerance dimension achieved while undertaking different work with those demanded by the component/job.
- a high level of neatness and consistency in the finish.
- minimal or no support in completing the project

13.2 INTERNALASSESSMENTS (FORMATIVE ASSESSMENT)

ASSESSABLE OUTCOME NO.	ASSESSABLE OUTCOME	INTERNAL ASSESSMENT MARKS
1.	Apply safe working practices.	
2.	Comply environment regulation and housekeeping	
3.	Interpret & use Company terminology and technical communication	
4.	Join MS sheets by Gas welding in different positions.	
5.	Join MS plates by SMAW in different positions.	
6.	Perform straight, bevel & circular cutting on MS plate by Oxy-acetylene cutting process.	
7.	Perform different type of MS pipe joints by Gas welding (OAW).	
8.	Weld different types of MS pipe joints by SMAW.	
9.	Weld Stainless steel, Cast iron, Brass & Aluminum by OAW or SMAW.	
10.	Perform Arc gauging on MS.	
	Sub-Total of Internal assessment for Semester- I	100
11.	Join MS sheets/plates by GMAW in different positions using different modes of metal transfer	
12.	Join Aluminum, Stainless Steel sheets by GTAW in different position.	
13.	Weld different type of pipe joints by GTAW.	
14.	Cut ferrous and nonferrous metal using plasma Arc cutting.	
15.	Join MS & Stainless Steel sheets by resistance spot welding.	
16.	Join Copper sheets by OAW in flat position.	
17.	Join similar & dissimilar metals by brazing operation.	
18.	Repair Cast Iron machine parts by welding.	
19.	Test welded joint by Dye penetrant & Magnetic particle testing methods.	
	Sub-Total of Internal assessment for Semester- II	100
	Total of Internal assessment	200

13.3 FINAL ASSESSMENT- ALL INDIA TRADE TEST(SUMMATIVE ASSESSMENT)

- a) There will be a single objective type Examination paper for the subjects Engineering drawing and Workshop Calculation & Science.
- b) There will be a single objective type Examination paper for the subjects Trade Theory and Employability Skills.
- c) The two objective type Examination papers as mentioned above will be conducted by National Council for Vocational Training (NCVT), whereas examination for the subject Trade Practical will be conducted by the State Government. NCVT shall supply the Question Paper for the subject Trade Practical.

Marking Pattern		
Sl. No.	Subject for the trade test	Maximum marks for the each subject
a)	Practical	300
b)	Trade Theory	200 Objective type Written test of 200 marks (Trade Theory 150 marks & Employability Skills 50 marks)
c)	Employability Skills	
d)	Work shop Calculation and Science.	100 Objective Type Written test of 100 marks (Engineering Drawing 50 marks & Work shop Calculation and Science 50 marks)
e)	Engineering Drawing	
f)	Internal assessment	100
TOTAL:		700

14. LIST OF TRADE COMMITTEE MEMBERS

Sl. No	Names & Designation	Organisation	Remarks
Members of Sector Mentor council			
1	Dr.G.Buvashekar	AGM, WRI, Trichy - Chairman	Chairman
2	Dr.K.Ashokkumar	AGM, BHEL, Trichy	Member
3	Prof.JyothiMukhopadhy	IIT, Ahmedabad	Member
4	B.Pattabhiraman	MD, GB Engineering, Tricgy	Member
5	Dr.Rajeevkumar	IIT, Mandi	Member
6	Dr.Vishalchauhan	IIT, Mandi	Member
7	Shri D.K.Singh	IIT, Kanpur	Member
8	Shri. Navneet Arora	IIT, Roorkee	Member
9	Shri. R. K. Sharma	Head, SDC, JBM Group, Faridabad	Member
10	Shri. Puneet Sinha	Deputy Director, MSME, New Delhi	Member
Mentor			
1	Shri.DeepankarMallick	Director of Training, DGE&T Hq,	Mentor
Members of Core Group			
1	Shri. M Thamizharasan	JDT, CSTARI, Kolkata	Member
2	Shri. M Kumaravel	DDT, FTI , Bangalore	Team Leader
3	Shri. SushilKumar	DDT, DGE&T Hq,	Member
4	Shri. S.P.Khatokar	T.O. ATI, Mumbai	Member
5	Shri. V.L. Ponmozhi	TO, CTI, Chennai	Member
6	Shri. D.Pani	TO, ATI, Howrah	Member
7	Shri. Amar Singh	TO, ATI, Ludhiyana	Member
8	Shri. Gopalakrishnan	TO, NIMI, Chennai	Member
9	Shri. Manjunatha B.S	JTO, GITI, K.G.F. Karnataka	Member
10	Shri. Venugopal PC	ITI Chalakudi, Kerala	Member

TRADE: WELDER**LIST OF TOOLS & EQUIPMENTS FOR 16 TRAINEES + 1****Consumables**

SI. No.	Name of the items	Quantity
1	Leather Hand Gloves 14"	17 pairs .
2	Cotton hand Gloves 8"	17 pairs
3	Leather Apron leather	17 nos.
4	S.S Wire brush 5 rows and 3 rows	17 nos.each
5	Leather hand sleeves 16"	17 pairs
6	Safety boots for welders	17 pairs
7	Leg guards leather	17 pairs
8	Rubber hose clips 1/2"	20 nos
9	Rubber hose oxygen 8 mm dia X 10 Mts long as per BIS	2 nos
10	Rubber hose acetylene 8 mm dia X 10 Mts long as per BIS	2 nos
11	Arc welding cables multi cored copper 400/ 600 amp as per BIS	45 mts each
12	Arc welding single coloured glasses 108 mm x 82 mm x 3 mm. DIN 11A &12 A	34 nos.
13	Arc welding plain glass 108 mm x 82 mm x 3 mm.	68 nos
14	Gas welding Goggles with Colour glass 3 or 4A DIN	34 nos
15	Safety goggles plain	34 nos
16	Spark lighter	6 nos
17	AG 4 Grinding wheels	10 nos

A: TRAINEES TOOL KIT:-

SI. No.	Name of the items	Quantity
1	Welding helmet fiber	17 nos.
2	Welding hand shield fiber	17 nos.
3	Chipping hammer with metal handle 250 Grams	17 nos.
4	Chisel cold flat 19 mm x 150 mm	17 nos.
5	Centre punch 9 mm x 127 mm	17 nos.
6	Dividers 200 mm	17 nos.
7	Stainless steel rule 300mm	17 nos.
8	Scriber 150 mm double point	17 nos.
9	Flat Tongs 350mm long	17 nos.
10	Hack saw frame fixed 300 mm	17 nos.
11	File half round bastard 300 mm	17 nos.
12	File flat 350 mm bastard	17 nos.
13	Hammer ball pane 1 kg with handle	17 nos.
14	Tip Cleaner	17 nos.
15	Try square 6"	17 nos

B:INSTRUMENTS& GENERAL SHOP OUTFIT: -

SI. No.	Name and Description of Tools	Quantity
16	Spindle key	4
17	Screw Driver 300mm blade and 250 mm blade	1 each
18	Number punch 6 mm	2 set
19	Letter punch 6 mm	2 set
20	Magnifying glass 100 mm .dia	2 nos
21	Universal Weld measuring gauge	2 nos
22	Earth clamp 600A	6 nos
23	Spanner D.E. 6 mm to 32mm	2 sets
24	C-Clamps 10 cm and 15 cm	2 each
25	Hammer sledge double faced 4 kg	1
26	S.S tape 5 meters flexible in case	1
27	Electrode holder 600 amps	6
28	H.P. Welding torch with 5 nozzles	2 sets
29	Oxygen Gas Pressure regulator double stage	2
30	Acetylene Gas Pressure regulator double stage	2
31	CO ₂ Gas pressure regulator, with flow meter	2 set
32	Argon Gas pressure regulator with flow meter	2 set
33	Metal rack 182 cm x 152 cm x 45 cm	1
34	First Aid box	1
35	Steel lockers with 8 Pigeon holes	2
36	Steel almirah / cupboard	2
37	Black board and easel with stand	1
38	Flash back arrester (torch mounted)	4 pairs
39	Flash back arrester (cylinder mounted)	4 pairs

General Installation

40	Welding Transformer with all accessories (400A, OCV 60–100 V, 60% duty cycle)	1 set
41	Welding Transformer (or) Inverter based welding machine with all accessories (300A , OCV 60 – 100 V, 60% duty cycle)	1 set
42	D.C Arc welding rectifiers set with all accessories (400 A. OCV 60 – 100 V, 60% duty cycle)	1 sets
43	GMAW welding machine 400A capacity with air cooled torch, Regulator, Gas preheater, Gas hose and Standard accessories	1 set
44	AC/DC GTAW welding machine with water cooled torch 300 A, Argon regulator, Gas hose, water circulating system and standard accessories.	1 set
45	Air Plasma cutting equipment with all accessories, capacity to cut 12 mm clear cut	01 set
46	Air compressor suitable for above air plasma cutting system.	01 no
47	Auto Darkening Welding Helmet	2 nos.
48	Spot welding machine to 15 KVA with all accessories	01 set
49	Portable gas cutting machine capable of cutting Straight & Circular with all accessories	01 set

50	Pedestal grinder fitted with coarse and medium grain size grinding wheels dia. 300 mm	1
51	Bench grinder fitted with fine grain size silicon carbide green grinding wheel dia. 150 mm	1
52	AG 4 Grinder	2 Nos
53	Suitable gas welding table with fire bricks	2 Nos
54	Suitable Arc welding table with positioner	6
55	Trolley for cylinder (H.P. Unit)	2
56	Hand shearing machine capacity to cut 6 mm sheets and flats	1
57	Power saw machine 14''	1
58	Portable drilling machine (Cap. 6 mm)	1
59	Oven, electrode drying 0 to 350°C, 10 kg capacity	1
60	Work bench 340x120x75 cm with 4 bench vices of 150 mm jaw opening	4 sets
61	Oxy Acetylene Gas cutting blow pipe	2 sets
62	Oxygen, Acetylene Cylinders	2 each*
63	CO ₂ cylinder	2 Nos *
64	Argon gas cylinder	2 Nos *
65	Anvil 12 sq. inches working area with stand	1 No.
66	Swage block	1 No.
67	Die penetrant testing kit	1 set
68#	Magnetic particle testing Kit	1 set
69	Fire extinguishers (foam type and CO ₂ type)	1
70	Fire buckets with stand	4 nos
71	Portable abrasive cut-off machine	1 No
72	Suitable Gas cutting table	1 No
73	Welding Simulators for SMAW/GTAW/GMAW	1 each (Optional)

NOTE:

1. * Optionally Gas cylinders can also be hired as and when required
2. No additional items are required to be provided for unit or batch working in the Second shift except the items under trainee's tool kit and steel lockers.
3. # One machine per institute irrespective of number of units of welding trade is necessary.

Class Room Furniture for Trade Theory

Sl. No	Names & Description of Furniture	Quantity
1	Instructor's table and Chair (Steel)	1 set
2	Students chairs with writing pads	16
3	White board size 1200mm X 900 mm	1
4	Instructors lap top with latest(vista & above) configuration pre-loaded with operating system. and MS Office package.	1
5	LCD projector with screen.	1
6	Welding Process, Inspection & codes DVD/ CDs	1 set each (optional)

LIST OF TOOLS & EQUIPMENTS FOR ENGINEERING DRAWING HALL

Sl. No.	NAME OF TOOLS / EQUIPMENTS	QUANTITY
1	Drawing Board	20
2	Models : Solid & cut section	as required
3	Table for trainees	20
4	Stool for trainees	20
5.	Cupboard (big)	01
6	White Board (size: 8ft. x 4ft.)	01
7	Trainer's Table	01
8	Trainer's Chair	01

GUIDELINES FOR INSTRUCTORS AND PAPER SETTERS

1. All the questions of the theory paper for the trade will be in objective type format.
2. Due care to be taken for proper & inclusive delivery among the batch. Some of the following method of delivery may be adopted:

- A) LECTURE
- B) LESSON
- C) DEMONSTRATION
- D) PRACTICE
- E) GROUP DISCUSSION
- F) DISCUSSION WITH PEER GROUP
- G) PROJECT WORK
- H) INDUSTRIAL VISIT

3. Maximum utilization of latest form of training viz., audio visual aids, integration of IT, etc. may be adopted.

4. The total hours to be devoted against each topic may be decided with due diligence to safety & with prioritizing transfer of required skills.

5. Questions may be set based on following instructions:-

Sl. No.	Question on different aspect	Weightage in %age	Key Words may be like
1	Information received	25	What, Who, When
2	Knowledge	50	Define, Identify, Recall, State, Write, List & Name
3	Understanding	15	Describe, Distinguish, Explain, Interpret & Summarize
4	Application	10	Apply, Compare, Demonstrate, Examine, Solve & Use

6. Due weightage to be given to all the topics under the syllabus while setting the question paper.