

COMPETENCY BASED CURRICULUM

FOR THE TRADE OF

SHEET METAL WORKER

UNDER

CRAFTSMAN TRAINING SCHEME (CTS)

IN SEMESTER PATTERN

BY



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

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1. INTRODUCTION

The Ministry of Skill Development & Entrepreneurship is the apex organization for development and coordination at National level for the programmes relating to vocational training including Women's Vocational Training and Employment Services. Employment service is operated through a countrywide network of Employment Exchanges. Industrial Training Institutes are under the administrative and financial control of State Governments or Union Territory Administrations. The Ministry also operates Vocational Training Schemes in some of the specialized areas through field institutes under its direct control. Development of these programmes at national level, particularly in the area concerning common policies, common standards and procedures, training of instructors and trade testing are the responsibility of the Ministry. But, day-to-day administration of employment Exchanges and Industrial Training Institutes rests with the State Governments/ Union Territories Administrations.

CSTARI one of the field institute of the Ministry is mandated to develop curricula for various courses under different schemes viz., CTS, ATS, MES, CoE& CITS. All the courses are certificate level and run on pan India basis under the aegis of NCVT. The curricula developed so far by this institute are skill based which catered the need of the industry manpower there by contributing significantly in the development of technical manpower. Hence vocational training provides country wide manpower and this trained manpower actually builds the wealth for the nation.

The broad concept of industry competency concerns the ability to perform particular tasks and duties to the standard of performance expected in the workplace. Competency requires the application of specified skills, knowledge and attitudes relevant to effective participation in an industry, industry sector or enterprise.

Competency covers all aspects of workplace performance and involves performing individual tasks; managing a range of different tasks; responding to contingencies or breakdowns; and dealing with the responsibilities of the workplace, including working with others. Workplace competency requires the ability to apply relevant skills, knowledge and attitudes consistently over time and in the required workplace situations and environments.

In line with this concept of competency based curriculum focus on what is expected of a competent individual in the workplace as an outcome of learning, rather than focusing on the learning process itself.

“The Competency Based Training” establishes a direct link between the things which trainees must learn in institutions and knowledge and skills expected from them for employability “The Competency Based Training” is a means of instruction which :

- i) Identifies the competencies required for work performance,
- ii) Prepares the trainees through precise learning objectives,
- iii) Is based on the realities of the world of work

When learning deals with performance type activities, it is necessary to analyse each job performed under a particular vocation. Skills required for doing a job may be manipulative and may require sequential and chronological order of performance. Therefore, teaching and learning content shall be presented in a psychological and methodological manner. Hence, identification of competencies becomes an essential exercise for planning and design a curriculum for vocational courses.

The elements of competency are the basic building blocks of the unit of competency. They describe in terms of outcomes the significant functions and tasks that make up the competency.

The performance criteria specify the required performance in relevant tasks, roles, skills and in the applied knowledge that enables competent performance. They are usually written in passive voice. Critical terms or phrases may be written in bold italics and then defined in range statement, in the order of their appearance in the performance criteria.

The essential skills and knowledge are either identified separately or combined. Knowledge identifies what a person needs to know to perform the work in an informed and effective manner. Skills describe the application of knowledge to situations where understanding is converted into a workplace outcome.

The procedure followed for this purpose is as follows:

- I) listing of job opportunities,
- II) identification of duties for each job,
- III) analyzing the elements of competencies and setting Performance criteria against each elements of competencies,
- IV) determining courses objectives,
- V) Preparing course content by projecting elements of competencies, Performance criteria, skills and knowledge and personality traits.

2. JOB ROLES: Reference NOS & NCO

Brief description of Job roles:

Sheet-metal worker make, install and repair articles and parts of articles of sheet metal such as sheet steel, copper, tin, brass, aluminium, zinc or galvanized iron. Sheet Metal Worker, makes sheet metal articles according to drawing or sample. Studies drawing or sample and records measurements if necessary. Selects sheet of required type, thickness (gauge) and size and marks it with scribe, square, divider, foot rule etc., according to drawing or sample. Shears wherever necessary by machine or handshears and makes it to required shape and size by bending, seaming, forming, riveting, soldering etc., using mallets, hammers, formers, sets, stakes, etc., or by various machines such as shearing, bending, beading, channelling, circle cutting. Checks work at stages during operations and does soldering, brazing, arc welding, gas welding, TIG welding & MIG welding as necessary. May undertake aluminium paneling work. May also undertake repair work. May specialise in different metal sheets such as tin, copper, brass.

Plan and organize assigned work and detect & resolve issues during execution in his own work area within 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 :7213.10**
- ii) NCO-2004: 7212.10**
- iii) NCO-2004: 7212.20**
- iv) NCO-2004: 7212.50**
- v) NCO 2004:7212.65**

NOS:-

- i) Sheet Metal worker – Hand Tools & Manually operated machines CSC/Q0301
- ii) Manual Metal Arc Welder/Shielded Metal Arc Welder 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 Sheet Metal Worker 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 Sheet metal worker 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. Plan and organize the work in familiar predictable/routine environment for different types of sheet metal working operations and check for work result.
11. Carry out routine jobs for setting the metals sheets for Marking, Cutting, Bending riveting, welding, brazing and spot welding operations.
12. Explain the principle of sheet metal cutting operations, bending operations, joining operation, riveting operation using appropriate tools & equipments.

13. Demonstrate practical skills of sheet metal cutting operations, bending operations, joining operation, riveting operation using appropriate tools & equipments.
14. Repair damaged sheet metal components or assemblies by suitable process & ensures the same for appropriate quality.
15. Demonstrate, development & Laying out of pattern.
16. Demonstrate joining of sheet metals using appropriate brazing/ Soldering process to the required quality.
17. Demonstrate practical skills of sheet metal welding using different welding processes viz., Arc welding, Gas welding, TIG welding, CO2 welding and Spot welding with appropriate equipment/ consumables.
18. Perform inspection/ testing of sheet metal components by visual inspection, 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** : **SHEET METAL WORKER**
2. **Ref.N.C.O./NOS Code No.** : **NCO-2004: 7213.10, 7212.10,7212.20, 7212.50, 7212.65,CSC/Q0301, 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 with Science and Mathematics under 10+2 system of Education or its equivalent
6. **Trainees per unit** : 16

6. COURSE STRUCTURE

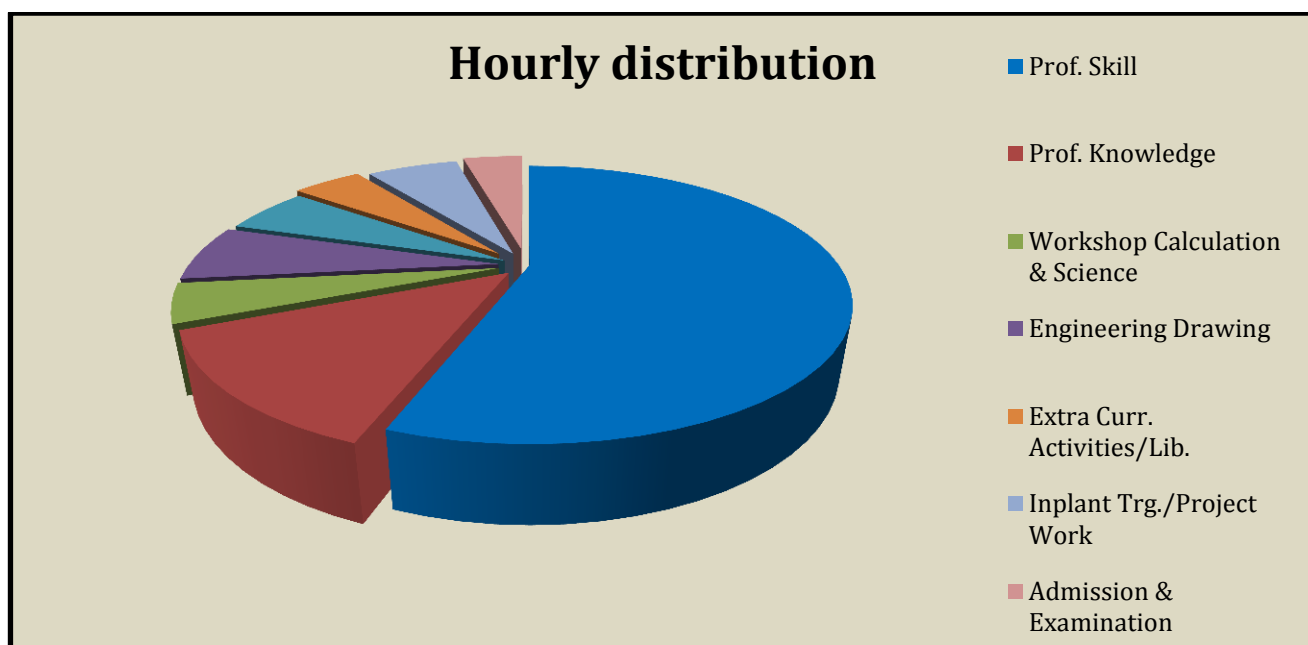
1. Name of the Qualification :SHEET METAL WORKER

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 Sheet Metal Worker 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. Selects sheet of required type, thickness (gauge) and size and mark it with scribe, square, divider, steel rule etc., according to drawing or sample.
12. Shears or bends the sheet wherever necessary by machine or hand shear.
13. Form sheet metal to required shape and size by bending, seaming, forming, riveting etc., using mallets, hammers, formers, sets, stakes, etc., or by various operations such as shearing, bending, beading, channelling, circle cutting.
14. Perform different type of MS pipe joints by Gas welding (OAW).
15. Performs soldering, brazing operations on sheet metal
16. Perform Arc welding, Gas welding TIG welding & MIG welding and Spot welding on sheet metals
17. Makes sheet metal articles according to drawing or sample.
18. Makes ducts, cabins & panels

19. Undertakes Aluminium frame works
20. May undertake repair work of mudguard, Radiators etc.
21. May work in different sheet metals such as tin, copper, brass.

9. ASSESSABLE OUTCOMES WITH ASSESSMENT CRITERIA

ASSESSABLE OUTCOME ALONGWITH ASSESSMENT CRITERIA TO 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 OUTCOMES:

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 environment	2.1 Identify environmental pollution & contribute to the avoidance

regulation and housekeeping	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, algebra, trigonometry and statistics.
	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.

conservation, global warming and pollution and contribute in day to day work by optimally using available resources.	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 OUTCOMES:

Semester-I

11. Selects sheet of required type, thickness (gauge) and size and mark it with scribe, square, divider, steel rule etc., according to drawing or sample.	11.1 Plan and select the type of sheet metal type & thickness as per requirement.
	11.2 Prepare the pieces as per drawing.
	11.3 Setting up the sheet in specific position.
	11.4 Mark the sheet using scribe, steel rule divider etc.
	11.5 Carry out dimensional inspection to ascertain quality .
12. Shears or bends the sheets wherever necessary by machine or hand shear	12.1 Plan and select the type machine required for shearing & bending
	12.2 Prepare, set the pieces as per drawing.
	12.3 Set up the pieces in specific position.
	12.4 Use the machine for shearing/bending or by hand.
	12.5 Carry out visual inspection correctness
13. Form sheet metal to required shape and size	13.1 Plan and mark on for forming operation
	13.2 Select the tools required for the bending,

by bending, seaming, forming, riveting, etc., using mallets, hammers, formers, sets, stakes, etc., or by various operations such as shearing, bending, beading, channelling, circle cutting.	seaming, forming, riveting operations like mallets, hammers, formers, sets, stakes, etc.
	13.3 Set the sheared plate properly on cutting table.
	13.4 Perform the bending, seaming, forming, riveting operations operation maintaining proper techniques and all safety aspects.
	13.5 Clean the job and inspect the cut surface for soundness of operation.
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. Performs soldering, brazing operations on sheet metal	15.1 Plan and select the nozzle size, working pressure, type of flame, filler rod and flux as per requirement.
	15.2 Prepare, set the pieces as per drawing.
	15.3 Braze/ solder the joint adapting proper brazing/soldering technique and safety aspect.
	15.4 Carry out visual inspection to ascertain quality weld joint.
16. Perform Arc welding, Gas welding TIG welding, MIG welding, spot welding on sheet metals	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. In case of arc welding, welding machine, electrode dis, ampere etc. In case of MIG welding select size of electrode wire, welding voltage, gas flow rate, wire feed rate as per requirement In case of TIG welding 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.
	16.3 Set and tack sheets 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.

Semester-II

17. Makes sheet metal articles according to drawing or sample.	17.1. Prepare, set the pieces as per drawing
	17.2. Selection of machine and material, marking, shearing/ bending
	17.3 Set up the pieces in specific position.
	17.4 Perform the sheet metal joining operations operation maintaining proper techniques and all safety aspects.
	17.5 Carry out visual inspection to ensure quality of joint.
18. Makes ducts, cabins & panels	18.1 Prepare, set the pieces as per drawing
	18.2. Selection of machine and material, marking, shearing/ bending
	18.3 Set up the pieces in specific position.
	18.4 Perform the sheet metal joining operation maintaining proper techniques and all safety aspects.
	18.5 Carry out visual inspection to ensure quality of joint.
19, Undertakes Aluminium frame works	19.1 Plan and select aluminium section like channels, rectangular tubes etc. specific type joint.
	19.2 Mark and cut the aluminium section as per development.
	19.3 Set up the pieces in specific position .

	19.4 Perform the Aluminium metal joining operations operation maintaining proper techniques and all safety aspects
	19.5 Carry out visual inspection to ensure quality of joint .
20. May undertake repair work of mudguard, Radiators etc.	20.1 Plan and mark on surface for repair work.
	20.2 Select the torch/nozzle size, current and working pressure of gas as per requirement.
	20.3 Perform the cutting operation by adapting proper techniques and safety aspects
	20.4. Perform the proper joining operation
	20.5 Clean and inspect for quality .
21. May work in different sheet metals such as tin, copper, brass	21.1 Plan and select the metal and clean the surface thoroughly.
	21.2. Selection of machine and material, marking, shearing/ bending
	21.3 Set up the pieces in specific position.
	21.4 Perform the sheet metal joining operations operation maintaining proper techniques and all safety aspects
	21.5 Clean and inspect for quality.

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. Selects sheet of required type, thickness (gauge) and size and mark it with scribe, square, divider, steel rule etc., according to drawing or sample.
2. Shears or bends the sheet wherever necessary by machine or hand shear.
3. Form sheet metal to required shape and size by bending, seaming, forming, riveting etc., using mallets, hammers, formers, sets, stakes, etc., or by various operations such as shearing, bending, beading, channelling, circle cutting.
4. Perform different type of MS pipe joints by Gas welding (OAW).
5. Performs soldering, brazing operations on sheet metal
6. Perform Arc welding, Gas welding TIG welding & MIG welding and Spot welding on sheet metals
7. Apply safe working practices.
8. Comply environment regulation and housekeeping
9. Interpret & use Company terminology and technical communication

Week No	TRADE PRACTICAL	TRADE THEORY
1	Induction of training Familiarisation with the Institute, Importance of trade in Training Machines used in the trade. Induction to safety devices used in shop floor.	General discipline in the institute Elementary of First aid Importance of the sheet metal work in the Industry. General safety precautions Safety precaution in sheet metal work
2	Identification of Tools and Equipments Induction and use of marking tools. Practice in Reading, Steel Rule, Scribing of straight lines, Bisecting of straight lines (on the sheet metal) using marking tools.	Metals and Non-Metals and their Characteristics, Types, Sizes and uses of Sheet Metals as per BIS . Use of reference table. Raw material information: CRCA, HRCA & MS Material Terms & definitions in sheet metal work.
3	Mark and cut through the straight lines Planishing of Sheet Metal and Practice in drawing simple Geometrical shapes. Practice in marking and cutting of sheets to various angles.	Marking and laying out tools and accessories <u>Measuring Tools</u> : steel Rule, calipers, try square, L square , Micrometer, Vernier caliper, Vernier height gauge, Combination set, screw pitch gauge, radius gauge, SWG, Bevel Protractor etc. <u>Marking Tools</u> : Scratch AWL, divider, Trammel point, punches etc

		<u>Cutting tools</u> :Snips, shears, hacksaw, chisel, cutting plier, files, drills, tap & die sets etc
4	Practice on cutting with different types of snips. Tin snips (Straight cut, Right cut and Left cut) cutting off inside and outside curve, cutting off notches and cutting off profiles.	<u>Hand tools</u> : mallets, hammer, sheet metal hammers, groovers, riveting tools, screw drivers, wrench and spanners etc. <u>Holding tools & accessories</u> : vices, C clamps, stakes, stakes holder, hollow mandrel, wooden former, Jigs & fixtures, soldering bits etc
5	Practice on Sheet Metal seams. "Grooved seam, Locked Grooved seam, Pane down seam, Bottom lock seam or Corner Fold (Knocked-up seam), Corner Clip Lock, Double Bottom Lock, Clip Lock (Cap Lock), snap Joint etc. (Folded Joints) and hemming practice	Sheet Metal Folded Joints : Description of Sheet Metal Seam, Grooved seam, Locked Grooved seam, Paned down seam, Knocked up seam inside and outside, capstrip seam, pitsburg seam etc...
6	Forming rectangular shapes using stakes. Forming Cylindrical job using various stakes such as Hollow Mandrel, Hatchet Stake; Tin Man's' Anvil stake etc.	Folding and joining allowances, edge stiffing, wiring allowances and false wiring, types of notches in sheet metal.
7	Folding, Bending Sheet Metal to 90 degree using wooden mallet, 'C' clamps etc. Making a radius using Wooden blocks using Hairpin Folder. Making a cylindrical container with knocked-up, bottom (Bottom Locked), Grooved Joint and hemmed Top. Forming frustum of Cone. Making of Mug, scoop, measuring can Hemming (single, Double) wire edge by hand process	Definitions of pattern, Development, stretched out pattern, Master pattern(gross pattern) and templates Development of by parallel line method, radial line method,
8	Make a taper chute square to rectangle transition. Make a taper chute square to round.	Development of surfaces: Triangulation method and geometrical construction methods
9	Making holes with solid punches , round punches as per BIS and use of hollow punches Making hole in sheet metal with help of wood block.	Solid and Hollow Punches. Description of hand punches as per BIS. Sizes of solid and hollow Punches and their uses.
10	Riveting practice using various types of rivet heads. Single chain riveted joint. Double chain and Zig- zag, Lap & butt riveted joints Making a dust pan (Corner and handle riveted) Making a fire bucket with lap riveted joint on one side and Locked Grooved Seam on the other side. Bottom Hollowing and Bottom Lock Seam.	Rivets and its parts, Selection of Rivet heads. Types of Rivet and their uses. Standard sizes of Rivets and Riveting Tools. Calculation for Riveting allowances (pitch and Lap)
11	Solder Lap joint Single plated solder butt joint	Fastening of Sheet Metal:. Self taping screws, Clips and Connectors; Their uses, Types and Allowance of 'S' Clips,

		Government Clips, Drive Clips, Mailing Clips etc.
12	Making an oil Can by hand process by soldering Making funnel by soldering process	Solder, Different types of solder and their composition. Types and uses of fluxes, their effect on different metal.
13	Make by soldering Elbow 90° equal dia pipe T joint 90° equal dia pipe T joint 90° unequal dia pipe by soldering	Process of soft soldering, hard soldering (brazing). Heating appliances (Hand Forge, Blow Lamp, L.P.G.)
14	Make by soldering T Pipe 60° branch joint unequal dia pipe Offset T joint equal dia	Development & laying out pattern of elbow pipe, T pipe and offset pipe in equal diameter.
15	Make a taper lobster back bend 90 degree from oblique cone by soldering	Development of T pipe, round equal and unequal. Introduction to tubes and pipes.
16	Forming square section segmental quarter bend pipe with suitable lock and forming round section segmental quarter bend pipe	Laying out pattern of 600 off-set 'T' pipe. Pattern Development of 'Y' pipe. Preparation of pickling solution. Protection-Coating, Cleaning and preparing of Sheet Metals Corrosion and anti corrosion treatment of sheet metal.
17	Making a square duct elbow with snap block	Method of galvanizing, tinning, anodising, sheradising and Electroplating.
18	Make a conical hopper by soldering	Development and laying out of pattern of segmental quarter bend pipe
19	Setting up of Oxy-acetylene plant and types of flames	Need for ducting. Places where ducting is employed and the working principle of a dust cyclone, Gutter and its use. False ceiling,
20	Setting up of Arc welding plant and striking & maintaining the arc & laying short beads	Safety precaution in gas & arc welding Description of Oxyacetylene plant and the equipments, accessories & tools
21	Fusion run with/without filler rod in flat position. Square butt joint in flat position by gas.	Types of oxy-acetylene flames & its uses Types and description of flux Types of welding blow pipes .& its functions
22	Brazing copper sheet in lap joint in flat position	Various types of pipe joints. Method of metal preparation & cleaning the base metal before welding. Gas welding defects causes & remedies. Arc welding defects causes & remedies.
23	Industrial Training / Project Work	
24	Industrial Training / Project Work	
25	Revision	Revision
26	Test	Test

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

LEARNING OBJECTIVES OF 2ND SEMESTER

1. Makes sheet metal articles according to drawing or sample.
2. Makes ducts, cabins & panels
3. Undertakes Aluminium frame works
4. May undertake repair work of mudguard, Radiators etc.
5. Apply safe working practices.
6. Comply environment regulation and housekeeping
7. Interpret & use Company terminology and technical communication

Week No	TRADE PRACTICAL	TRADE THEORY
1	<ul style="list-style-type: none"> - Importance of machinery used in the trade. - Types of job made by the trainees in trade - Introduction to machinery safety including fire fighting equipment and their uses etc - 	<ul style="list-style-type: none"> - Importance of the trade in the development of Industrial Economy of the Country. - Review of Types of sheet metal Fabrication. - Methods of developments.
2	<ul style="list-style-type: none"> - Locked groove joint by aluminum sheet - Single riveted lap joint by aluminum sheet. - Double strap single row riveted butt joint by aluminum sheet 	<ul style="list-style-type: none"> - Introduction to Aluminum fabrication, and its applications. - Ferrous and Non-Ferrous metals. Use of Copper and Alloys. - Laying out pattern of conical elbows. Pattern development of lobster back bend. - Chemical and Physical properties of Aluminium. - Use of Aluminium and its Alloys
3	<ul style="list-style-type: none"> - Exercise involving practical work on Aluminium Sheet, and using Pop Rivet. - Aluminium Windows with. different extruded sections, Aluminium Soldering. 	<ul style="list-style-type: none"> - Brief Description of hand punch machine. Hand and Power operated drilling Machines. Drill Bits, parts and effects of cutting angles. - Angles for Drilling Sheet Metals, effect of speed, Feed Cutting Fluids, etc., on metals. - Difference between drilled and punched holes -
4	<ul style="list-style-type: none"> - Making holes in sheet metal using Punching Machine. - Making holes in sheets with a twist drill. - Tri-paning with use of hand and electric drilling machine. Grinding a drill bit - Practice in Drilling Holes in walls and Ceilings as applied to ducting work. - Use of rawl bits and rawl plug. - 	<ul style="list-style-type: none"> - Description of swaging and beading machine, its parts, operating principles etc. - Description of Fly Ball press. Operating Principles of Power Press and press brakes. - Method to calculate the pressure adjustment. Clearance between Die and Punch. - Introduction to "C" and "H" frame presses
5	<ul style="list-style-type: none"> - Practice on hollowing and raising on non-ferrous sheet as well as ferrous sheet. - Practice on removing dents of spherical or hemi-spherical articles using wheeling and raising machine. (Repairing mud guards etc.) 	<ul style="list-style-type: none"> - Properties of stainless steel and its uses. - Properties and uses of tin, lead, zinc and silver. - Description and Physical properties of Muntz Metal, Gun Metal, White Metal etc

	-	
6	<ul style="list-style-type: none"> - Practice on pipe bending by hand. Pipe bending using Hydraulic Pipe bending' machine . - Development of a cone: Cylinder fitted to a cone. Equal dia pipe joint with crimping and Ogee beading. - 	<ul style="list-style-type: none"> - Introduction to pipe/tube bending. - Brief description of Hydraulic pipe bending machine. Operating Principles etc. - Description of roll forming machine types and operating principles, description of slip roll forming machine and its function
7	<ul style="list-style-type: none"> - Practice on external threading using “Die stock”. - Practice on internal threading using taps. - Typical folding, Bending Practice, Making Steel-Racks, Reinforcement with angle iron. - Use of self tapping screws and other fasteners. 	<ul style="list-style-type: none"> - Use of Die and Die Holder, Description of taps and tap wrench.
8	<ul style="list-style-type: none"> - Project work such as Steel Stool, Aluminium Ladder etc. - Metal Spinning: Making a cylindrical medicine container of Aluminium Sheet - 	<ul style="list-style-type: none"> - Method to operate folding/brake folder for typical folding. - Description and use of jigs and fixtures
9	<ul style="list-style-type: none"> - Making a Copper article by use of power press and also making brass and stainless steel articles. - Practice of Buffing and polishing - 	<ul style="list-style-type: none"> - Definition of Planishing and its application. Brief description of polishing machine. Various types of bobs and polishing compounds
10	<ul style="list-style-type: none"> - Angle iron bending in different angles and different radii. Twisting the M.S. square rod and flats. - 	<ul style="list-style-type: none"> - Operating principles of spinning lathe. Description of spinning
11	<ul style="list-style-type: none"> - Gas welding Square butt joint on M.S. sheet in down hand position .Fillet Tee& Lap joint on M.S sheet in down hand position. - 	<ul style="list-style-type: none"> - Different process of metal joining types of weld joint &weld positions. Oxy-acetylene welding equipments&application ,Types of flame& their uses .
12	<ul style="list-style-type: none"> - Pipe butt joint in down hand position - Butt joint on MS flat in down hand position by arc - Fillet lap and T joint on MS flat in down hand position - 	<ul style="list-style-type: none"> - Principle of arc welding. Types of welding machines and their uses. Advantages and disadvantages of AC/DC welding machines. - Arc length and its importance - Welding defects
13	<ul style="list-style-type: none"> - Resistance welding. Spot welding, seam welding. - 	<ul style="list-style-type: none"> - Principle of resistance welding. Types and applications. Welding symbols
14	<ul style="list-style-type: none"> - CO₂ welding. Deposit bead on MS sheet in flat position. Lap joint T joint and butt joint in down hand position. - 	<ul style="list-style-type: none"> - Introduction to CO₂ welding process. Welding equipments and accessories. Advantages and application of CO₂ process.
15	<ul style="list-style-type: none"> - TIG welding. Deposit bead on SS sheet in flat position. Making butt, Tee and corner joint. - 	<ul style="list-style-type: none"> - TIG welding process. Advantages. Description of equipments. Types of polarity and application
16	<ul style="list-style-type: none"> - TIG welding. Deposit bead on Aluminium sheet in flat position. Making butt, Tee and 	<ul style="list-style-type: none"> - Types of Tungsten Electrodes, Filler rods, Shielding Gases.

	corner joint. -	- Defects, causes and remedy in TIG welding process
17	- MS/SS pipe butt and Y joint by TIG welding process.	- Latest sheet metal cutting techniques: Plasma cutting, Laser cutting, water jet cutting and punching etc.
18	- Make models of Aluminium sliding windows and doors.	- Specification of aluminium channels angles, strips, tubes beadings, packing rubber, cardboard, glasses etc.
19	- Partitions of mini model rooms by using aluminum channels beadings etc	- Tools and equipments used in aluminium fabrication. - Assembly & Sub assembly: Gaurding assembly, Door assembly, Chassis assembly, Cabinet assembly, Power pack assembly etc.
20	- Electrical Panel, trunk boxes & ducts fabrication and Painting .	- Process of painting. Spray painting. Etch primer painting, Powder coating, buffing, grinding, and sanding. - Selection of different grit sizes.
21	- Any Special Exercises: Repairing Mudguard and Radiators and testing of Sheet metal containers	- Types of Radiators and construction of Radiators, Mufflers, Estimation of work.
22	- Any Special Exercises: Repairing Blocked Silencer and fuel tank	- Material handling: handling of light, medium and heavy materials. - Use of cranes and types. - Estimation and costing
23	- Industrial training / Project wok	
24	- Industrial training / Project wok	
25	Revision	
26	Test	

10.2 SYLLABUS CONTENT OF CORE SKILLS

First Semester

(Semester Code no. WLD- 01)

Duration: Six Month

SYLLABUS CODE :ED-FAB-I-1.1

SYLLABUS FOR ENGINEERING DRAWING

SEMESTER-I

Sl. No	Engineering Drawing	Hours
1	- Importance of Engineering Drawing and its Knowledge. - Use of Drawing Instruments.	6
2	- Letters, Numbers and Alphabets as per BIS - Layout of Drawing Sheet & Title Block.	6
3	- Drawing of straight lines, Geometrical constructions, rectangles, Circles, Polygons etc.	6
4	- Use of different types of line and symbols for drawing. - Importance & dimensioning techniques as per BIS.	3
5	- Isometric views with dimensions such as Cube, Rectangular Block, Cylinder, etc	3
6	- Orthographic Projection in 3rd angle, as per BIS - Orthographic Projection in 1st angle, as per BIS (Concept only)	9
7	- Plan and elevation of simple objects like Hexagonal Block, square Block, Circular Block, tapered Block, etc.	6
8	- Views of simple Hollow and Solid Blocks with Dimensions.	6
9	- Construction of Orthographic Projection from the given Isometric view of simple shaped Blocks in 3rd angle method.	12
10	- Construct an Orthographic Projection from the given Isometric view of shaped Blocks in 1st angle method.	6
11	- Reading of simple Engineering drawing.	3
12	Revision	
13	Examination	

SYLLABUS CODE NO.ED-FAB-II-1.2
SYLLABUS FOR ENGINEERING DRAWING
SEMESTER-II

Sl. No	Engineering Drawing	Hours
1	- Reading of Engineering drawing related to missing lines and missing views.	3
2	- Simple orthographic drawing- from the given Isometric views of simple objects.	9
3	- Conventional representation of Materials as per BIS. - Views of simple solid bodies cut by section plane on drawing standard methods. - (Full and Half Sections) BIS.	6
4	- Surface Development of Prism, Pyramid.	6
5	- Cylinder Projection and Development, Cone Projection and Development. - Examples based on right cones.	6
6	- Types of rivets with dimensions as per BIS.	3
7	- Types of Riveted joints.	6
8	- Hexagonal nuts and bolts with dimensions.	3
9	- Screw threads with their dimensions as per BIS.	3
10	- Different symbols used in related trade.	3
11	- Exercises on application of Trade related symbols.	3
12	- Freehand sketching of hand tools of the trade.	3
13	- Free hand sketching of simple objects related to trade.	6
14	- Reading of fabricated engineering drawing	3
15	Revision	
16	Examination	

Second Semester
(Semester Code no. WLD - 02)

Duration: Six Month

SYLLABUS CODE No.W/S-FAB--I- 1.1

SYLLABUS FOR WORKSHOP SCIENCE AND CALCULATION

HOURS	SCIENCE TOPICS	HOURS	CALCULATION TOPICS
1	Introduction and Importance of Science and Calculation to the Trade skill	4	General simplifications - BODMAS rule Fraction-Addition, Subtraction, multiplication and Division-Problems. Decimal-Addition, Subtraction, Multiplication, and Division-Problems
2	- System of Units - British, Metric and S. I. Units for Length, Mass, Area, Volume, Capacity and time. Conversions between British and Metric Systems.	2	Conversion of Fraction to Decimal and vice-versa.
2	- Density & Specific gravity - Mass, weight. Definition and units	4	Square roots: The Square and Square root of a Whole Number and Decimal
3	- Metals: Properties and uses of cast iron, wrought iron, plain carbon steels and alloy steels - Difference between metals, non-metals and alloys.	4	Percentage - Changing Percent to Decimal and Fraction and vice – versa – applied problem
2	- Properties and uses of Copper, Zinc, Lead, Tin and Aluminum	4	Concept on Ratio and Proportion- Direct and Inverse Proportion, simple applied problems
2	- Properties and uses of Brass, Bronze, Rubber ,Timber and insulating materials.	6	Algebraic Symbols and Fundamentals Addition, Subtraction, Multiplication and Division-Problems.
3	- Concept of heat and temperature. Difference between heat and temperature. Effects of Heat, Thermometric Scales such as a Celsius, Fahrenheit and Kelvin, Temperature measuring Instruments - types of thermometers and pyrometers		
3	- Conversions between the above Scales of Temperature. - Units of Heat-Calorie, B.Th.U & C.H.U., joule. - Concept of Specific Heat, Latent Heat, problems on Heat Loss and Heat Gain.		
2	- Definition of Force - Units of Force in M.K.S.& S.I. Systems . - Concept of Pressure and its Units in different systems		
20	-	24	

Total hours: 20 hours (Science) + 24 hours (Calculation) = 44 hours.

SYLLABUS CODE No.W/S-FAB--II- 1.2
SYLLABUS FOR WORKSHOP SCIENCE AND CALCULATION

SEMESTER-II

HOURS	SCIENCE TOPICS	HOURS	CALCULATION TOPICS
4	Electricity, Current, voltage, Power, resistance, Conductors, insulators, Ohm's law, Types of Current, Effects of current and related problems. Watt, kW, Electrical energy – watt-hour, kWh & Board of trade unit.	2	Fundamental algebraic formulae viz. $(a+b)^2$, $(a-b)^2$ etc. Simple Equations – related problems.
2	<ul style="list-style-type: none"> - Concept of fuse - Concept of open circuit, closed circuit, Short circuit - Concept of earthing 	6	<ul style="list-style-type: none"> • Menstruation- Concept of 2D figures and 3D object, • Definition of perimeter, area and volume : related units - perimeter and area of plain figures like Square, Rectangle, Equilateral Triangle, Isosceles Triangle, Right Angled Triangle, Scalene Triangle-simple applied Problems
2	<ul style="list-style-type: none"> - Units of work in M.K.S, System and S.I. Unit of Work- - Simple Problems. 	3	<ul style="list-style-type: none"> • Perimeter and area: Hexagon, Circle, Circular ring, Sector & Ellipse- Problems.
2	<ul style="list-style-type: none"> - Units of Power such as Watt and Horse Power - Definition of I.H.P., B.H.P. and Efficiency. 	3	<ul style="list-style-type: none"> • Volume and Weight of Simple Solid bodies such as Cube, Cuboids, Cone, Cylinder and Hollow Cylinder- applied Problems.
4	<ul style="list-style-type: none"> - Definition of Energy: Potential Energy and Kinetic Energy - Law of Conservation of Energy, S.I. Unit of Energy - Simple Problems in P.E. and K.E. 	3	<ul style="list-style-type: none"> • Finding the capacity in Litres of Square, Rectangular, Hexagonal, Conical and Cylindrical Shaped Vessels
2	<ul style="list-style-type: none"> - Linear motion – Speed, velocity, acceleration, retardation 	3	<ul style="list-style-type: none"> • Finding the lateral Surface Area and Total Surface Area of Square, Rectangular, Hexagonal, Conical and Cylindrical Shaped Vessels by using simple calculator
4	<ul style="list-style-type: none"> - Definition and units of Stress, Strain. Ultimate stress & breaking stress. - Explanation of terms shear force and bending moment. - Simple problems on stress & strain 	2	<ul style="list-style-type: none"> • Trigonometrical ratios. Trigonometrical tables. Basic trigonometrical calculations by using scientific calculator
20	-	22	

Total hours: 20 hours (Science) + 22 hours (Calculation) = 42 hours.

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 DGT 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 DGT institutes

6. **Instructor** "One full time regular instructor shall be engaged on every 240 number of trainees for teaching the subject 'Employability Skills'. One additional full time regular instructor would be required on increase in every 240 trainees. Wherever the trainees are less than 240 or part thereof, a part-time instructor may be engaged to teach the subject. This has been illustrated in the table below:

S. No.	Number of trainees	Instructor (s) required
a)	Less than 240	One part-time Instructor
b)	240	One full-time Instructor
c)	Between 240 and 480	One full-time Instructor + One part-time Instructor
d)	Between 480 and 720	Two full-time Instructors + One part-time Instructor
e)	Between 720 and 960	Three full-time Instructors + One part-time Instructor

11.2 DISTRIBUTION OF TOPICS BETWEEN SEMESTERS FOR EMPLOYABILITY SKILL

Course Duration	Semester1	Semester2	Examination
	Topics	Topics	
01 Year (Two semesters)	<ol style="list-style-type: none"> 1. English Literacy 2. I.T. Literacy 3. Communication Skills 	<ol style="list-style-type: none"> 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 SKILL 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	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. Information Security and antivirus tools, Do's and Don'ts in Information Security, Awareness of IT – ACT, types of cyber crimes.

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
Behavioral 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
8th Class Pass + NTC/NAC in the Trade of "Sheet metal worker" trade 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 : 11 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 STANDARDS

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.	Selects sheet of required type, thickness (gauge) and size and mark it with scribe, square, divider, steel rule etc., according to drawing or sample.	
5.	Shears or bends the sheet wherever necessary by machine or hand shear.	
6.	Form sheet metal to required shape and size by bending, seaming, forming, riveting etc., using mallets, hammers, formers, sets, stakes, etc., or by various operations such as shearing, bending, beading, channelling , circle cutting.	
7.	Perform different type of MS pipe joints by Gas welding (OAW).	
8.	Performs soldering, brazing operations on sheet metal	
9.	Perform Arc welding, Gas welding TIG welding & MIG welding and Spot welding on sheet metals	
	Sub-Total of Internal assessment for Semester- I	200
11.	Makes sheet metal articles according to drawing or sample.	
12.	Makes ducts, cabins & panels	
13.	Undertakes Aluminium frame works	
14.	May undertake repair work of mudguard, Radiators etc.	
15.	May work in different sheet metals such as tin, copper, brass.	
	Sub-Total of Internal assessment for Semester- II	200
	Total of Internal assessment	400

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
2	Dr.K.Ashokkumar	AGM, BHEL, Trichy	Member
3	Prof. JyothiMukhopadhy	IIT, Ahmedabad	Member
4	B.Pattabhiraman	MD, GB Engineering, Trichy	Member
5	Dr.Rajeevkumar	IIT, Mandi	Member
6	Dr.Vishalchauhan	IIT, Mandi	Member
7	Shri D.K.Singh	ITI, 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.MThamizharasan	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.Khataokar	TO, 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.Balachandranachari A.V	Principal,ITI, Kottayam, Kerala	Member
10	Shri.Pazhanimurugan. P	JTO, GITI, K.G.F. Karnataka	Member

TRADE: SHEET METAL WORKER**LIST OF TOOLS & EQUIPMENTS FOR 16 TRAINEES + 1**

S. No	Name of the Tools	Quantity
TRAINEES KIT		
1	Steel Rule 300 mm	16+1
2	Wing Divider 200 mm	16+1
3	Centre Punch 100 mm	16+1
4	Spring Dividers 150 mm	16+1
5	Ordinary Wooden Mallet	16+1
6	Soldering Copper Hatchet Type 0.25 kg	16+1
7	Cross Peen Hammer 0.25 kg with handle	16+1
8	Protractor with blade 150mm	16+1
9	Steel tape 2 metres	16+1
10	Ballpen hammer 0.5kg with handle	16+1
11	Scriber 150 mm x 3 mm (Engineer's)	16+1
12	Prick punch 100mm	16+1
SHOP OUT FIT PER UNIT		
13	Steel Square 450 mm x 600 mm	4 Nos.
14	Sheet Metal Gauge	1 No
15	Hatcher Stake	4 Nos.
16	Stake Round and Bottom	4 Nos.
17	Half Moon Stake	4 Nos.
18	Funnel Stake	4 Nos.
19	Anvil Face Stake	4 Nos.
20	Bick Iron Stake	4 Nos.
21	Tinman's Horse	2 Nos.
22	Hammer Peaning with handle	4 Nos.
23	Hammer Creasing with handle	4 Nos.
24	Hammer Planishing with handle	4 Nos.
25	Hammer Block with handle	2 Nos.
26	Shear Tinman 300mm	8 Nos
27	Snip straight	8 Nos
28	Right cut snips 250mm	4 Nos
29	Left cut snips 250mm	4 Nos
30	Hand Shear Universal 250 mmID	4 Nos.
31	Hollow Punch set Round 3 mm Dia	2 Nos.
32	Rivet sets snap and Dolly combined 3 mm	4 Nos.
33	Chisel cold flat 25 mm x 250 mm .	4 Nos
34	Punch Letter 4 mm	1 set
35	Punch Number 4 mm	1 set
36	File flat 250 mm second cut	2 Nos.
37	File flat 250 mm smooth	2 Nos.
38	File flat 300 mm bastard	2 Nos.

39	File half round 300 mm smooth	2 Nos.
40	Hacksaw frame 300 mm adjustable (Tubular)	4 Nos.
41	Hand Groover 5 mm	4 Nos.
42	Plier.Combination 150 mm	2 Nos.
43	Grip Wrench 200 mmID	2 .Nos.
44	Ladle 150 mm Dia.	2 Nos
45	Blow Lamp 1 litre.	2 Nos
46	H.S.S. Twist Drill 3 mm, 4 mm & 6 mm each (parallel Shank)	3 Nos.
47	Hand Drill machine 0 to 12 mm	2 Nos.
48	Soldering Copper Hatchet type 500 gms.	8 Nos
49	Pneumatic rivet gun	2 Nos.
50	Trammel Point (with beam 600 mm)	1 No.
51	Vernier caliper (0 mm - 150 rom)	1 No
52	Micrometer Outside (0 to 25 mm)	1 No.
53	File Rasp cut 250 mm	2 Nos.
54	D.E. Spanner G.P. (6 mm to 32 mm) (Set of 12 spanner)	2 Set
55	Bossing Mallet	4 Nos
56	End tacked Mallet	4 Nos
57	Soft hammer (Brass, copper,Lead)	4 Nos
58	Steel Rule 600mm	4 Nos
59	Oilcan pressure feed 500ml	2Nos
60	Raising hammer with handle	4 Nos
61	Rawl Punch holder and bits (No.8, 10, 12, 14)	2 . Sets
62	Hollowing Hammer with handle	4 Nos.
63	Tripaning tool 70 mm	1 No.
64	Hand vice 50 mm	4 Nos.
65	Tongs Flat	2 Pairs.
66	Portable Electric drill (Single phase) -6mm	2 Nos
67	Pop rivet gun	2 Nos.
68	Lazy Tong	2 Nos.
69	Screw Driver 250 mm	2 Nos.
70	Round File 2nd Cut 250 mm	4 Nos.
71	Triangular File 'Smooth 250 mm	4 Nos.
72	Square File 2nd Cut 250 mm.	4 Nos.
73	Needle File (Swiss File) 150 mm	1 set
74	'C' Clamp 150 mm	2 Nos.
GENERAL INSTALLATIONS		
75	Bench leaver shears 250 mm Blade x 3mm Capacity	1 No.
76	Air Compressor (Pressure and displacement of air) Pneumatic Pop rivet Gun	1 . No
77	Spray Gun-(painting) 500 ml.	1 No.
78	Combination turning up and wiring machine	1 No.
79	Guillotine. Shearing Machine foot operated	1 No.
80	Oxy acetylene welding plant (complete set)	1 set
81	Circle cutting machine 300 mm dia	1 set
82	Pillar type drilling machine 12 mm	1 No.
83	Slip roll former 1.6. mm x 1000 mm	1 No.
84	D.E. Grinder Pedestal motorised 200 mm	1 No.
85	Anvil 50 kgs with Stand	1 No.

86	Bench vice 120 mm, 150 mm	2 each
87	Fly press Ball press No.4 single body	1 No.
88	Power Press 2 Tons	1 No.
89	Buffing and Polishing Machine	1 No.
90	Nibbling Machine	1 No.
91	Spinning Lathe	1 No.
92	Seaming Machine .	1 No.
93	Glass cutter – Diamond point	1 No.
94	Work Bench 1820 x 1310 x 760 mm	4 Nos.
95	Almirah 1820 x 1210 x 450 mm	2 Nos.
96	Metal rack 1820 x 1520 x 450 mm	2 Nos.
97	Steel Lockers with 8 Drawers .	2 Nos.
98	Fire extinguisher Soda Acid and foam type	1 each
100	Fire buckets with Stand.	4, Nos.
101	Black Board with Easel .	1 No.
102	Wooden Stool 450.mm.	1 No.
103	Portable Nibbler	2 Nos.
104	Portable Pneumatic Shear.	2 Nos.
105	Pipe Bending Machine (Hydraulic Type) 12 mm to 30 mm	1 No.
106	Hand Press Brake Capacity (0.8 mm)	1 No.
107	Beading Machine with 380 mm throat clearance (with crimping rollers)	1 No.
108	Tin smiths bench folder 600 x 1.6 mm	1 No.
109	Gas Welding Table 1220 mm x 760 mm	1 No.
110	Spot & Seam Welding Machine	1 No each.
111	Arc welding Transformer/ Rectifier/Inverter 300Amps with accessories	1 set
112	Co ₂ welding machine complete set 300Amps	1 set
113	TIG welding machine complete set 200 Amps	1 set
114	Universal cutting machine	1 No.

CLASS ROOM FURNITURE FOR TRADE THEORY

Sl. No	Names & Description of Furniture	Quantity
1	Instructor's table and Chair (Steel)	1 set
2	white magnetic board size 1200mm X 900 mm	1
3	Instructors lap top with latest configuration pre loaded with O.S and MS Office package.	1
4	LCD projector with screen	1

GUIDELINES FOR INSTRUCTORS AND PAPER SETTERS

1. All the questions of 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.