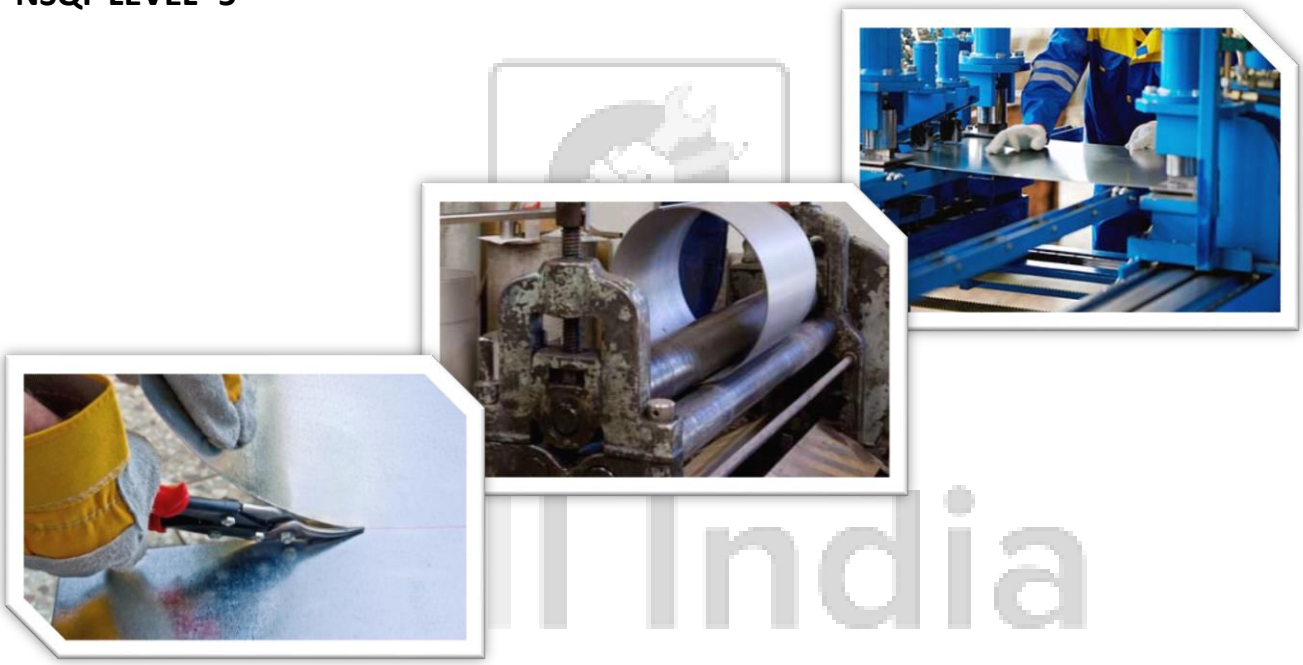
SHEET METAL WORKER

COMPETENCY BASED CURRICULUM

(Duration: 2 Yrs.)

APPRENTICESHIP TRAINING SCHEME (ATS)

NSQF LEVEL- 5



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SECTOR – PRODUCTION & MANUFACTURING

सत्यमेव जयते

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

Directorate General of Training

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SHEET METAL WORKER

(Revised in 2018)

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Developed By

Ministry of Skill Development and Entrepreneurship
Directorate General of Training
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ACKNOWLEDGEMENT

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2. **OCL Ltd. (Dalmia Group), Odisha**
3. **TATA Motors, Pune**
4. **JBM Group, Chennai**
5. **MTAB Technology (P) Ltd., Chennai**

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Co-ordinator for the course: Sh. Nirmalya Nath, ADT, CSTARI- Kolkata

Sl. No.	Name & Designation Shri/Mr./Ms.	Organization	Mentor Council Designation
Expert group on restructuring of Apprenticeship Training Modules			
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1. BACKGROUND

1.1 Apprenticeship Training Scheme under Apprentice Act 1961

The Apprentices Act, 1961 was enacted with the objective of regulating the programme of training of apprentices in the industry by utilizing the facilities available therein for imparting on-the-job training. The Act makes it obligatory for employers in specified industries to engage apprentices in designated trades to impart Apprenticeship Training on the job in industry to school leavers and person having National Trade Certificate(ITI pass-outs) issued by National Council for Vocational Training (NCVT) to develop skilled manpower for the industry**.** There are four categories of apprentices namely**; trade apprentice, graduate, technician and technician (vocational) apprentices.**

Qualifications and period of apprenticeship training of **trade apprentices** vary from trade to trade. The apprenticeship training for trade apprentices consists of basic training followed by practical training. At the end of the training, the apprentices are required to appear in a trade test conducted by NCVT and those successful in the trade tests are awarded the National Apprenticeship Certificate.

The period of apprenticeship training for graduate (engineers), technician (diploma holders and technician (vocational) apprentices is one year. Certificates are awarded on completion of training by the Department of Education, Ministry of Human Resource Development.

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1.2 Changes in Industrial Scenario

Recently we have seen huge changes in the Indian industry. The Indian Industry registered an impressive growth during the last decade and half. The number of industries in India have increased manifold in the last fifteen years especially in services and manufacturing sectors. It has been realized that India would become a prosperous and a modern state by raising skill levels, including by engaging a larger proportion of apprentices, will be critical to success; as will stronger collaboration between industry and the trainees to ensure the supply of skilled workforce and drive development through employment. Various initiatives to build up an adequate infrastructure for rapid industrialization and improve the industrial scenario in India have been taken.

1.3 Reformation

The Apprentices Act, 1961 has been amended and brought into effect from 22nd December, 2014 to make it more responsive to industry and youth. Key amendments are as given below:

- Prescription of number of apprentices to be engaged at establishment level instead of trade-wise.
- Establishment can also engage apprentices in optional trades which are not designated, with the discretion of entry level qualification and syllabus.
- Scope has been extended also to non-engineering occupations.
- Establishments have been permitted to outsource basic training in an institute of their choice.
- The burden of compliance on industry has been reduced significantly.

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2. TRAINING SYSTEM

2.1 GENERAL

Directorate General of Training (DGT) under Ministry of Skill Development & Entrepreneurship offers range of vocational training courses catering to the need of different sectors of economy/ Labour market. The vocational training programmes are delivered under aegis of National Council of Vocational Training (NCVT). Craftsman Training Scheme (CTS) and Apprenticeship Training Scheme (ATS) are two pioneer programmes of NCVT for propagating vocational training.

Sheet Metal Worker trade under ATS is one of the most popular courses delivered nationwide through different industries. The course is of two years (02 Blocks) duration. It mainly consists of Domain area and Core area. In the Domain area Trade Theory & Practical impart professional - skills and knowledge, while Core area - Workshop Calculation and science, Engineering Drawing and Employability Skills imparts requisite core skills & knowledge and life skills. After passing out the training programme, the trainee is being awarded National Apprenticeship Certificate (NAC) by NCVT having worldwide recognition.

Broadly candidates need to demonstrate that they are able to:

- Read & interpret technical parameters/document, plan and organize work processes, identify necessary materials and tools;
- Perform task with due consideration to safety rules, accident prevention regulations and environmental protection stipulations;
- Apply professional skill, knowledge, core skills & employability skills while performing jobs and solve problem during execution.
- Check the job/assembly as per drawing for functioning, identify and rectify errors in job/assembly.
- Document the technical parameters related to the task undertaken.

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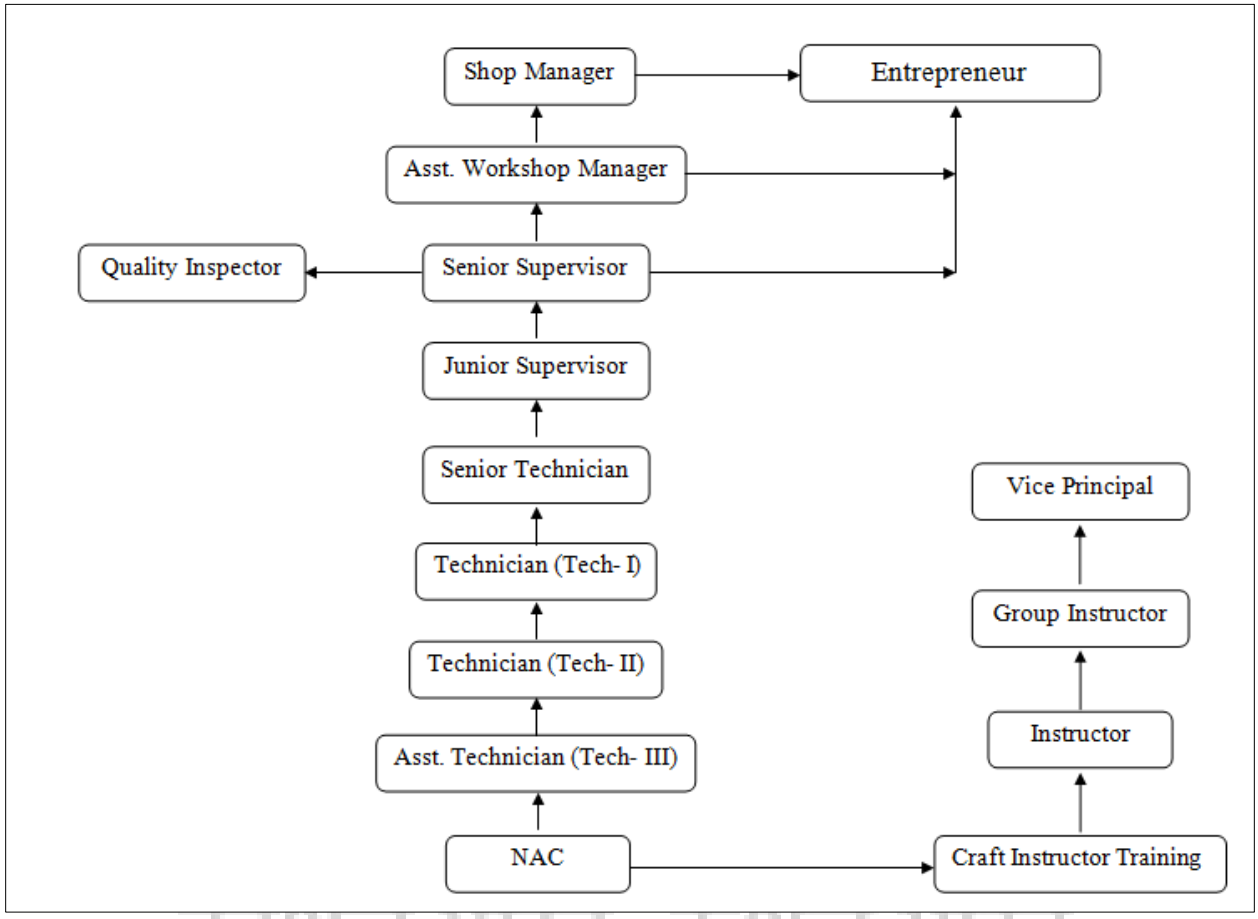
2.2 CAREER PROGRESSION PATHWAYS:

- Can join Crafts Instructor Training Scheme (CITS) in the trade for becoming instructor in ITIs.
- Indicative pathways for vertical mobility.



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2.3 COURSE STRUCTURE:

Table below depicts the distribution of training hours across various course elements during a period of two years (*Basic Training and On-Job Training*) :-

Total training duration details: -

Time (in months)	1-3	4-12	13-15	16-24
Basic Training	**Block– I**	-----	**Block – II**	------
Practical Training (On - job training)	----	**Block – I**	------	**Block – II**

A. Basic Training

For 02 yrs. course (Engg.) :-(**Total 06 months:** 03 months in 1st yr. + 03 months in 2nd yr.)
For 01 yr. course (Engg.) :-(**Total 03 months:** 03 months in 1st yr.)

S No.	Course Element	Total Notional Training Hours	
		For 02 Yrs. course	**For 01 Yr. course**
1.	Professional Skill (Trade Practical)	550	275
2.	Professional Knowledge (Trade Theory)	240	120
3.	Workshop Calculation & Science	40	20
4.	Engineering Drawing	60	30
5.	Employability Skills	110	55
	Total (Including internal assessment)	**1000**	**500**

B. On-Job Training:-

For 02 yrs. Course (Engg.) :- (**Total 18 months:** 09 months in 1st yr. + 09 months in 2nd yr.)

Notional Training Hours for On-Job Training: 3120 Hrs.

For 01 yr. course (Engg.) :-(**Total 12 months**)

Notional Training Hours for On-Job Training: 2080 Hrs.

C. Total training hours:-

Duration	**Basic Training**	**On-Job Training**	**Total**
For 02 yrs. course (Engg.)	1000 hrs.	3120 hrs.	4120 hrs.
For 01 yr. course (Engg.)	500 hrs.	2080 hrs.	2580 hrs.

2.4 ASSESSMENT & CERTIFICATION:

The trainee will be tested for his skill, knowledge and attitude during the period of course and at the end of the training programme as notified by Govt of India from time to time. The Employability skills will be tested in first two semesters only.

a) The **Internal assessment** during the period of training will be done by **Formative assessment method** by testing for assessment criteria listed against learning outcomes. The training institute have to maintain individual *trainee portfolio* as detailed in assessment guideline. The marks of internal assessment will be as per the template (Annexure – II).

b) The final assessment will be in the form of summative assessment method. The All India Trade Test for awarding NAC will be conducted by NCVT on completion of course as per guideline of Govt of India. The pattern and marking structure is being notified by govt of India from time to time. **The learning outcome and assessment criteria will be basis for setting question papers for final assessment. The examiner during final examination will also check** individual trainee's profile as detailed in assessment guideline before giving marks for practical examination.

2.4.1 PASS REGULATION

The minimum pass percent for Practical is 60% & minimum pass percent for Theory subjects 40%. The candidate pass in each subject conducted under all India trade test.

2.4.2 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 should be given while assessing for team work, avoidance/reduction of scrap/wastage and disposal of scarp/wastage as per procedure, behavioral attitude, sensitivity to environment and regularity in training. The sensitivity towards OSHE and self-learning attitude are to be considered while assessing competency.

Assessment will be evidence based comprising the following:

- Job carried out in labs/workshop
- Record book/ daily diary
- Answer sheet of assessment
- Viva-voce
- Progress chart
- Attendance and punctuality
- Assignment
- Project work

Evidences of internal assessments are to be preserved until forthcoming semester examination for audit and verification by examination body. The following marking pattern to be adopted while assessing:

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Performance Level	Evidence
(a) Weightage in the range of 60 -75% to be allotted during assessment	
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.	• Demonstration of good skill in the use of hand tools, machine tools and workshop equipment • Below 70% tolerance dimension/accuracy achieved while undertaking different work with those demanded by the component/job/set standards. • A fairly good level of neatness and consistency in the finish • Occasional support in completing the project/job.
(b)Weightage in the range of above75% - 90% to be allotted during assessment	
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.	• Good skill levels in the use of hand tools, machine tools and workshop equipment • 70-80% tolerance dimension/accuracy achieved while undertaking different work with those demanded by the component/job/set standards. • 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	
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.	• High skill levels in the use of hand tools, machine tools and workshop equipment • Above 80% tolerance dimension/accuracy achieved while undertaking different work with those demanded by the component/job/set standards. • A high level of neatness and consistency in the finish. • Minimal or no support in completing the project.

3. JOB ROLE

Brief description of Job roles:

Sheet Metal Worker, General 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 scriber, square, divider, foot rule etc., according to drawing or sample. Shears wherever necessary by machine or hand shears and makes it to required shape and size by bending, seaming, forming, rivetting, soldering etc., using mallets, hammers, formers, sets, stakes, etc., or by various machines such as shearing, bending, beading, channeling , circle cutting. Checks work at stages during operations and does soldering, brazing as necessary. May undertake pneumatic and hydraulic tests. May also undertake repair work. May specialize in different metal sheets such as tin, copper, brass. Dent Remover; Panel Beater removes dents from sheet metal parts such as mudguards, body panels, tanks, containers, trunks by beating with mallets, smoothens surface for painting and other operations. Gets parts dismantled, examines dents caused by stress or accidents and starts beating from highest point on inner side with mallet to bring it back to original shape. Supports outer surface with soft metal-piece, wood or broader mallet to avoid distortion in reverse direction. Manipulates support and uniformly beats inner portion till damaged portion is reformed to original shape. May engage an assistant to hold support and guide him in manipulating it. May also scrape or lightly file outer surface to remove further defects, if any, for obtaining finer finish.

Sheet Metal Workers, Other perform number of routine and low skilled tasks, such as doing primary development of sheet metal, cutting sheets to sizes, assisting in operating sheet metal machines, applying brazing compound on joints to be brazed, heating rivets for assembly etc. and are designated as: Sheet Metal Helper if assists Sheet Metal Worker by performing simple flanging, punching, shearing soldering etc. for fabrication of sheet metal products, Tin Smith Helper if cuts tin sheets according to drawing or sample using foot rule, callipers and compass and assists Tin Smith in bending, shaping and joining various component parts. Sheet Metal Machine Helper if assists Sheet Metal Machine Operator in setting and operating sheet metal working machines such as bending machine, channeling machine, shearing machine etc. Sheet Metal Machine Operator operates sheet metal machine for sizing, bending and forming sheet metal for further operations. Sets machine to required dimensions (except press tools) using common measuring instruments such as foot rule, calipers etc. Operates machine, feeds trial piece and checks for dimensions and resets machine if necessary. Checks out-turn from time to time to ensure correctness. May operate one or more sheet metal working machines such as shearing machine, bending machine, channeling machine, forming machine and is designated as SHEARING MACHINE OPERATOR, BENDING MACHINE OPERATOR , CHANNELING MACHINE OPERATOR, GROOVING MACHINE OPERATOR, FORMING MACHINE OPERATOR, etc. May set cutters, blades, dies etc. and undertake minor repairs under guidance. Plan and organize assigned work and detect & resolve issues during execution. Demonstrate possible solutions and agree tasks within the team. Communicate with required clarity and understand technical English. Sensitive to environment, self-learning and productivity. Perform TPM (Total Production Management), TQM (Total Quality Management) and record keeping system.

SHEET METAL WORKER

Reference NCO: NCO-2015.-

i. 7213.0101 - Sheet Metal Worker, General
ii. 7213.9900- Sheet Metal Workers, Other

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4. NSQF LEVEL COMPLIANCE

NSQF level for Sheet Metal Worker trade under ATS: **Level 5**

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 ATS mostly matches with the Level descriptor at Level- 5.

The NSQF level-5 descriptor is given below:

LEVEL	Process required	Professional knowledge	Professional skill	Core skill	Responsibility
Level 5	Job that requires well developed skill, with clear choice of procedures in familiar context.	knowledge of facts, principles, processes and general concepts, in a field of work or study	a range of cognitive and practical skills required to accomplish tasks and solve problem by selecting and applying basic methods, tools, materials and information.	Desired mathematical skill, understanding of social, political and some skill of collecting and organizing information, communication.	Responsibility for own work and Learning and some responsibility for other's works and learning.

5. GENERAL INFORMATION

Name of the Trade	SHEET METAL WORKER
NCO - 2015	7213.0101
NSQF Level	Level – 5
Duration of Apprenticeship Training (Basic Training + On-Job Training)	Two years (02 Blocks each of one year duration).
Duration of Basic Training	a) Block –I : 3 months b) Block – II : 3 months **Total duration of Basic Training: 6 months**
Duration of On-Job Training	a) Block–I: 9 months b) Block–II : 9 months **Total duration of Practical Training: 18 months**
Entry Qualification	Passed 10th Class with Science and Mathematics under 10+2 system of Education or its equivalent
Selection of Apprenticeship	The apprentices will be selected as per Apprenticeship Act amended time to time.
Instructors Qualification for Basic Training	As per ITI instructors qualifications as amended time to time for the specific trade.
Infrastructure for Basic Training	As per related trade of ITI
Examination	The internal examination/ assessment will be held on completion of each block. Final examination for all subjects will be held at the end of course and same will be conducted by NCVT.
Rebate to Ex-ITI Trainees	01 year
CTS trades eligible for SHEET METAL WORKER Apprenticeship	1. SHEET METAL WORKER

Note:

- *Industry may impart training as per above time schedule for different block, however this is not fixed. The industry may adjust the duration of training considering the fact that all the components under the syllabus must be covered. However the flexibility should be given keeping in view that no safety aspects is compromised.*
- *For imparting Basic Training the industry to tie-up with ITIs having such specific trade and affiliated to NCVT.*

6. LEARNING OUTCOME

6.1 GENERIC LEARNING OUTCOME

The following are minimum broad Common Occupational Skills/ Generic Learning Outcome after completion of the Sheet Metal Worker course of 02 years duration under ATS.

Block I & II:-

1. Recognize & comply safe working practices, environment regulation and housekeeping.

2. Understand and explain different mathematical calculation & science in the field of study including basic electrical. *[Different mathematical calculation & science –* ***Units & Measurements, Material Science, Mass .Weight and Density, Speed and Velocity, Ratio & Proportion, Work, Power and Energy Algebra, Heat & Temperature, Mensuration, Basic Electricity, Simple machines Transmission of power, Trigonometry, Concept of pressure – Definition,***

3. Interpret specifications, different engineering drawing and apply for different application in the field of work. *[Different engineering drawing-Lines ,****Dimensioning****, **Orthogonal View Isometric view, Constructions, Projections, Screw, Rivets and Joints, Reading of drawing, Free hand Sketches]***
4. Select and ascertain measuring instrument and measure dimension of components and record data.
5. Explain the concept in productivity, quality tools, and labour welfare legislation and apply such in day to day work to improve productivity & quality.
6. Explain energy conservation, global warming and pollution and contribute in day to day work by optimally using available resources.
7. Explain personnel finance, entrepreneurship and manage/organize related task in day to day work for personal & societal growth.
8. Plan and organize the work related to the occupation.

6.2 SPECIFIC LEARNING OUTCOME

Block – I

1. Practice and understand precautions to be followed while working in sheet metal jobs.
2. Prepare different types of documentation as per industrial need by different methods of recording information.
3. Safety and best practices/Basic Industrial Culture (5S, KAIZEN, etc.)
4. Prepare different types of documentation as per industrial need by different methods of recording information.

5. Development in radial line method, triangulation method, geometrical constructions etc.
6. Selects sheet of required type, thickness (gauge) and size and mark it with scriber, square, divider, foot rule etc., according to drawing or sample.
7. Use of different machines of sheet metal section.
8. Shear sheet metal by machine or hand shear and make it to required shape and size by bending, seaming, forming, riveting, soldering etc., using mallets, hammers, formers, sets, stakes, etc.
9. Performs soldering, brazing
10. Makes sheet metal different articles according to drawing or sample.
11. Sheet metal forming processes: Shearing, Forming and Finishing.

Block – II

12. Undertakes Aluminium frame works and other sheet metals such as tin, copper, brass.
13. Undertake repair work of different sheet metal components.
14. Transferring the measurement, Finding out centre of a round bar using dividers, calipers, combination set etc.
15. Spray painting, Galvanizing, Sheradizing, Electroplating/Iron, Nickel plating, Tinning.
16. Use of Duralumin Rivet, Riveting: Using Pop riveting Gun.
17. Metal Spinning.
18. Gas cutting of Sheets/Plates.
19. Use of power operated machines/tools such as portable pneumatic grinder/chisel/nibbler/riveter etc.
20. Use of Hydraulic Press Tools, Practice on deep drawing by press tools.
21. Practice on triangulation line method of development for Ducting.
22. Repairing of damaged mudguard using wheeling and raising machine.
23. Use of jigs and fixtures.
24. Making Twisted Duct, oblong duct for room cooler or air conditioner using Aluminium Alloy Metal. Principle of Ductwork for air handling systems in industry and types and PEB Work (Pre Engineering Building structure).
25. Practice on bus body building work.
26. Practice on Argon Welding, MIG and TIG Welding Projection, Seam and Resistance spot welding (RSW) machines.
27. Further practice on tube bending (both ferrous and non-ferrous)
28. Perform TPM (Total Productive Maintenance), TQM (Total Quality Management) and record keeping system.
29. Accuracy testing of Machine tools such as geometrical parameters.
30. Dismantling and mounting of pulleys.

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31. Use simple jigs and fixtures for drilling.
32. Dismounting, repairing damaged gears and mounting and check for workability.
33. Repair& replacement of belts and check for workability.
34. Maintenance, troubleshooting, and safety aspects of pneumatic and hydraulic systems (The practical for this component may demonstrated by video)

NOTE: Learning outcomes are reflection of total competencies of a trainee and assessment will be carried out as per assessment criteria.

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7. LEARNING OUTCOME WITH ASSESSMENT CRITERIA

GENERIC LEARNING OUTCOME	
LEARNING OUTCOMES	**ASSESSMENT CRITERIA**
1. Recognize & comply safe working practices, environment regulation and housekeeping.	1.1 Follow and maintain procedures to achieve a safe working environment in line with occupational health and safety regulations and requirements.
	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/unsalvageable 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.
	1.12 Identify environmental pollution & contribute to avoidance of same.
	1.13 Take opportunities to use energy and materials in an environmentally friendly manner
	1.14 Avoid waste and dispose waste as per procedure
	1.15 Recognize different components of 5S and apply the same in the working environment.
2. Understand, explain different mathematical calculation & science in the field of study including basic	2.1 Explain concept -Units & Measurements, Material Science, Mass .Weight and Density, Speed and Velocity, Ratio & Proportion, Work, Power and Energy Algebra, Heat & Temperature, Mensuration, Basic Electricity,

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electrical and apply in day to day work.[Different mathematical calculation & science -Units & Measurements, Material Science, Mass .Weight and Density, Speed and Velocity, Ratio & Proportion, Work, Power and Energy Algebra, Heat & Temperature, Mensuration, Basic Electricity, Simple machines Transmission of power, Trigonometry, Concept of pressure – Definition,		Simple machines Transmission of power, Trigonometry, Concept of pressure – Definition.
	2.2	Measure dimensions as per drawing
	2.3	Use scale/ tapes to measure for fitting to specification.
	2.4	Comply given tolerance.
	2.5	Prepare list of appropriate materials by interpreting detail drawings and determine quantities of such materials.
	2.6	Ensure dimensional accuracy of assembly by using different instruments/gauges.
	2.7	Explain basic electricity, insulation &earthing.
3. Interpret specifications, different engineering drawing and apply for different application in the field of work. [Different engineering drawing-Dimensioning, Orthogonal View Isometric view, Constructions, Projections, Screw, Rivets and Joints, Reading of drawing, Free hand Sketches,	3.1	Read & interpret the information on drawings and apply in executing practical work.
	3.2	Read & analyse the specification to ascertain the material requirement, tools, and machining /assembly /maintenance parameters.
	3.3	Encounter drawings with missing/unspecified key information and make own calculations to fill in missing dimension/parameters to carry out the work.
4. Select and ascertain measuring instrument and measure dimension of components and record data.	4.1	Select appropriate measuring instruments such as micrometers, vernier calipers, dial gauge, bevel protector and height gauge (as per tool list).
	4.2	Ascertain the functionality & correctness of the instrument.
	4.3	Measure dimension of the components & record data to analyse the with given drawing/measurement.
5. Explain the concept in productivity, quality tools, and labour welfare legislation and apply such in day to day work to improve productivity & quality.	5.1	Explain the concept of productivity and quality tools and apply during execution of job.
	5.2	Understand the basic concept of labour welfare legislation and adhere to responsibilities and remain sensitive towards such laws.
	5.3	Knows benefits guaranteed under various acts

6. Explain energy conservation, global warming and pollution and contribute in day to day work by optimally using available resources.	6.1	Explain the concept of energy conservation, global warming, pollution and utilize the available recourses optimally & remain sensitive to avoid environment pollution.
	6.2	Dispose waste following standard procedure.
7. Explain personnel finance, entrepreneurship and manage/organize related task in day to day work for personal & societal growth.	7.1	Explain personnel finance and entrepreneurship.
	7.2	Explain role of Various Schemes and Institutes for self-employment i.e. DIC, SIDA, SISI, NSIC, SIDO, Idea for financing/ non financing support agencies to familiarizes with the Policies /Programmes & procedure & the available scheme.
	7.3	Prepare Project report to become an entrepreneur for submission to financial institutions.
8. Plan and organize the work related to the occupation.	8.1	Use documents, drawings and recognize hazards in the work site.
	8.2	Plan workplace/ assembly location with due consideration to operational stipulation.
	8.3	Communicate effectively with others and plan project tasks.
	8.4	Assign roles and responsibilities of the co-trainees for execution of the task effectively and monitor the same.
SPECIFIC OUTCOME		
Block-I& II		
*Assessment Criteria i.e. the standard of performance, for each specific learning outcome mentioned under **block – I & block – II** (section: 10) must ensure that the trainee achieves well developed skill with clear choice of procedure in familiar context. Assessment criteria should broadly cover the aspect of **Planning** (Identify, ascertain, estimate etc.); **Execution** (perform, illustration, demonstration etc. by applying 1) a range of cognitive and practical skills required to accomplish tasks and solve problems by selecting and applying basic methods, tools, materials and information 2) Knowledge of facts, principles, processes, and general concepts, in a field of work or study 3)Desired Mathematical Skills and some skill of collecting and organizing information, communication) and **Checking/ Testing** to ensure functionality during the assessment of each outcome. The assessments parameters must also ascertain that the candidate is responsible for own work and learning and some responsibility for other's work and learning.*		

8. SYLLABUS

BASIC TRAINING (Block – I)

Duration: (03) Three Months

Week No.	Professional Skills (Trade Practical)	Professional Knowledge (Trade Theory)
1	1. Induction to safety devices used in shop floor. 2. Identification of Tools and Equipments 3. Induction and use of marking tools. 4. Practice in Reading, Steel Rule, Scribing of straight lines, Bisecting of straight lines (on the sheet metal) using marking tools.	General safety precautions Safety precaution in sheet metal work Introduction of First aid. Safety attitude development of the trainee by educating him to use Personal Protective Equipment (PPE). Response to emergencies eg; power failure, fire, and system failure. Introduction to 5S concept & its application. Fire: - Types, causes and prevention methods. Fire Extinguisher, its types. 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.
2	5. Mark and cut through the straight lines. 6. Planishing of Sheet Metal and Practice in drawing simple Geometrical shapes. 7. Practice in marking and cutting of sheets to various angles.	Marking and laying out tools and accessories. Measuring Tools: steel Rule, calipers, try square, L square, SWG, Bevel Protractor etc. Cutting tools : Snips, shears, hacksaw, chisel, cutting plier, files, drills, tap & die sets etc
3	8. Practice on cutting with different types of snips. 9. Tin snips (Straight cut, Right cut and Left cut) cutting off inside and outside curve, cutting off notches and cutting off profiles. 10. Practice on Sheet Metal seams. "Grooved seam, Locked Grooved seam, Pane down seam, Bottom lock seam or Corner Fold (Knocked-up seam) and hemming practice	Hand tools: mallets, hammer, sheet metal hammers, groovers, riveting tools, screw drivers, wrench and spanners etc. Holding tools & accessories: vices, C clamps, stakes, stakes holder, hollow mandrel, wooden former.. 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..
4	11. Forming rectangular shapes using stakes. 12. Forming Cylindrical job using various	Folding and joining allowances, edge stiffing, wiring allowances and false wiring, types of

	stakes such as Hollow Mandrel, Hatchet Stake; Tin Man's' Anvil stake etc. 13. Folding, Bending Sheet Metal to 90 degree using wooden mallet, 'C' clamps etc. 14. Folding, Bending Sheet Metal to 90 degree using wooden mallet, 'C' clamps etc. 15. Making of Mug. 16. Hemming (single, Double) wire edge by hand process	notches in sheet metal. Definitions of pattern, Development, stretched out pattern, Master pattern (gross pattern) and templates, - Development of by parallel line method, radial line method.
5	17. Make a taper chute square to round. 18. Making holes with solid punches, round punches as per BIS and use of hollow punches. 19. Making hole in sheet metal with help of wood block.	Development of surfaces: Triangulation method and geometrical construction methods Solid and Hollow Punches. Description of hand punches as per BIS. Sizes of solid and hollow Punches and their uses.
6	20. Riveting practice using various types of rivet heads. 21. Single chain riveted joint. Double chain and Zig- zag, Lap & butt riveted joints.	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)
7	22. Solder Lap joint. 23. Single plated solder butt joint. 24. Making funnel by soldering process.	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. Solder, Different types of solder and their composition. Types and uses of fluxes, their effect on different metal.
8	25. Make by soldering 26. Elbow 90° equal dia pipe T joint 90° equal dia pipe T joint 90° unequal dia pipe by soldering 27. Make by soldering 28. T Pipe 60°branch joint unequal dia pipe Offset T joint equal dia	Process of soft soldering, hard soldering (brazing). -Heating appliances (Hand Forge, Blow Lamp, L.P.G.) Development & laying out pattern of elbow pipe, T pipe and offset pipe in equal diameter.
9	29. Make a taper lobster back bend 90 degree from oblique cone by soldering. 30. Forming square section segmental quarter bend pipe with suitable lock and forming round section segmental quarter bend pipe.	Development of T pipe, round equal and unequal. Introduction to tubes and pipes. -Laying out pattern of 600 off-set 'T' pipe. Pattern Development of Y' pipe.
10.	31. Making a square duct elbow with snap	Method of galvanizing, tinning, anodising,

	block 32. Make a conical hopper by soldering	sheradising and Electroplating. Development and laying out of pattern of segmental quarter bend pipe
11	33. Setting up of Oxy-acetylene plant and types of flames 34. Setting up of Arc welding plant and striking & maintaining the arc & laying short beads	Need for ducting. Places where ducting is employed and the working principle of a dust cyclone. Safety precaution in gas & arc welding -Description of Oxyacetylene plant and the equipment's, accessories & tools
12	35. Fusion run with/without filler rod in flat position. 36. Square butt joint in flat position by gas. 37. Brazing copper sheet in lap joint in flat position.	Types of oxy-acetylene flames &its uses Types and description of flux Types of welding blow pipes .& its functions Various types of pipe joints.
13	**Assessment/Examination 03days**	

NOTE: -

More emphasis to be given on video/real-life pictures during theoretical classes. Some real-life pictures/videos of related industry operations may be shown to the trainees to give a feel of Industry and their future assignment.

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BASIC TRAINING (Block – II)

Duration: (03) Three Months

Week No.	Professional Skills (Trade Practical)	Professional Knowledge (Trade Theory)
1	38. Introduction to machinery safety including firefighting equipment and their uses etc 39. Locked groove joint by aluminum sheet 40. Single riveted lap joint by aluminum sheet. 41. Double strap single row riveted butt joint by aluminum sheet	Review of Types of sheet metal Fabrication. Methods of developments. Ferrous and Non-Ferrous metals. Use of Copper and Alloy Chemical and Physical properties of Aluminium. Use of Aluminium and its Alloys.
2	42. Exercise involving practical work on Aluminium Sheet, and using Pop Rivet. 43. Aluminium Windows with. Different extruded sections, Aluminium Soldering.	Brief Description of hand punch machine. Angles for Drilling Sheet Metals, effect of speed, Feed Cutting Fluids, etc., on metals. Difference between drilled and punched holes.
3	44. Making holes in sheet metal using Punching Machine. 45. Making holes in sheets with a twist drill. 46. Practice in Drilling Holes in walls and Ceilings as applied to ducting work.	Description of swaging and beading machine, its parts, operating principles etc. Method to calculate the pressure adjustment. Clearance between Die and Punch.
4	47. Practice on hollowing and raising on non-ferrous sheet as well as ferrous sheet. 48. Practice on pipe bending by hand. 49. Development of a cone: Cylinder fitted to a cone. Equal dia pipe joint with crimping and Ogee beading.	Properties of stainless steel and its uses. Properties and uses of tin, lead, zinc and silver. Introduction to pipe/tube bending. Description of roll forming machine types and operating principles, description of slip roll forming machine and its function
5	50. Typical folding, Bending Practice, Making 51. Steel-Racks, Reinforcement with angle iron. 52. Use of self taping screws and other fasteners. 53. Making a cylindrical medicine container of Aluminium Sheet.	Use of Die and Die Holder, Description of taps and tap wrench. Method to operate folding/brake folder for typical folding.
6	54. Practice of Buffing and polishing 55. Angle iron bending in different angles and different radii. Twisting the M.S. square rod and flats.	Definition of Planishing and its application. Brief description of polishing machine. Various types of bobs and polishing compounds.
7	56. Gas welding Square butt joint on M.S.	Different process of metal joining types of

	sheet in down hand position. Fillet Tee & Lap joint on 57. M.S sheet in down hand position. 58. Pipe butt joint in down hand position 59. Butt joint on MS flat in down hand position by arc	weld joint &weld positions. Oxy-acetylene welding equipments & application. Principle of arc welding. Types of welding machines and their uses.
8	60. Spot welding, seam welding. 61. Deposit bead on MS sheet in flat position. Lap joint T joint and butt joint in down hand position.	Arc length and its importance Welding defects Welding symbols Welding equipments and accessories.
9	62. TIG welding. Deposit bead on SS sheet in flat position. Making butt, Tee and corner joint.	TIG welding process. Advantages. Description of equipments. Types of Tungsten Electrodes, Filler rods, Shielding Gases. Defects, causes and remedy in TIG welding process
10	63. MS/SS pipe butt and Y joint by TIG welding process.	Specification of aluminium channels angles, strips, tubes beadings, packing rubber, cardboard, glasses etc.
11	64. Electrical Panel, trunk boxes & ducts 65. Fabrication and Painting .	Tools and equipments used in aluminium fabrication. Process of painting. Spray painting. Etch primer Painting, Powder coating, buffing, grinding, and sanding..
12	66. Any Special Exercises: Repairing 67. Mudguard and Radiators and testing of 68. Sheet metal containers.	Material handling: handling of light, medium and heavy materials. Estimation and costing
13	**Assessment/Examination 03days**	

NOTE: -

- *More emphasis to be given on video/real-life pictures during theoretical classes. Some real-life pictures/videos of related industry operations may be shown to the trainees to give a feel of Industry and their future assignment.*

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9. SYLLABUS - CORE SKILLS

9.1 WORKSHOP CALCULATION SCIENCE & ENGINEERING DRAWING

Block – I		
Sl. No.	**Workshop Calculation and Science (Duration: - 20 hrs.)**	**Engineering Drawing (Duration : - 30 hrs.)**
1.	Units & Measurements- FPS, CGS, MKS/SI unit, unit of length, Mass and time. Fundamentals and derived units Conversion of units and applied problems.	Engineering Drawing: Introduction and its importance Different types of standards used in engineering drawing. Drawing Instruments: their uses 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.	Material Science : properties -Physical & Mechanical, Types -Ferrous & Non-Ferrous, difference between Ferrous and Non-Ferrous metals	Lines : types and applications in Drawing as per BIS SP:46-2003 Drawing geometrical object using all types of lines. Drawing of Geometrical Figures: Angle, Triangle, Square, Rectangle and Circle. Letters: - Lettering styles, Single stroke letters and numbers as per IS standard. Lettering practice
3.	Mass .Weight and Density : Mass, Unit of Mass, Weight, difference between mass and weight, Density, unit of density,	Dimensioning- Types of dimension, elements of dimensions, Methods of indicating Values, Arrangement, Alignment and indication of dimensions. Scales:-Types use and construction. Representative factor of scale.
4.	Speed and Velocity: Rest and motion, speed, velocity, difference between speed and velocity, acceleration, retardation. Average Velocity, Acceleration & Retardation. Related problems. Circular Motion: Relation between circular motion and Linear motion, Centrifugal force, Centripetal force	Method of presentation of Engineering Drawing - Pictorial View - Orthogonal View - Isometric view
5.	Ratio & Proportion : Simple calculation on related problems. Percentage: Introduction, Simple calculation.	Constructions: - Draw proportionate free hand sketches of plane figures. Sketch horizontal, vertical and inclined line by free hand, Draw

		circles by free hand using square and radial line method, Draw arcs and ellipse by free hand
6.	Work, Power and Energy: work, unit of work, power, unit of power, Horse power of engines, mechanical efficiency, energy, use of energy, potential and kinetic energy, examples of potential energy and kinetic energy. Meaning of H.P., I.H.P., B.H.P., and F.H.P. and CC and Torque.	Projections: Concept of axes plane and quadrant. Orthographic projections Method of first angle and third angle projections (definition and difference) Symbol of 1st angle and 3rd angle projection as per IS specification. Free hand Drawing of Orthographic projection from isometric/3D view of geometrical blocks

Block – II		
Sl. No.	**Workshop Calculation and Science (Duration: - 20 hrs.)**	**Engineering Drawing (Duration : - 30 hrs.)**
1.	Algebra: Addition, Subtraction, Multiplication, Division, Algebraic formula, Linear equations (with two variables).	Screw :- Its Types and Sizes, Screw thread, their standard forms as per BIS, external and internal thread.
2.	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.	Rivets and Joints:- Prepare a drawing sheet on rivets nomenclature and Joints.
3.	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. Volume of cut-out solids: hollow cylinders, frustum of cone, block section. Volume of simple solid blocks.	Free hand Sketches for simple pipe line with general fittings.
4.	Basic Electricity: Introduction, use of electricity, how electricity is produced, Types of current_ AC, DC, their comparison, voltage, resistance, their units. Conductor, insulator, Types of connections - series, parallel, electric power, Horse power, energy, unit of electrical energy. Concept of earthling.	Reading of drawing. Simple exercises related to missing lines, dimensions. How to make queries.

5.	Simple machines Transmission of power: - Transmission of power by belt, pulleys & gear drive. Heat treatment process: - Heat treatment and advantages. Annealing, Normalizing, Hardening, Tempering.	Simple exercises related to trade related symbols. Basic electrical and electronic symbols
6.	Trigonometry: Trigonometrical ratios, measurement of angles. Trigonometric tables. Finding the value of unknown sides and angles of a triangle by Trigonometrical method. Finding height and distance by trigonometry. Application of trigonometry in shop problems. (viz. taper angle calculation). Calculate the area of triangle by using trigonometry and application of Pythagoras theorem.	Free hand sketch of trade related components / parts /cutting tool indicating angles.
7.	Concept of pressure - Definition:-Force, Pressure, and their units, atmospheric pressure, gauges used for measuring pressure, problems. Introduction to pneumatics & hydraulics systems.	Free hand sketch of trade related components / parts /cutting tool indicating angles.
8.	Simple exercises related to trade related Test Papers. Solution of NCVT test papers	

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9.2 EMPLOYABILITY SKILLS
(DURATION: - 110 HRS.)

Block – I (Duration – 55 hrs.)	
1. English Literacy	Duration : 20 Hrs. Marks : 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	Duration : 20 Hrs. Marks : 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	Duration : 15 Hrs. Marks : 07
Introduction to Communication Skills	Communication and its importance Principles of Effective communication Types of communication - verbal, non verbal, written, email, talking on phone. Non verbal 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
Block – II **Duration – 55 hrs.**	
4. Entrepreneurship Skills	Duration : 15 Hrs.

	Marks : 06
Concept of Entrepreneurship	Entrepreneur - Entrepreneurship - Enterprises:-Conceptual issue Entrepreneurship vs. management, Entrepreneurial motivation. Performance & Record, Role & Function of entrepreneurs in relation to the enterprise & relation to the economy, Source of business ideas, Entrepreneurial opportunities, The process of setting up a business.
Project Preparation & Marketing analysis	Qualities of a good Entrepreneur, SWOT and Risk Analysis. Concept & application of PLC, Sales & distribution Management. Different Between Small Scale & Large Scale Business, Market Survey, Method of marketing, Publicity and advertisement, Marketing Mix.
Institutions Support	Preparation of Project. Role of Various Schemes and Institutes for self-employment i.e. DIC, SIDA, SISI, NSIC, SIDO, Idea for financing/ non financing support agencies to familiarizes with the Policies /Programmes & procedure & the available scheme.
Investment Procurement	Project formation, Feasibility, Legal formalities i.e., Shop Act, Estimation & Costing, Investment procedure - Loan procurement - Banking Processes.
5. Productivity	Duration : 10 Hrs. Marks : 05
Benefits	Personal / Workman - Incentive, Production linked Bonus, Improvement in living standard.
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 and Environment Education	Duration : 15 Hrs. Marks : 06
Safety & Health	Introduction to Occupational Safety and Health importance of safety and health at workplace.
Occupational Hazards	Basic Hazards, Chemical Hazards, Vibroacoustic Hazards, Mechanical Hazards, Electrical Hazards, Thermal Hazards. Occupational health, Occupational hygienic, Occupational Diseases/ Disorders & its prevention.
Accident & safety	Basic principles for protective equipment. 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 provision legislation of India. safety, health, welfare under legislative of India.
Ecosystem	Introduction to Environment. Relationship between Society and Environment, Ecosystem and Factors causing imbalance.
Pollution	Pollution and pollutants including liquid, gaseous, solid and hazardous waste.
Energy Conservation	Conservation of Energy, re-use and recycle.
Global warming	Global warming, climate change and Ozone layer depletion.
Ground Water	Hydrological cycle, ground and surface water, Conservation and Harvesting of water.
Environment	Right attitude towards environment, Maintenance of in -house environment.
7. Labour Welfare Legislation	Duration : 05 Hrs. Marks : 03
Welfare Acts	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	Duration : 10 Hrs. Marks : 05
Quality Consciousness	Meaning of quality, Quality characteristic.
Quality Circles	Definition, Advantage of small group activity, objectives of quality Circle, Roles and function of Quality Circles in Organization, 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 House-keeping, Practice of good Housekeeping.
Quality Tools	Basic quality tools with a few examples.

10. DETAILS OF COMPETENCIES (ON-JOB TRAINING)

The **competencies/ specific outcomes** on completion of On-Job Training are detailed below: -

Block – I

1. Practice and understand precautions to be followed while working in sheet metal jobs.
2. Prepare different types of documentation as per industrial need by different methods of recording information.
3. Safety and best practices/Basic Industrial Culture (5S, KAIZEN, etc.)
4. Prepare different types of documentation as per industrial need by different methods of recording information.
5. Development in radial line method, triangulation method, geometrical constructions etc.
6. Selects sheet of required type, thickness (gauge) and size and mark it with scriber, square, divider, foot rule etc., according to drawing or sample.
7. Use of different machines of sheet metal section.
8. Shear sheet metal by machine or hand shear and make it to required shape and size by bending, seaming, forming, riveting, soldering etc., using mallets, hammers, formers, sets, stakes, etc.
9. Performs soldering, brazing
10. Makes sheet metal different articles according to drawing or sample.
11. Sheet metal forming processes: Shearing, Forming and Finishing.

Block – II

12. Undertakes Aluminium frame works and other sheet metals such as tin, copper, brass.
13. Undertake repair work of different sheet metal components.
14. Transferring the measurement, Finding out centre of a round bar using dividers, calipers, combination set etc.
15. Spray painting, Galvanizing, Sheradizing, Electroplating/Iron, Nickel plating, Tinning.
16. Use of Duralumin Rivet, Riveting: Using Pop riveting Gun.
17. Metal Spinning.
18. Gas cutting of Sheets/Plates.
19. Use of power operated machines/tools such as portable pneumatic grinder/chisel/nibbler/riveter etc.
20. Use of Hydraulic Press Tools, Practice on deep drawing by press tools.
21. Practice on triangulation line method of development for Ducting.
22. Repairing of damaged mudguard using wheeling and raising machine.

23. Use of jigs and fixtures.
24. Making Twisted Duct, oblong duct for room cooler or air conditioner using Aluminium Alloy Metal. Principle of Ductwork for air handling systems in industry and types and PEB Work (Pre Engineering Building structure).
25. Practice on bus body building work.
26. Practice on Argon Welding, MIG and TIG Welding Projection, Seam and Resistance spot welding (RSW) machines.
27. Further practice on tube bending (both ferrous and non-ferrous).
28. Perform TPM (Total Productive Maintenance), TQM (Total Quality Management) and record keeping system.
29. Accuracy testing of Machine tools such as geometrical parameters.
30. Dismantling and mounting of pulleys.
31. Use simple jigs and fixtures for drilling.
32. Dismounting, repairing damaged gears and mounting and check for workability.
33. Repair& replacement of belts and check for workability.
34. Maintenance, troubleshooting, and safety aspects of pneumatic and hydraulic systems (The practical for this component may demonstrated by video.

Note:

1. Industry must ensure that above mentioned competencies are achieved by the trainees during their on job training.

2. In addition to above competencies/ outcomes industry may impart additional training relevant to the specific industry.

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ANNEXURE – I

INFRASTRUCTURE FOR PROFESSIONAL SKILL & PROFESSIONAL KNOWLEDGE

SHEET METAL WORKER			
LIST OF TOOLS AND EQUIPMENT for Basic Training (For 20 Apprentices)			
A. TRAINEES TOOL KIT (For each additional unit trainees tool kit Sl. 1-18 is required additionally)			
Sl. no.	**Name of the Tool &Equipments**	**Specification**	**Quantity**
1.	Steel Rule	300 mm	20 Nos.
2.	Wing Divider	200 mm	20 Nos.
3.	Centre Punch	100 mm	20 Nos.
4.	Spring Dividers	150 mm	20 Nos.
5.	Ordinary Wooden Mallet	As per standard	20 Nos.
6.	Soldering Copper Hatchet Type	0.25 kg	20 Nos.
7.	Cross Peen Hammer with handle	0.25 kg	20 Nos.
8.	Protractor with blade	150mm	20 Nos.
9.	Steel tape	2 mtrs.	20 Nos.
10.	Ballpene hammer with handle	0.5kg	20 Nos.
11.	Scriber (Engineer's)	150 mm x 3 mm	20 Nos.
12.	Prick punch	100mm	20 Nos.
B : INSTRUMENTS & GENERAL SHOP OUTFIT			
13.	Steel Square	450 mm x 600 mm	4 Nos.
14.	Sheet Metal Gauge	As per standard	1 No
15.	Hatcher Stake	As per standard	4 Nos.
16.	Stake Round and Bottom	As per standard	4 Nos.
17.	Half Moon Stake	As per standard	4 Nos.
18.	Funnel Stake	As per standard	4 Nos.
19.	Anvil Face Stake	As per standard	4 Nos.
20.	Bick Iron Stake	As per standard	4 Nos.
21.	Tinman's Horse	As per standard	2 Nos.
22.	Hammer Peaning with handle	As per standard	4 Nos.
23.	Hammer Creasing with handle	As per standard	4 Nos.
24.	Hammer Planishing with handle	As per standard	4 Nos.
25.	Hammer Block with handle	As per standard	2 Nos.

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26.	Shear Tinman	300mm	8 Nos
27.	Snip straight	As per standard	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 second cut	250 mm	2 Nos.
37.	File flat smooth	250 mm	2 Nos.
38.	File flat bastard	300 mm	2 Nos.
39.	File half round smooth	300 mm	2 Nos.
40.	Hacksaw frame adjustable (Tubular)	300 mm	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 each (parallel Shank)	3 mm, 4 mm & 6mm	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. (Set of 12 spanner)	(6 mm to 32mm)	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.
C : GENERAL MACHINERY INSTALLATIONS			
75.	Bench leaver shears	250 mm Blade x 3mmCapacity	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	300 mm dia	1 set
82.	Pillar type drilling machine	12 mm	1 No.
83.	Slip roll former mm	1.6. mm x 1000	1 No.
84.	D.E. Grinder Pedestal motorised	200 mm	1 No.
85.	Anvil with Stand	50 kgs	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
99.	Fire buckets with Stand-		4, Nos.
100.	Black Board with Easel .		1 No.
101.	Wooden Stool	450.mm.	1 No.
102.	Portable Nibbler		2 Nos.
103.	Portable Pneumatic Shear.		2 Nos.
104.	Pipe Bending Machine (Hydraulic Type)	12 mm to 30 mm	1 No.
105.	Hand Press Brake	Capacity (0.8 mm)	1 No.
106.	Beading Machine (with crimping rollers)	380 mm throat clearance	1 No.
107.	Tin .smiths bench folder	600 x 1.6 mm	1 No.
108.	Gas Welding Table	1220 mm x 760 mm	1 No.
109.	Spot Welding Machine		1 No.
110.	Arc welding Transformer/ Rectifier/Inverter with accessories	300Amps	1 set
111.	Co_2 welding machine complete set	300Amps	1 set
112.	TIG welding machine complete set	200 Amps	1 set
113.	Universal cutting machine		1 No.

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INFRASTRUCTURE FOR WORKSHOP CALCULATION & SCIENCE AND ENGINEERING DRAWING

TRADE: SHEET METAL WORKER

LIST OF TOOLS& EQUIPMENTS FOR -20APPRENTICES

1) **Space Norms** : 45 Sq.m.(For Engineering Drawing)

2) Infrastructure:

A : TRAINEES TOOL KIT:-			
Sl. No.	**Name of the items**	**Specification**	**Quantity**
1.	Draughtsman drawing instrument box		20
2.	Set square celluloid 45	^{o} (250 X 1.5 mm)	20
3.	Set square celluloid 30^{o}-60^{o}	(250 X 1.5 mm)	20
4.	Mini drafter		20
5.	Drawing board IS: 1444	(700mm x500 mm)	20
B : Furniture Required			
Sl. No.	**Name of the items**	**Specification**	**Quantity**
1	Drawing Board		20
2	Models : Solid & cut section		as required
3	Drawing Table for trainees		as required
4	Stool for trainees		as required
5	Cupboard (big)		01
6	White Board (size: 8ft. x 4ft.)	(size: 8ft. x 4ft.)	01
7	Trainer's Table		01
8	Trainer's Chair		01

TOOLS &EQUIPMENTS FOR EMPLOYABILITY SKILLS		
Sl. No.	**Name of the Equipment**	**Quantity**
1.	Computer (PC) with latest configurations and Internet connection with standard operating system and standard word processor and worksheet software	10 Nos.
2.	UPS - 500VA	10 Nos.
3.	Scanner cum Printer	1 No.
4.	Computer Tables	10 Nos.
5.	Computer Chairs	20 Nos.
6.	LCD Projector	1 No.
7.	White Board 1200mm x 900mm	1 No.
Note: - Above Tools &Equipments not required, if Computer LAB is available in the institute.		

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FORMAT FOR INTERNAL ASSESSMENT

Name & Address of the Assessor :			**Year of Enrollment :**
Name & Address of ITI (Govt./Pvt.) :			**Date of Assessment :**
Name & Address of the Industry :			**Assessment location: Industry / ITI**
Trade Name :	**Semester:**		**Duration of the Trade/course:**
Learning Outcome:			

Sl. No	**Candidate Name**	**Father's/Mother's Name**	Safety consciousness (15)	Workplace hygiene (5)	Attendance/ Punctuality (10)	Ability to follow Manuals/ Written instructions (5)	Application of Knowledge (10)	Skills to handle tools & equipment (10)	Economical use of materials (5)	Speed in doing work (10)	Quality in workmanship (15)	VIVA (15)	**Total internal assessment Marks**	**Result (Y/N)**
1														
2														

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