FORGER & HEAT TREATER

COMPETENCY BASED CURRICULUM

(Duration: 2 Yrs.)

APPRENTICESHIP TRAINING SCHEME (ATS)

NSQF LEVEL- 5

SECTOR – PRODUCTION & MANUFACTURING

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

FORGER & HEAT TREATER

(Revised in 2018)

APPRENTICESHIP TRAINING SCHEME (ATS)

NSQF LEVEL - 5

Developed By

Ministry of Skill Development and Entrepreneurship
Directorate General of Training
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Co-ordinator for the course: Sh. Nirmalya Nath., ADT, CSTARI- Kolkata

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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.

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.

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.

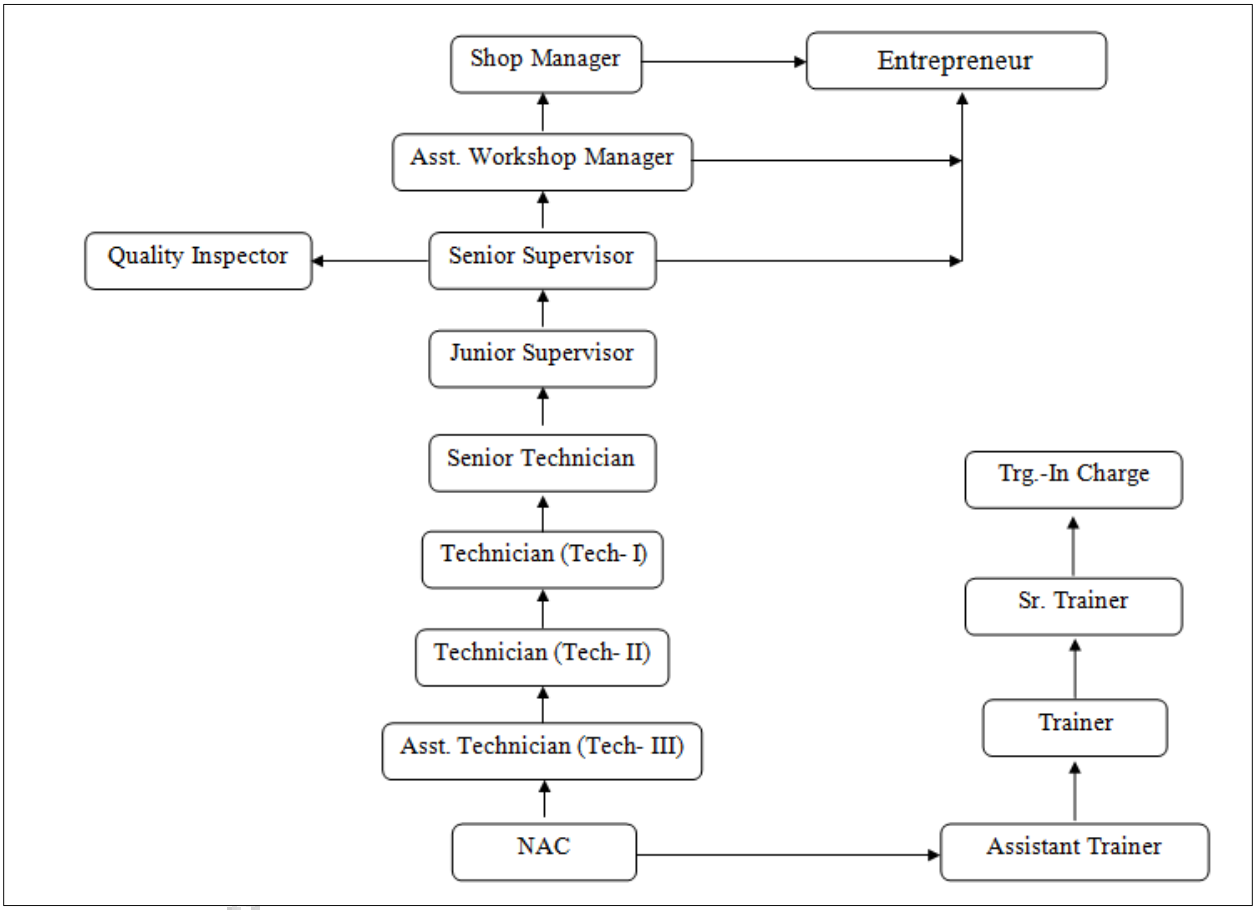
Forger & Heat Treater trade under ATS is one of the most popular courses delivered nationwide through different industries. The course is of two years (02 Blocks) duration. It mainly consists of Domain area and Core area. In the Domain area Trade Theory & Practical impart professional - skills and knowledge, 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.

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.



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 (section-2.4.2). 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 (section-2.4.2) 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:

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:

Forger & Heat Treater Blacksmith; Forges metal required shape and size by processes heating, bending, hammering etc. Heats metal and furnace to required degree of temperature. Places it on anvil holding it with tongs and forges it to required shape and size by hammering either himself or by Hammer man. May use swages, sets from tools, jigs, etc. according to shape required. May weld by forging (joining two pieces with brass and borax by heating), and work by cold process is designated as ANGLESMITH OR SPRING SMITH if specialized in working on angle iron or in making springs.

Forger & Heat Treater Hammer Operator; Forging Machine Operator forges iron or steel to required dimensions by heating and hammering with power hammer. Heats metal red hot and adjusts it below hammer on anvil with tongs. Holds it firmly with tongs and operates hammer by paddle or signals to Lever man to operate power hammer with required force and momentum. Turns sides of metal by tongs for hammering according to requirements. May heat or get metal heated number of times according to necessity. May finish article by himself striking it with hand hammer.

Forger & Heat Treater Hammer man; Striker hammers iron and steel to required dimension with sledges according to direction of Blacksmith. Selects sledge according to nature of forging and strikes hot metal hard or light as per direction of Blacksmith. May also work by cold process.

Stamper; Drop Forger shapes articles from metal pieces by using dies and drop forging or stamping machine. Sets required die and punch securely in machine, heats metal to red hot and firmly places it on die holding it with long tongs. Signals Stamper, Helper to bring punch down with force. Checks formation by sight and adjusts position of material every time before strike. Applies oil, saw dust or powdered coal on die before stamping. May reheat and handle more than one set of die for completing article. May also work by cold process in case of hammer dies and metal sheets.

Forger & Heat Treater Blacksmiths, Hammer- smiths and Forging-press Workers, other perform variety of routine and low skilled tasks not elsewhere classified, in smithy section such as operating levers of power hammer, pulling string of drop forging machine, assisting Forging Machine Operator in placing material on anvil or carrying it off and are designated according to nature of work done.

Heat Treater controls heat-treating furnaces, baths and quenching equipment to alter physical and chemical properties of metal objects, using specifications and methods of controlled heating and cooling, such as hardening, tempering, annealing, case-hardening, and normalizing: Determines temperature and time of heating cycle, and type and temperature of

baths and quenching medium to attain specified hardness, toughness, and ductility of parts, using standard heat-treating charts, and utilizing knowledge of heat-treating methods, equipment, and properties of metals. Adjusts furnace controls and observes pyrometer to bring furnace to prescribed temperature. Loads parts into furnace. Removes parts after prescribed time and quenches parts in water, oil, brine, or other bath, or allows parts to cool in air. May test hardness of parts. May set up and operate die-quenching machine to prevent parts from warping. May set up and operate electronic induction equipment to heat objects.
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.

Reference NCO 2015:

1. 8131.2200 – Heat Treater
2. 7221.0500 - Stamper/ Forging Operator

4. NSQF LEVEL COMPLIANCE

NSQF level for Forger & Heat Treater 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 **Forger & Heat Treater** 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	**FORGER & HEAT TREATER**
NCO-2015	8131.2200, 7221.0500
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 Apprentices	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 trades 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 Forger & Heat Treater Apprenticeship	1. Heat Treater 2. Stamper/Forging operator

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 Forger & Heat Treater 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 -Work, Power & Energy, Algebra, Geometry & Mensuration, Trigonometry, Heat & Temperature, Levers & Simple machine, graph, Statistics, Centre of gravity, Power transmission, Pressure]*
3. Interpret specifications, different engineering drawing and apply for different application in the field of work. *[Different engineering drawing-Geometrical construction, Dimensioning, Layout, Method of representation, Symbol, scales, Different Projections, Machined components & different thread forms, Assembly drawing, Sectional views, Estimation of material, Electrical & electronic symbol]*
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. Recognize & comply safe working practices, environment regulation and housekeeping.
2. Prepare different types of documentation as per industrial need by different methods of recording information.
3. Familiarization, Introduction to the trade importance, machinery used in the trade.
4. Perform to safety including fire fighting Equipment's and their use.
5. Method of heating iron, use of various Fire Zones in a forge while heating.

6. Perform of process used to hammers and cold chisels.
7. Set up method for process jumping operations- Full, Middle and End.
8. Observed to all Forging of various chisels, flat, crosscut, Diamond point, flat taper, Round taper, Square and Hexagon tapers with correct size and Round Nose etc.
9. Observed to Forging of Bolts & Rivets by using Bolster, Spanners, use of punches and drifts.
10. Perform to Bending of solid Bars in different cross sections. Cold and Hot method.
11. Perform to different shape on Filing Practice. Uses of various Files. Grinding practice.
12. Marking, Punching, Chipping, Drilling, Taping, Threading and Hack sawing.
13. Observed to different process of Hardening and tempering of chisels and other cutting tools. Use of colour chart. Practice of annealing & Normalizing.
14. Perform to different types of forgings such as Cube, Die casts, Using of power Hammer.
15. Set up to Riveting practice (Cold and hot) process..
16. Learn out come to different types of furnaces.
17. Perform to forger & heat treater different type operate Drop forging machines.
18. Non-conventional heat treatment process
19. Perform to Hardness testing methods & scales

Block – II

20. Perform to different shape of Forge welding practice on rounds, Square and Flat Bars. Lap Welding on Links & ring.
21. Perform to many type joint Forge Butt welding practice on thicker section, welding practice on Low and High carbon steel bars.
22. Perform to different types forgings process of Hand forging agricultural implements and hand tools.
23. Setup to Fabricating small cylindrical cans, buckets, rectangular containers from sheet metal.
24. Observe to Soldering and joining of ferrous and non-ferrous components (Soft & Hard).
25. Perform brazing the tool tips with holder.
26. Making of coil spring and tempering.
27. Perform to Bending of steel pipes and strips to different radius and angles.
28. Making set of leaf spring and tempering.
29. Lay outcome to Assembling:
    (a) Male and female fitting.
    (b) Parts by riveting so as to make complete unit according to drawing.
30. Perform to many type Operations of Pneumatic power hammer, Steam hammer, Hydraulic Presses etc.

31. Observe to Forge the Lever double eyes, Bell crank lever Double ended spanner (stamping).
32. Perform to Heat treatment of forged components. Case hardening in steel, Carburising, Cyaniding and nitriding, Flame hardening, Induction hardening, Studying of hardness of case hardening parts at different places in its cross section (case and depth).
33. Setup tempering of hardened steel at different temperatures for varying carbon to be checked after every exercises.
34. Check out to Hardening of steel at different temperatures, different carbon contents and hardness to be checked after every exercise.
35. Check out to Annealing of steel of various carbon contents. Exercises to be carried out at their corresponding annealing temperatures. Hardness of part to be checked before and after annealing.
36. Check out to allowances for forged components-shrinkage allowances for different steels and non ferrous metals. A chart is to be prepared; it is to be verified by actually measuring the components dimensions.
37. Perform to Ergonomics - Handling methods of heavy parts
38. Check out to Pollution control standards - Forging & Heat treatment
39. Check out to Inspection and acceptance, methods of forged and heat treated material-detection of micro cracks, internal cracks, surface cracks, ISO standards.
40. Perform to TPM process (Total Productive Maintenance), TQM (Total Quality Management) and record keeping system.

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

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	2.1 Explain concept of basic science related to the field such as Material science, Mass, weight, density, speed, velocity, heat & temperature, force, motion,

field of study including basic electrical and apply in day to day work.*[Different mathematical calculation & science -Work, Power & Energy, Algebra, Geometry & Mensuration, Trigonometry, Heat & Temperature, Levers & Simple machine, graph, Statistics, Centre of gravity, Power transmission, Pressure]*	pressure, heat treatment, centre of gravity, friction.
	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-Geometrical construction, Dimensioning, Layout, Method of representation, Symbol, scales, Different Projections, Machined components & different thread forms, Assembly drawing, Sectional views, Estimation of material, Electrical & electronic symbol]*	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	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

to improve productivity & quality.	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	
<u>Block-I & II (Section:10)</u>	
*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.	Safety: - its importance, classification, personal, general, workshop and job safety. Occupational health and safety. Basic injury prevention, Basic first aid, Hazard identification and avoidance, safety signs for Danger, Warning, caution & personal safety message. Preventive measures for electrical accidents & steps to be taken in such accidents. Importance of housekeeping & good shop floor practices. Disposal procedure of waste materials like cotton waste, metal chips/burrs etc. Fire& safety: Use of Fire extinguishers.	Importance of safety and general precautions observed in the in the industry/shop floor. All necessary guidance to be provided to the new comers to become familiar with the working of Institute system including stores procedures. 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. Accidents- Definition types and causes. First-Aid, nature and causes of injury and utilization of first-aid. Introduction to 5S concept & its application. Fire: - Types, causes and prevention methods. Fire Extinguisher, its types. Global warming its causes and remedies. Industrial Waste its types, sources and waste Management.
2.	Method of heating iron, use of various Fire Zones in a forge while heating.	Fuels used in forge shop. Anvil, swage block, dot punch tongs, hammers, chisels, Description, their uses and maintenance. Importance of sawing, method of sawing, frames and blade-centre punches.
3.	Method of Hand Hammer practice, Forging various cross sections.	Measuring and marking tools used in forging. Description their uses and maintenance.
4.	Use of Tongs, Hammers and Anvil etc. Reading of Brass Rule, use of caliper for measurement.	Metals –Ferrous Metals and Nonferrous; their physical and Mechanical properties. Forgeable Non-forgeable metals. Pig iron, cast-iron, wrought iron, steel properties and

		uses. Advantages of forging over other manufacturing process.
5.	Sledge Hammer practice, Drawing out, Jumping operations, method of various sledge-hammer, Fuller, Swages, and swage Block etc.	Hand forging operations, drawing out, jumping, cutting, Finishing, spreading, tapering.
6.	Forge flat taper, Round taper, Square and Hexagon tapers with correct size.	Steels and their classification, composition, properties uses. Punching-Method of punching, defects, remedies, effect of hot working and cold working changes in properties of steel on heating.
7.	Drawing out various cross sections of square, Round, Hexagon Octagon etc.	Process of the steel for forging-Oxidation and De carbonization. Defect in for and Remedies.
8.	Forging of various chisels, Flat, crosscut, Diamond point and, Round Nose etc.	Files classification, Selection of Files, for proper work. Equipment and tools used in Fitting shop. (Vice, Hammers, Chisels, marking Tools)
9.	Forging of Bolts & Rivets by using Bolster.	Need of heat-treatment for cutting tools, hardening and tempering of cutting tools by single heating and double heating method. Definition of Annealing and Normalizing Different between the above.
10.	Forging of Spanners, Box spanners and Ring spanners, use of punches and drifts.	Importance of power forging. Advantages and application in industry-importance of oil fired furnace-construction working principle.
11.	Bending of solid Bars in different cross sections. Cold and Hot method.	Various types of power hammer. Spring power hammer-pneumatic power hammer-working Principle-uses-operations and safety.
12.	Hardening and tempering of chisels and other cutting tools. Use of colour chart. Practice of annealing & Normalising of steel, by using open fire test by hammer.	Principle of drop hammer types-operations controlling the hammer blows-maintenance and Safety rules.
13.	**Internal 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.*

BASIC TRAINING (Block – II)

Duration: (03) Three Months

Week No.	Professional Skills (Trade Practical)	Professional Knowledge (Trade Theory)
1	Hardening and tempering of chisels and other cutting tools. Use of colour chart. Practice of annealing &Normalizing of steel, by using open fire test by hammer.	Annealing-Normalizing- Hardening and tempering process for plain carbon steel.
2.	Method of operating Oil Fired Furnace and power Hammer practice. Forging various cross section by using power Hammer. (a) Round to Square. (b) Square to Round	Allowance for various seems bending, swaging, plain shing and flattening of sheet. Different development methods of elbow, cones, bucket. Safety rules to be followed in sheet metal workshop.
3.	Drawing out and setting out operation using power hammer. Forging a cube using a power hammer.	Safety while working in heat treatment shops. Types of furnaces. Electrical oil fired, salt bath furnaces, Induction heater etc. Description and use.
4.	Forging different types of forgings such as Die casts the help of power Familiarization of tools and equipment used in sheet-metal: Practice on marking and cutting of sheets	Principle of Heat Treatment. Method of hardness Measurements, Rock well, Brinell and Vickers test. Iron carbon phase diagram for plain carbon steels, critical temperature, Structure of Ferrite, pearlite.
5	Practice on Forming different shapes in sheets Forming Funnel, Rectangular Boxes, Riveting and Grooving by using stakes. Fabrication of sheet metal container by soldering and Brazing.	Forging High speed steel tools temperature-used. Tools used- precaution to be followed. Allowance for forging,
6.	Safety precaution observed while using Electrical Furnace and construction detail of Heat-Treating Furnace. Operating of Furnace and their controls. (a) Oil Fired Furnace. (b) Electric Furnace (Direct and Indirect)	Importance of forge welding and its principle-welding fire scarfing, Types of welding joints-Lap-Butt joints cleft 'V' welding
7.	Observation of Temperature, distribution of Muffle Furnace and heating methods for various jobs.	Punching and drifting methods, different types of punches and drifts. Precaution should be observed while working on high

	Practice by using Rock well Hardness Tester. Identification of steel. By Spark test and sound test.	carbon steel. Method of equalizing temperature to avoid burning of steel. Surface Hardening method, Pack carburising, Gas carburising, Nitriding, carbontriding,
8.	Effect of different Quenching Medias on Handers steel, Brine cold water, oil, air and Warm water. Annealing, Normalizing, Hardening and Tempering operations by using Electrical oil Fired Furnace.	Heat Treatment of ferrous- Nonferrous metals.
9.	Forge Butt welding practice on thicker section, welding practice on Low and High carbon steel bar.	Heat-Treatment of Low Alloy, Steel-medium Alloy Steel and High Alloy steel.
10.	Forging and Eye-Bolt. Forging a Crane Hook. Forging spanners. Forging Carpentry Tools. (Firmer Chisel-Mortise chisel claw Hammer).	Working principle of Forging presses. Types, Safety rules forging operations Handling mechanisms etc.
11.	Forming of Lathe Tools. a. Screw cutting tool. b. Parting tool. c. Boring tool. d. From tool.	Time-Temperature and transformation diagram and cooling curves for different steels.
12.	Hardening and tempering of-high speed steel and aprong steel. Heat treatment of stainless steel. Forging an Adze by Forge welding, Grinding and Heat treatment.	General information on automatic Forging and stamping machine. Estimation of cost of forged and Heat-Treatment. Study of Forging defects, Fabrication defects, Heat Treatment Defects etc.
13.	**Internal 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.*

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.	**Constructions: -** Draw proportionate free hand sketches of plane figures. Sketch

	Percentage: Introduction, Simple calculation.	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.	Free hand sketch of trade related components / parts /cutting tool indicating angles.

	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.	
7.	**Concept of pressure** - **Definition**:-Force, Pressure, and their units, atmospheric pressure, gauges used for measuring pressure, problems. Introduction to pneumatics & hydraulics systems.	
8.	**Simple exercises related to trade related Test Papers. Solution of NCVT test papers.**	

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 /Program me 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	Basic Hazards, Chemical Hazards, Vibroacoustic Hazards, Mechanical

Hazards	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-JOBTRAINING)

BROAD LEARNING TO BE COVERED IN INDUSTRY FOR FORGER & HEAT TREATER TRADE:

1. Recognize & comply safe working practices, environment regulation and housekeeping.
2. Carry out the explain different mathematical calculation & science in the field of study including basic electrical.
3. Record keeping and documentation
4. Making components observing different metal removing procedure and perform different fitting job.
5. Assembling of different components as per requirement and check functionality.
6. Carryout maintenance of different machines including Forger & Heat Treater machine system.

Note: Actual training will depend on the existing facilities available in the establishments.

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

Block – I

1. Recognize & comply safe working practices, environment regulation and housekeeping.
2. Prepare different types of documentation as per industrial need by different methods of recording information.
3. Familiarization, Introduction to the trade importance, machinery used in the trade.
4. Method of heating iron, use of various Fire Zones in a forge while heating.
5. Using of hammers and cold chisels.
6. Jumping operations- Full, Middle and End.
7. Forging of various chisels, flat, crosscut, Diamond point, flat taper, Round taper, Square and Hexagon tapers with correct size and Round Nose etc.
8. Forging of Bolts & Rivets by using Bolster, Spanners, use of punches and drifts.
9. Bending of solid Bars in different cross sections. Cold and Hot method.
10. Filing Practice. Uses of various Files. Grinding practice.
11. Marking, Punching, Chipping, Drilling, Taping, Threading and Hack sawing.
12. Hardening and tempering of chisels and other cutting tools. Use of colour chart. Practice of annealing & Normalizing.
13. Different types of forgings such as Cube, Die casts, Using of power Hammer.
14. Riveting practice (Cold and hot).
15. Drop forging of machines parts.
16. Non-conventional heat treatment process
17. Hardness testing methods & scales

Block – II

18. Forge welding practice on rounds, Square and Flat Bars. Lap Welding on Links & ring.
19. Forge Butt welding practice on thicker section, welding practice on Low and High carbon steel bars.
20. Hand forging of items of agricultural implements and hand tools.
21. Fabricating small cylindrical cans, buckets, rectangular containers from sheet metal.
22. Soldering and joining of ferrous and non-ferrous components (Soft & Hard).
23. Brazing the tool tips with holder.
24. Making of coil spring and tempering.
25. Bending of steel pipes and strips to different radius and angles.
26. Making set of leaf spring and tempering.
27. Assembling:
28. Male and female fitting.
29. Parts by riveting so as to make complete unit according to drawing.
30. Operations of Pneumatic power hammer, Steam hammer, Hydraulic Presses.
31. Forge the Lever double eyes, Bell crank lever Double ended spanner (stamping).
32. Heat treatment of forged components. Case hardening in steel, Carburising, Cyaniding and nitriding, Flame hardening, Induction hardening, Studying of hardness of case hardening parts at different places in its cross section (case and depth).
33. Tempering of hardened steel at different temperatures for varying carbon to be checked after every exercises.
34. Hardening of steel at different temperatures, different carbon contents and hardness to be checked after every exercise.
35. Annealing of steel of various carbon content. Exercises to be carried out at their corresponding annealing temperatures. Hardness of part to be checked before and after annealing.
36. Allowances for forged components-shrinkage allowances for different steels and non ferrous metals. A chart is to be prepared; it is to be verified by actually measuring the components dimensions.
37. Ergonomics - Handling methods of heavy parts
40. Pollution control standards - Forging & Heat treatment
41. Inspection and acceptance, methods of forged and heat treated material-detection of micro cracks, internal cracks, surface cracks, ISO standards.
42. Perform TPM (Total Productive Maintenance), TQM (Total Quality Management) and record keeping system.

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.

ANNEXURE – I

INFRASTRUCTURE FOR PROFESSIONAL SKILL & PROFESSIONAL KNOWLEDGE

FORGER & HEAT TREATER			
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.	Goggles	As per standard requirement	16 pairs.
2.	Gloves	As per standard requirement	16 pairs.
3.	Apron leather	106 cm	16 pairs.
4.	Blacksmiths safety boots	As per standard requirement	16 pairs.
B : INSTRUMENTS & GENERAL SHOP OUTFIT			
5.	Brass Rule	300 mm	8 nos.
6.	Calipers outside	20 cm	8 nos.
7.	Calipers inside	20 cm	8 nos.
8.	Compass wing	20 cm	8 nos.
9.	Smith square	45cm x 30 cm	8 nos.
10.	File flat rough double cut	35 cm	8 nos.
11.	File half round rough	25 cm	8 nos.
12.	File square rough	25 cm	8 nos.
13.	File triangular rough	20 cm	8 nos.
14.	Hardia or bottom sit for anvil	5 cm	4 nos.
15.	Tong bolt	300, 500, 1000, 1500 mm	6 each
16.	Tong side	300, 500, 1000, 1500 mm	6 each
17.	Tong flat	300, 500, 1000, 1500 mm	6 each
18.	Tong round	300, 500, 1000, 1500 mm	6 each
19.	Tong hollow bit	300, 500, 1000, 1500 mm	6 each
20.	Set cold rounded	2.5 x 20 cm	16 nos.
21.	Chisel cold flat	As per require	16 nos.
22.	Chisel cold flat	6 mm	16 nos.
23.	Flatter rounded square	63 mm	4 nos.
24.	Swage top rounded	12 mm	4 nos.

25.	Swage top rounded	19 mm	4 nos.
26.	Swage top rounded	25 mm	4 nos.
27.	Fuller top rounded	6 mm	4 nos.
28.	Fuller top rounded	12 mm	4 nos.
29.	Fuller top rounded	19 mm	4 nos.
30.	Fuller bottom	6 mm	4 nos.
31.	Fuller bottom	12 mm	4 nos.
32.	Fuller bottom	19 mm	4 nos.
33.	Swage bolster in set of 3	12 x 15 x 19 mm	2 sets.
34.	Centre punch	10 cm	2 nos.
35.	Punch round	19 to 38 mm x 6 mm raising	2 sets.
36.	Punch round	6 to 15 mm x 3 mm raising	2 sets.
37.	Punch oval	25 x 12 mm	4 nos.
38.	Punch oval	25 x 38 mm	4 nos.
39.	Punch oval		4 nos.
40.	Hammer smith with. handled	1.8 kg	4 nos.
41.	Hammer smith with. handled	0.9 kg	4 nos.
42.	Swage bottom	5 mm	4 nos.
43.	Swage bottom	12 mm	4 nos.
44.	Swage bottom	14 mm	4 nos.
45.	Square mouth tong	As per require	4 nos.
46.	Blacksmith's bending link	As per require	4 nos.
47.	Blacksmith fork	As per require	4 nos.
48.	Blacksmith's levelling block with holes and accessories for bending	As per require	1 no.
49.	Steel rule	30 cm	8 nos.
50.	Try square engineers	15 cm	4 nos.
51.	Hacksaw frame adjustable	30 cm	4 nos.
52.	Hammer sledge double faced with handled	3.2 kg.	4 nos.
53.	Hammer sledge double faced with handled	6.3 kg.	2 nos.
54.	Hammer set handled	0.9 kg.	4 nos.
55.	Hammer set handled	1.8 kg.	2 nos.
56.	Rivet snap set of two	9 and 12 mm	2 sets.
57.	Goggles	As per require	1 pair
58.	Poker	As per require	1 pair
59.	Shovel	As per require	4 nos.

60.	B.S.W. taps and dies with set of suitable tap size drills	6 to 12 mm by 1.5 mm	1 set.
61.	Rake hand	As per require	4 nos.
62.	Hot set rounded	As per require	2 nos.
63.	Drill twist set	3 to 12 mm by 1.5 mm	1 set.
64.	Tank, water	15 x 75 x 4 cm	8 nos.
65.	Block swage	35 cm x 35 cm x 12	2 nos.
66.	Leg vice jaw	10 cm	2 nos.
67.	Work bench	182 cm x 91 cm x 6 cm	4 nos.
68.	Almirah cast iron or stainless steel	182 cm x 12 cm x 45 cm	1 no.
69.	Wheel barrow	As per require	1 no.
70.	Annealing box	25 x 10 x 25 cm	1 no.
71.	Metal rack	182 x 152 x 45 cm	2 nos.
72.	Steel lockers with drawers (standard size)	As per require	2 nos.
73.	Black board with easel	As per require	1 no.
74.	Fire extinguisher	As per require	2 nos.
75.	Fire buckets	As per require	4 nos.
76.	Safety blanket	As per require	1 no.
77.	Anvil london pattern.	150 kg	3 nos.
78.	Bench vice jaw	15 cm	4 nos.
79.	Mallet wooden	0.66 kg	4 nos.
80.	Soldering copper	0.27 kg	4 nos.
81.	Protractor with blade	As per require	2 nos.
82.	Tinman’s square	45 cm x 60 cm	4 nos.
83.	Standard sheet metal gauge	As per require	1 no.
84.	Stake ratchet	As per require	4 nos.
85.	Stake round & bottom	As per require	4 nos.
86.	Stake half moon	As per require	4 nos.
87.	Funnel	As per require	4 nos.
88.	Bick iron	As per require	4 nos.
89.	Horse	As per require	2 nos.
90.	Hammer greasing	As per require	4 nos.
91.	Hammer plasting	As per require	4 nos.
92.	Shear tinman’s	30 cm	8 nos.
93.	Snip straight	As per require	8 nos.
94.	Snip bend	As per require	8 nos.

95.	Hand shear universal	As per require	2 nos.
96.	Punch round	4 mm	4 nos.
97.	Revit sets and combined	4 mm	4 nos.
98.	Revit sets and combined	6 mm	4 nos.
99.	Groover	6 mm	4 nos.
100.	Groover	4 mm	4 nos.
101.	Blow lamp	4 pint	1 no.
102.	Blow lamp	1 pint	1 no.
103.	Drill hand	0 to 6 mm, 8 mm, 10 mm and 12 mm	2 nos.
104.	Hammer raising	0.45 kg.	2 nos.
105.	Soldering iron	425 mm	4 nos.
106.	Rawl punch holder and bits	As per require	2 nos.
107.	Hand vice	5 cm No. 1	2 nos.
108.	Brush steel wire	5 cm x 15 cm	4 nos.
109.	Gloves pairs for welding No. 1	As per require	4 nos.
110.	Trammel medium	As per require	1 no.
111.	Portable forge	As per require	2 nos.
112.	Welding plant oxy-acetylene complete (High pressure) (To be provided where no welding trade exists)	As per require	1 no.
C : GENERAL MACHINERY INSTALLATIONS			
113.	Forge with hood and chimney blowers forge capacity 1000 cft/main 15 cm water gauge pressure complete with electric motors, starter and switch with air pipe line cocks etc. complete set.	800-1000 cft /main 15 cm	8 nos.
114.	Blacksmith's cones	25 to 38 mm and 76 to 254 mm	2 nos.
115.	Lever shear hand operated blade	30 cm	1 no.
116.	Pipe bending machine manually operated		1 no.
117.	Pneumatic hammer	50 kg. with accessories capacity 30 cm stroke motorized	1 no.
118.	Pneumatic hammer with accessories motorized	100 kg.with capacity 50 cm stroke	2 nos.
119.	Pillar type drilling machine capacity.	12 mm	2 nos.
120.	Pedestal grinder with wheels.	20 cm	1 nos.

121.	Oil fired furnace for forging	forging 3 ft. x 3 ft. x 2 ½ heating range upto 1350 C	1 nos.
122.	Electric furnace rating about 12 kW., 440 volt, 3 phase up to 1000 C, 50 cycles chamber size 300 x 200 x 500 mm with automatic temperature pyrometers	Chamber size 300 x 2000 x 500 mm	1 no.
123.	Oil Quenching tank 50 liters capacity	50 liters	1 no.
124.	Water tank for quenching capacity about 50 liters.	50 liters	1 no.
125.	Rockwell hardness testing machine	ABC scale load 60, 100 and 150 kgs.	1 no.
126.	Alloy steel test pieces of known composition of at least 15 different steel pieces	-	1 no.
127.	Shearing machine for cutting flat, square round bars and planes hand operated (any smaller make)	Standard requirement	1 no.

INFRASTRUCTURE FOR WORKSHOP CALCULATION & SCIENCE AND ENGINEERING DRAWING

TRADE: FOREGER & HEAT TREATER

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+1 set
2.	Set square celluloid 45^o	(250 X 1.5 mm)	20+1 set
3.	Set square celluloid 30^o-60^o	(250 X 1.5 mm)	20+1 set
4.	Mini drafter		20+1 set
5.	Drawing board IS: 1444	(700mm x500 mm)	20+1 set
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.)	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.		

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														