FITTER (STEEL PLANT)

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

FITTER (STEEL PLANT)

(Revised in 2018)

APPRENTICESHIP TRAINING SCHEME (ATS)

NSQF LEVEL - 5

Developed By

Ministry of Skill Development and Entrepreneurship
Directorate General of Training
CENTRAL STAFF TRAINING AND RESEARCH INSTITUTE
EN-81, Sector-V, Salt Lake City,
Kolkata – 700 091

ACKNOWLEDGEME

The DGT sincerely expresses appreciation for the contribution of the Industry, State Directorate, Trade Experts and all others who contributed in revising the curriculum. Special acknowledgement to the following industries/organizations who have contributed valuable inputs in revising the curricula through their expert members:

Special acknowledgement is extended by DGT to the following expert members who had contributed immensely in this curriculum.

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

Sl. No.	Name & Designation Shri/Mr./Ms.	Organization	Mentor Council Designation
Expert group on restructuring of Apprenticeship Training Modules			
1.	**PRAKASH SINGH,** Chief Capability Development	Capability Development TATA Steel LTD, Jamshedpur- 831001	Chairman
2.	**B.N. CHOWDHURY**, Head-Cadre and special training.	-Do-	Member
3.	**PAWAN KUMAR DAS**, SR. Manager, Training	-Do-	Member
4.	**MANU KUMAR VARMA** SR. Manager, Training	-Do-	Member
5.	**AKHILESH KUMARKARN**, SR. Manager, Training	-Do-	Member
6.	**SAKET KUMAR**, Manager	-Do-	Member
7.	**S.K. MAKUR**, SR. Manager	-Do-	Member
8.	**RABINDRA K. SINGH** Manager, Training	-Do-	Member
9.	**SATRUGHNA NAYAK**, JE-II	-Do-	Member
10.	**RAHUL SHARMA**, SR. Manager	-Do-	Member
11.	**JAI KISHORE**, Assistant Manager	-Do-	Member
12.	**SUNIL KUMAR**, Manager	-Do-	Member
13.	**TRIBENI PRASAD**, SR. Instructor	-Do-	Member
14.	**BINU SHARKAR ROY**, Assistant Manager	-Do-	Member
15.	**TAPAS KR. DHAR**, Manager	-Do-	Member
16.	**L. K. Mukherjee,** DDT	CSTARI, Kolkata	Member
17.	**N. Nath,** ADT	CSTARI, Kolkata	Member

CONTENTS

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.

Fitter (Steel Plant) trade under ATS is one of the 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.

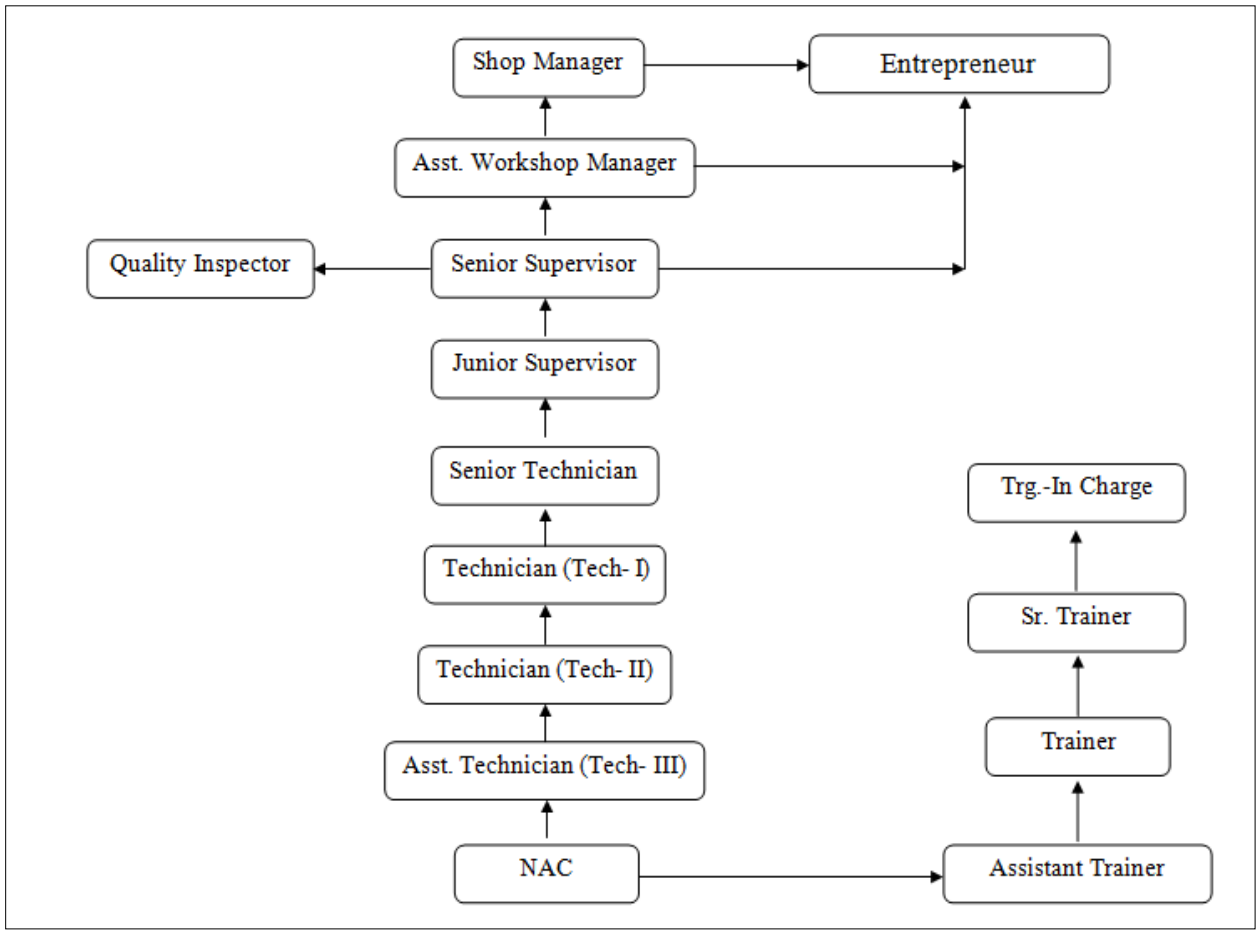
Broadly candidates need to demonstrate that they are able to:

- 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.

Fitter (Steel Plant)

2.2 CAREER PROGRESSION PATHWAYS:

- 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– II**	**-----**	**Block – II**	**------**
Practical Training (On - job training)	**----**	**Block – II**	**------**	**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.)

Sl. 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) Weight age 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) Weight age 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) Weight age 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:

Fitter Steel Plant identifies metals, tools; carrying out fitting and fabrication operations like measuring, marking out, sawing, grinding, drilling, chiseling, threading, tapping, scraping, manual lapping and inspecting of components in order to fit a component as per specifications. It also involves basic oxy-fuel gas cutting and basic manual arc welding as per given instructions and under supervision. He dismantles, removes and replaces faulty equipment at component or unit level on a variety of different types of mechanical assemblies and sub-assemblies and diagnosing, locating faults, overhauling, fitting and adjusting mechanical systems and equipment, checking vibration etc. to ensure fitness of equipment prior to hand over and informing supervisor, operations, etc

He does Leveling, Alignment and Balancing ensures alignment of moving parts (e.g. Pumps, blowers, fans etc.). He does regular upkeep of Hydraulic/Pneumatic equipment/system, checking of hydraulic medium (hydraulic mineral oil), air pressure, identifying problem and rectifying breakdowns in hydraulic and pneumatic system.

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:

1. **7126.0301, -** Pipe Fitter
2. **7126.9900, -** Plumbers and Pipe Fitters, Other
3. **7224.0102, -** Fitter – Fabrication
4. **7233.0101, -** Maintenance Fitter –Mechanical
5. **7233.0121, -** Fitter Levelling, Alignment & Balancing
6. **7233.2901, -** Fitter: Hydraulic and Pneumatic System
7. **7233.9900, -** Machinery Mechanics and Fitters, Other
8. **7412.0202 -** Mechanical Fitter

4. NSQF LEVEL COMPLIANCE

NSQF level for Fitter (Steel Plant) 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 Fitter (Steel Plant) 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, communicatio n.	Responsibility for own work and Learning and some responsibility for other's works and learning.

5. GENERAL INFORMATION

Name of the Trade	FITTER (STEEL PLANT)
NCO-2015	**7126.0301, 7126.9900, 7224.0102, 7233.0101, 7233.0121, 7233.2901, 7233.9900, 7412.0202**
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 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	02 years
CTS trades eligible for Fitter (Steel Plant) Apprenticeship	Fitter (Steel Plant)

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 Fitter (Steel Plant) 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. Filing & fitting of mating components within an accuracy
2. Dismounting and Mounting of pedestal & hand grinding wheel
3. Performance of common jigs and Fixture for drilling.

4. Installation & Alignment of belts, Chain, Sprockets

5. Mounting of split bush bearing, Roller contact bearing, Taper roller bearing with proper clearance
6. Inspection and mounting of ball bearing on shaft with proper fit.
7. Plummer blocks Mounting methods
8. Checking size of solid bush bearing, journal and housing for proper fit.
9. Checking split bush bearing for proper contact on journal and housing
10. Overhauling of gear box (Pre cleaning, dismantling, clearing, inspection, repair/replacement, assemble).
11. Checking of backlash and root clearance with feeler gauge, Dial Test Indicator and lead wire.
12. Shaft alignment
13. Method of levelling, Preparation of packing and shim.
14. Checking misalignment with the help of Taper gauge, Feeler gauge and Dial test.
15. Checking the verticality of a pole with the help of plum bob
16. Locking static unbalance in a rotor, finding the correction weight.
17. Cutting, Threading and fitting of pipe.
18. Method of static balancing and correction.

Block – II

1. Bending of pipes and making pipe joint as per drawing.
2. Assembly, disassembly and overhauling of valves.
3. Preventive & Schedule maintenance of pumps and overhauling of pump.
4. Dismantling, cleaning assembly of fans, Blowers, their parts.
5. Preventive & schedule maintenance.
6. Measurement current, voltage, resistance and power using appropriate measuring equipments
7. Measurement of displacement, pressure, temperature, flow, level and speed
8. Testing of power supply (AC & DC)
9. Overhauling of Valves, Hydraulic pumps and hydraulic actuators.
10. Preparing inspection check-list, taking measurement with the help of industrial thermometer and temperature gun.
11. Overhauling/ Assembly practice of Bearing assembly, Gear/Pulley mounting
12. Overhauling/ Assembly practice of Gear box, Pump and Valve
13. Overhauling/ Assembly practice of Jack, Hydraulic cylinder, Lifting hoist and Belts
14. Joining of metals using welding methods.
15. Inspection of plant machinery and system
16. Maintenance of Fans, Blowers and compressor

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, pressure,

field of study including basic electrical and	heat treatment, centre of gravity, friction.
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]*	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 to improve productivity &	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.

quality.	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 (Section:10)	
*Assessment Criteria i.e. the standard of performance, for each specific learning outcome mentioned under **block – I & 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.*	

BASIC TRAINING (Block – I)

Duration: (03) Three Months

Week No.	Professional Skills	Professional Knowledge
1.	Cardiopulmonary Usage of Resuscitation (CPR)	Familiarization with the Institute & steel industry. Machinery used in the trade and type of work done by the trainees in the trade. Importance of safety, general safety precautions observed in the Institute and in the section. Importance of the trade & trade training, Related instructions & subjects to be taught. Salient features of Apprentices' Act. Introduction to general, behavioral and Road safety Overview of steel manufacturing process.
2.	Marking lines, Cut metals pieces of different profiles & selections by hack-sawing (straight, inclined & curved line) to an accuracy of 0.5mm Filling flat, square and steps to an accuracy of 0.5mm (Measurement by Precision Instrument).	Introduction of first aid. Causes and type of fires, fire precautions against outbreak of fire, different type of fire extinguishers and their uses. Precautions while working at height. Gas safety Electrical safety Quality-brief introduction of improvement techniques followed in the organization-Small group activities (SGA), Quality Circle (QC) Importance of house keeping

3.	Checking and setting of micrometer, Vernier calipers. Filling flat, square, steps and contour surfaces to an accuracy of 0.4mm.	Linear measurements & its units. Classification and functional detail of following basic measuring and marking tools:- • Steel Rule • Calipers, • Divider, Trammel • Try Square • Marking Punch Classification and functional detail of Files. Filling technique. Precision Measuring Instruments: Concept of precision & accuracy Micrometer (outside, inside and depth) – working principle, use & care, calculation of least count. Vernier calipers, principle, calculation of least count, use and care.
4.	Transfer of dimensions from drawing to work pieces. Finding center of a round bar with the help of 'V' block and marking block. Filling flat, square, steps and contour surfaces to an accuracy of 0.3mm Chipping practice on flat surface, slots & oils grooves, and chamfer at different angle on MS plate.	Classification and functional detail of following marking devices: Surface plate, angle plate, marking block and V-Block. Chipping technique. Introduction and care of pedestal grinding machine. Related hazards, risk and precautions. Interchangeability-Definition and its necessity, basic size, actual size, limits, deviation, Tolerance, allowance, clearance, interference, Fits-Definition, types, description with sketches. Method of expressing Tolerance as per BIS, Hole and Shaft basis (BIS standard) Related calculation on Limit, Fit and Tolerance. Surface finish – importance, symbol, measuring techniques. Lapping & horning process Jigs & fixtures-type & uses
5.	Use of drilling machine for drilling through & blind holes, counter sinking on MS flat. Drilling on cylindrical surface. Reaming of drilled hole by hand reamer. Filling flat,	Classification and functional detail of Drill, tap, dies & Reamer. Drilling machines: -Bench, pillar & radial -Drilling operation -Cutting speed, feed & depth of cut. Related hazards, risk and precautions. Grinding wheel specification Bond, structure, grade,

	square, steps and contour surface to an accuracy of 0.2mm. Internal & external threading by Taps & Die Making internal threads with taps (through holes and blind holes).	abrasives, Types and their applications, care during mounting and operation. Related hazards, risk and precautions.
6.	Scraping practice on flat & curved surfaces Filing practice on internal and external profiles to an accuracy of 0.2mm.	Scrapers: Types and use Marking media, Prussian blue, red lead, chalk and their special application and description. Precision measuring instruments: Classification, use, least count Vernier height gauge, Dial test indicator, Digital Micrometer, Vernier Bevel protractor Gauges-Classification and uses of Sine bar, Slip gauge, Limit gauge, Feeler gauge, thread gauge, screw pitch gauge, taper gauge. Brief Introduction to ferrous metals used for hand tools. Concept of normalizing, annealing, tempering, case hardening. Related hazards, risk and precautions.
7.	Identification of various types of fasteners & locking devices, checking threads, use of various type of spanners, Use of circlip and circlip plier. Filling & fitting mating components within an accuracy of ± 0.10mm & angular 30 minutes. Tightening of nut with the help of torque wrench	Introduction to fasteners, screw threads, related terminology and specification. Keys-types & use,(parallel, sunk, tangential, gib head, woodruff, key ways.) Related hazards, risk and precautions Types of nuts, bolt, studs, locking devices for nut, wrench and spanner, pliers, screw drivers, Circlip, split pin, Concept of torque & torque wrench. Different types of rivets and their application.

8.	Identification of various components of mechanical power transmission system-Shafts, coupling, keys, gears, bearing, belts, chains pulley, rope. Measuring shaft and coupling bore for finding out taper & ovality and to determine the type of fit. Finding out the size of key for a given set of shaft & bore. Key making, mounting of coupling on shaft with key.	Elements of mechanical power transmission, type of spindles and shafts (Universal spindle, Plain shaft, Hollow shaft, crank shaft, cam shaft). Positive and Non-positive driver, Friction drive, Gear drive, Belt drive, Chain drive and Rope drive. Basic concept of Clutches **Couplings:** Concept of coupling and its type viz. Rigid coupling-Muff coupling, Flange coupling, Flexible coupling, Pin-bush coupling, Chain coupling, Gear coupling, Spider coupling, Tyre coupling, Grid coupling, Oldham-coupling, Fluid coupling, Universal coupling. **Belts-** Belt specification (Flat and V) Pulley used for belts driver.
9.	Identification of various types of bearings. Identification of various types of rolling contact bearing and Tools-tackles used for mounting and dismounting.	**Bearing:** Type, description and function of sliding and rolling contact bearings- Solid bush, Split bush, Collar and Pivot bearing. Type of Rolling contact bearings-Bell bearings-Deep groove, Angular contact, magneto bearing, Self aligning and Ball thrust bearing. Roller bearing-Cylindrical-Needle roller, Taper roller, Spherical roller, self aligning and Spherical roller thrust bearing. ISO bearing designation code.
10.	Filing & fitting mating components within an accuracy of ± 0.12 mm & angular within 30 minutes.	**Gear:** Type, description and function of gears-Spur, Single helical, Double helical, Spiral, Bevel, Straight and Spiral bevel, Worm gears, Rack and pinion. Gear terminology. Gear train- simple, compound, reverted and epicyclic. Types of Gear box Gear meshing **<u>Lubrication (oil and Grease)</u>** Concept of lubrication Types and properties of Oil and Grease. Methods of oil lubrication- Once through and centralized system-grease guns, centralized system.

Fitter (Steel Plant)

11.	Plane and Step turning up to an accuracy of 0.1 mm Removal of broken studs from an assembly.	Introduction to lathe machines and lathe operations. Cutting tools. Speed, feed & depth of cut Lathe accessories and attachment. Related hazards, risk and precautions. Type of taper and methods of taper turning. Introduction to Shaper machine and shaper operations. Quick return mechanism of shaper. Speed, feed & depth of cut. Types of pipe, tubes and different fittings. Tools used in pipe work.
12.	Making key in a shaper machine up to an accuracy of 0.1mm. Lap and finish flat surfaces by hand only Tool grinding.	**Leveling** Definition and importance of leveling, Concept of Soft foot, Methods of checking and correcting soft foot. Types of levels-Sprit level, Water level, Dumpy level. **Alignment:** Definition and importance of alignment, Type of misalignment, Shaft vs. coupling alignment, Concept of Soft foot, Concept of axial float, Concept of indicator sag, Dial Test Indicator, **Plumbing** Understanding plumbing, method of checking the verticality of pole or structure, Calculation of packing required to make corrections. **Balancing** Understanding importance of balancing and reasons of unbalancing. Types of unbalancing
13.	**Revision & Internal Assessment**	

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	Professional Knowledge
1.	Use of different type of valve like: Gate, Globe, butterfly, Diaphragm.	Pipe bending and jointing methods. Different types of expansions joints and their application in steel industry. Supports and hangers. Pipe colour code. Safety precaution to be observed while working at pipeline. Constructional detail of different type of valve & their uses like: Gate, Globe, butterfly, Diaphragm.
2.	Identification of various types of centrifugal pumps, their parts. Identification of various types of fans, Blowers, their parts. Identification of various types of compressors, their parts.	**Pump** Function of pump. Types and working principle of centrifugal pump. Vertical turbine pump. Constructional detail of pump. Starting and stopping Series & parallel operation of pump. Pump performance and characteristics. Cavitations & aeration **Fan & Blowers** Types and working principle Constructional detail of Fans & Blowers. **Compressors** Compression theory Types of compressors Constructional detail of compressors, working mechanism , loading unloading.

Fitter (Steel Plant)

3.	**Electrical:** Safety precautions to be observed while working in electric shop. Identification of electrical accessories. Making simple wiring circuits and measurement of current and voltage. Identification of passive and active electronic components. Observation of waveforms in a power Verification of logic gate operations.	Safety in electrical shop Passive circuit elements-resistors, capacitors and inductors. Its identification and testing. Colour code. Ohm' law and its applications. Energy sources. Series and parallel connections. Basic principle of DC generators and motors, alternators and AC motors and transformers. Introduction to electronics and its industrial applications. Diodes and transistors. Introduction to digital electronics- numbers system and logic gates Programmable logic controller (PLC)- General concept of working, Relay Logic Control vs PLC, Block diagram, applications.
4.	Identification and familiarization of various types of hydraulic elements such as pumps, valves, actuators and oil filters.	Basic principles of Hydraulic- Advantage & limitation of hydraulic system, hydrostatic transmission, Pascal's law, Brahma's press, pressure & flow, speed of an actuator. Function and construction of gear pump, vane pump and piston pump, cylindrical & hydraulic motor.
5.	Simulation of hydraulic circuits. -Simple hydraulic circuits. Practical on hydraulic circuits.	Auxiliary & fluid conditioner: Reservoir, filter, strainer, pressure gauge, pipe & pipe fitting, accumulator, seal & packing. Simple hydraulic circuits: - Hydraulic symbols - Study of different hyd. Circuits Related hazards, risk and precautions. Electro hydraulic circuit, Electrical components - Switches, Solenoid, Relay

6.	Identification of various types of pneumatic elements such as: control valves, actuators, filter, pressure regulator and lubricator. Overhauling of pneumatic cylinders - Practice on Pneumatic circuit	Basic principle of pneumatic system. Advantages & limitation. Air preparation. Functional details of pneumatic cylinder, motor, control valves and FRL unit. Introduction to Pneumatic actuators Pneumatic Symbols Pneumatic circuit Electrical control components - Switches , Solenoid, Relay
7.	Video demo of awareness on environment pollution. Use of vibration meter to take measurement. Practice on accuracy testing of machine tools.	Awareness on environment pollution and effects. Basic knowledge of air pollution control equipment. (ESP, Bag house, cyclone separators etc.) Major emission and pollution source and their effect on environment. Control of NOx and SOx and SPM to permissible level. Standard of ambient air quality, work environment, effluent discharge. Dust handling and disposal system. Control of water pollution- effluent treatment plans Occupational health and ergonomics.
8.	Setting up of an arc welding machine, Straight bead practice. Edge preparation for same thickness of plate for arc welding. Laying straight-line bead on 12mm M.S. Plate in flat position and Horizontal position. Making butt, lap, tee and corner joint by arc on 12 mm M.S. Plate on Flat, Horizontal position.	Metal joining Method & its advantages Welding (Fusion, Non-fusion & Pressure) Common tools used in welding, Classification of welding processes. Arc Welding accessories. Electric Arc Welding – Manual Metal Arc Welding - effect of variations in welding procedure on weldments during manual metal Arc Welding. Basic Welding joints & Positions:- Purpose of root gap, tacking & key hole in the job pieces during welding. Arc Welding Machine:- AC & DC Welding Machine advantages & disadvantages of AC & DC Welding. Safety Precautions: Related to Arc welding m/c & accessories. Manual Metal Arc Welding Electrodes:- Sizes & Coding Edge Preparation:- Necessity of edge preparation, Nomenclature of butt & fillet weld.

		Welding Symbols. Weld defects.
9.	Setting up of a gas welding set. Making different types of flames with gas welding equipment. Making straight beads with and without filler rod. Making square butt joint using plates / sheets of up to 3mm thickness. Setting up to gas cutting set. Setting up & adjustment of flame. Gas cut plates and sheets for the required dimensions – Straight cut, bevel cut, piercing hole and profile cutting.	High Pressure Oxy-Acetylene Welding equipments & Accessories Safety precautions in handling Oxy-Acetylene Gas welding set. Systems of Oxy-Acetylene Welding-Flashback & backfire Types of Oxy-Acetylene flames:- Gases used in welding & Gas flame combination. Filler Rods for Gas Welding Safety in gas cutting process. Principle of gas cutting. Oxy-Acetylene-Oxy L.P.G. cutting equipments. Name and application of other metal joining methods.
10.	Dismantle, inspect and do minor repairs and assemble machine tools such as drill, shaper, lathe and power saw machines.	Knowledge of different tools & tackles used in rigging. Construction and capacity of wire rope. Capacity of ropes (other than wire rope). Application of knots and hitches. Care and maintenance of wire rope. Different type of jacks, chain block and pull lift. Knowledge of different types of scaffolding. Material movement by using different rigging tools and techniques. Safety appliances & precautions in rigging. Maintenance of tools and tackles. Principle & mode of material handling. Various components used in belt conveyor system & their functions.(Pulleys, idlers, scrapers, skirts, belt, take up unit system and safety devices) Vibratory screen- working mechanism. Feeders:- types, working, mechanism.
11.	Practice of different type of knots & hitches used in material handling Reaving sets of pulley block. Splicing of manila rope. Inspection of wire rope.	Different types of raw materials used for Iron making. Process of sinter, coke, iron and steel making. Awareness of rolling process. Rolling of long & flat product,- Hot & cold rolling. Sources of water, Various types of impurities in water

		(Total suspended, dissolved solids and dissolved gases) Soft & hard water, filtration. Awareness of water quality parameters. Introduction to cooling circuits- open/close Introduction to Cooling Towers, Heat Exchangers
12.	Identification of different components of machine tools. Inspection of machine tool components. Demo on maintenance tools. Demonstration on belt joining	Power transmission and lubrication system in machine tools. Accuracy testing of machine tools. Various maintenance practices. Maintenance strategy- Reactive, Preventive, Predictive and proactive Importance of inspection. Chain and Pulley Blocks- Uses and working principle -Cranes and Hoists -Crab and winch, slings, rollers, bars and levers. Engineering material and their properties Heat and temperature
13.	**Assessment / Examination (03 days)**	

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

Topic No.	Engineering Drawing	Duration (in hours)	Workshop Science & Calculation	Duration (in hours)
		30		**20**
1	**Engineering Drawing:** Introduction and its importance -Viewing of engineering drawing sheets. Method of Folding of printed Drawing Sheet as per BIS SP:46-2003 Drawing Instruments : their Standard and 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.		**Unit**: Systems of unit- FPS, CGS, MKS/SI unit, unit of length, Mass and time, Conversion of units.	
2	**Lines :** - Definition, types and applications in Drawing as per BIS SP:46-2003 - Classification of lines (Hidden, centre, construction, Extension, Dimension, Section) - Drawing lines of given length (Straight, curved) - Drawing of parallel lines, perpendicular line - Methods of Division of line segment		**Fractions & Simplification**: Fractions, Decimal fraction, Multiplication and Division of Fractions and Decimals, conversion of Fraction to Decimal and vice versa. Simple problems Simplification using BODMAS.	

3	**Drawing of Geometrical Figures**: Definition, nomenclature and practice of - - Angle: Measurement and its types, method of bisecting. - Triangle -different types - Rectangle, Square, Rhombus, Parallelogram. - Circle and its elements.		**Square Root** : Square and Square Root, method of finding out square roots, Simple problem using calculator	
4	**Lettering and Numbering** as per BIS SP46-2003: - Single Stroke, Double Stroke, inclined, Upper case and Lower case.		**Ratio &Proportion:** Simple calculation on related problems.	
5	**Free Hand sketch:** Hand tools and measuring instruments used in electronics mechanics Trades		**Percentage:** Introduction, Simple calculation. Changing percentage to decimal and fraction and vice-versa.	
6	**Free hand drawing :** - Lines, polygons, ellipse, etc. - Geometrical figures and blocks with dimension. -Transferring measurement from the given object to the free hand sketches.		**Material Science** : Properties - Physical & Mechanical, Types – Ferrous & Non-Ferrous, difference between Ferrous and Non-Ferrous metals, introduction of Iron, Cast Iron, Wrought Iron, Steel, difference between Iron and Steel, Alloy steel, carbon steel, stainless steel, Non-Ferrous metals, Non-Ferrous Alloys.	

Fitter (Steel Plant)

B. Block- II

Topic No.	a) Engineering Drawing	Duration (in hours)	b) Workshop Science & Calculation	Duration (in hours)
		30		**20**
1	**Symbolic Representation** (as per BIS SP:46-2003) of : - Fastener (Rivets, Bolts and Nuts) - Bars and profile sections - Weld, brazed and soldered joints. - Electrical and electronics element - Piping joints and fittings		**Mass ,Weight and Density** : Mass, Unit of Mass, Weight, difference between mass and weight, Density, unit of density, specific gravity of metals	
2	**Construction of Scales and diagonal scale**		**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.	
3	LED, IRLED, photo diode, photo transistor, opto-coupler symbols symbol of Logic gates			
4	Half adder, full adder, multiplexer and de-multiplexer		**Algebra:** Addition, Subtraction, Multiplication, Division, Algebraic formula, Linear equations (with two variables).	
5	UJT, FET, MOSFET, DIAC, TRIC, SCR, IGBT symbols and circuits of FET Amplifier, SCR using UJT triggering, snubber circuit, light dimmer circuit using TRIAC, UJT based free running		**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.	

	oscillator.		**Trigonometry:** Trigonometrical ratios, measurement of angles. Trigonometric tables. Finding height and distance by trigonometry.	

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)

BROAD LEARNING TO BE COVERED IN INDUSTRY FOR FITTER (STEEL PLANT) TRADE:

1. Safety and best practices/Basic Industrial Culture (5S, KAIZEN, etc.)
2. Record keeping and documentation
3. Fitting components using different metal fitting procedure and perform testing of the assembly.
4. Assembling of different components as per requirement and check functionality.
5. Carryout maintenance of different systems.
6. *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. Practice and understand precautions to be followed while working in fitting jobs.
2. Prepare different types of documentation as per industrial need by different methods of recording information
3. Demonstration of common jigs and Fixture for drilling.
4. Dismounting and Mounting of pedestal & hand grinding wheel
5. Filing & fitting of mating components within an accuracy
6. Installation & Alignment of belts, Chain, Sprockets
7. Mounting of split bush bearing, Roller contact bearing, Taper roller bearing with proper clearance
8. Inspection and mounting of ball bearing on shaft with proper fit.
9. Plummer blocks Mounting methods
10. Checking size of solid bush bearing, journal and housing for proper fit.
11. Checking split bush bearing for proper contact on journal and housing
12. Overhauling of gear box (Pre cleaning, dismantling, clearing, inspection, repair/replacement, assemble).
13. Checking of backlash and root clearance with feeler gauge, Dial Test Indicator and lead wire.
14. Shaft alignment
15. Method of levelling, Preparation of packing and shim.
16. Checking misalignment with the help of Taper gauge, Feeler gauge and Dial test.
17. Checking the verticality of a pole with the help of plum bob
18. Locking static unbalance in a rotor, finding the correction weight.
19. Cutting, Threading and fitting of pipe.
20. Method of static balancing and correction.

Fitter (Steel Plant)

Block – II

1. Bending of pipes and making pipe joint as per drawing.
2. Assembly, disassembly and overhauling of valves.
3. Preventive & Schedule maintenance of pumps and overhauling of pump.
4. Dismantling, cleaning assembly of fans, Blowers, their parts.
5. Preventive & schedule maintenance.
6. Measurement current, voltage, resistance and power using appropriate measuring equipments
7. Measurement of displacement, pressure, temperature, flow, level and speed
8. Testing of power supply (AC & DC)
9. Overhauling of Valves, Hydraulic pumps and Hydraulic actuators.
10. Preparing inspection check-list, taking measurement with the help of industrial thermometer and temperature gun.
11. Overhauling/ Assembly practice of Bearing assembly, Gear/Pulley mounting
12. Overhauling/ Assembly practice of Gear box, Pump and Valve
13. Overhauling/ Assembly practice of Jack, Hydraulic cylinder, Lifting hoist and Belts.
14. Joining of metals using welding methods.
15. Inspection of plant machinery and system
16. Maintenance of Fans, Blowers and compressor

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

FITTER (STEEL PLANT)		
LIST OF TOOLS AND EQUIPMENT for Basic Training (For 20 Apprentices)		
Sl. No.	**Item**	**Qty**
1.	Steel Rule 15cm with metric graduation	As required.
2.	Try Square 10cm blade.	
3.	Caliper outside 15cm spring	
4.	Caliper inside 15cm spring.	
5.	Caliper 15cm hermaphrodite	
6.	Divider 15cm spring	
7.	Straight Scriber 15cm.	
8.	Centre Punch 10cm.	
9.	Screw driver 15cm	
10.	Chisel cold flat 10cm	
11.	Hammer ball peen 0.45 kg. With handle	
12.	Hammer ball peen 0.22 kg. With handle	
13.	File flat 25cm. second cut	
14.	File flat 25 cm. smooth	
15.	File half round second cut 15cm.	
16.	Hacksaw frame fixed 30cm.	
17.	Safety goggles.	
18.	Dot slot punch 10 cm.	
19.	Steel Rule 30cm to read metric.	
20.	Steel Rile 60cm.	
21.	Straight edge 45cm steel	
22.	Surface plate 45x45 cm Cl/Granite.	
23.	Marking table 91x91x122 cm.	
24.	Universal scribing block 22cm.	
25.	V-Block pair 7cm and 15cm with clamps	
26.	Square adjustable 15cm blade.	
27.	Angle plate 10 x 20 cm.	
28.	Spirit Level 15cm metal	
29.	Punch letter 3mm set.	
30.	Punch number set 3mm	
31.	Punch hollow 6mm to 19 set of 5	
32.	Punch round 3mm x 4mm set of 2.	
33.	Portable hand drill (Electric)0 to 6mm	
34.	Drill twist s/s 1.5 to 12mm by 0.5 mm	

35.	Drill twist S/S 8mm to 15mm by ½ mm	
36.	Taps and dies complete set in box B.A	
37.	Taps and dies complete set in box with-worth.	
38.	Taps and dies complete set in box 3-18mm set of 10	
39.	File warding 15cm smooth	
40.	File knife edge 15cm smooth	
41.	File cut saw 15cm smooth	
42.	File feather edge 15cm smooth	
43.	File triangular 15cm smooth	
44.	File round 20 cm second cut	
45.	File square 15cm second cut	
46.	File square 25cm second cut	
47.	Feeler gauge 10 blades	
48.	File triangular 20cm second cut	
49.	File flat 30cm second cut	
50.	File flat 20cm bastard	
51.	File flat 30cm bastard.	
52.	File Swiss type needle set of 12.	
53.	File half round 25cm second cut.	
54.	File half round 25cm bastard	
55.	File round 30cm bastard	
56.	File hand 15cm second cut.	
57.	Card file.	
58.	Oil Stone 15cm x 5cm x 2.5cm	
59.	Stone carborandum 15cm x 5cm x 5cm x 4cm.	
60.	Oil Can 0.25 litres.	
61.	Pliers Combination 15 cm	
62.	Soldering Iron 350 gm.	
63.	Blow lamp 0.50 litres.	
64.	Spanner D.E. 6-25mm set of 10 pcs.	
65.	Spanner adjustable 15cm	
66.	Interchangeable ratchet socket set with a 12mm driver, sized 10-32mm set of 18 socket & attachments.	
67.	Box spanner set 6-25mm set of 8 with Tommy bar.	
68.	Glass magnifying 7cm	
69.	Clamp toolmaker 5cm and 7.5cm set of 2.	
70.	Clamp “C” 5cm	
71.	Clamp “C” 10cm	
72.	Hand Reamer adjustable cover max 9,12,18mm-set of 3	
73.	Hand Reamer taper 4-9mm set of 6 OR 4-7mm set of 4.	
74.	Reamer parallel 12-16mm set of 5.	
75.	Scraper flat 15cm	

76.	Scraper triangular 15cm	
77.	Scraper half round 15cm	
78.	Chisel cold 9mm cross cut 9mm diamond.	
79.	Chisel cold 19mm flat	
80.	Chisel cold 9mm flat	
81.	Stud Extractor EZY-out	
82.	Combination Set 30cm.	
83.	Micrometer 0-25 mm outside.	
84.	Micrometer 25-50mm outside.	
85.	Micrometer 50-75mm outside.	
86.	Micrometer inside 25-50 mm with extension rods.	
87.	Vernier calliper 15cm	
88.	Vernier height gauges 30cm.	
89.	Vernier bevel protractor.	
90.	Screw pitch gauge.	
91.	Wire gauge, metric standard.	
92.	Drill twist Taper Shank 12mm to 25mm x 1.5.	
93.	Drill chunk 12mm.	
94.	Pipe wrench 40cm	
95.	Pipe wrench 30cm	
96.	Pipe vice 100mm	
97.	Adjustable pipe tap set BSP with die set cover pipe size 15, 20,25,32,38,50mm.	
98.	Wheel dresser (One for 4 units).	
99.	Machine vice 10 cm	
100.	Machine vice 15 cm	
101.	Sleeve drill Morse 0-1,1-2,2-3.	
102.	Vice bench 12cm jaws.	
103.	Vice leg 10cm jaw.	
104.	Bench working 240 x 120 x 90 cm.	
105.	Almirah 180 x 90 x 45cm	
106.	Lockers with 8 drawers (standard size).	
107.	Metal rack 182 x 182 x 45 cm	
108.	Instructor Table	
109.	Instructor Chair	
110.	Black Board with eraser.	
111.	Fire extinguisher (For 4 units)	
112.	Fire Buckets	
113.	Wing compass 25.4cm or 30cm.	
114.	Hand hammer 1kg. with handle	
115.	Slip Gauge as Johnson metric set.	
116.	Carbide Wear Block 1mm-2mm.	

117.	Gauge snap Go and Not Go 25 to 50mm by 5mm.Set of 6pcs.	
118.	Gauge plug single 3 ended 5 to 55 by 5mm. Set of 11 pcs.	
119.	Gauge telescopic upto 150mm.	
120.	Dial test indicator. 01mm on stand.	
121.	Sine bar 125mm.	
122.	Sine bar 250mm.	
123.	Lathe tools H.S.S. tipped set.	
124.	Lathe tools bit 6mm x 75mm.	
125.	Lathe tools bit 8mm x 75mm.	
126.	Lathe tools bit 10mm x 85mm.	
127.	Arm strong type tool bit holder R.H.	
128.	Arm strong type tool bit holder L.H.	
129.	Arm strong type tool bit holder straight.	
130.	Stilson wrenches 25cm.	
131.	Pipe cutter 6mm to 50mm wheel type.	
132.	Pipe bender spool type up to 25mm. with stand manually operated.	
133.	Adjustable pipe chain tonge to take pipes up to 300mm.	
134.	Adjustable spanner 38 cm long.	
135.	Dial vernier caliper 0-200 mm LCO 0.05mm.(Universal type)	
136.	Screw thread micrometer with interchangeable 0-25mm. Pitch anvils	
137.	for checking metric threads 60.	
138.	Depth micrometer 0-25mm. 0.01mm.	
139.	Vernier caliper 0-150mm. L.C. 0.02mm.	
140.	Comparators stand with dial indicator LC 0.01mm.	
141.	Engineer's try square (knife-wedge) 150mm blade.	
LIST OF ADDITIONAL TOOLS FOR ALLIED TRADE IN WELDING		
142.	Transformer welding set 150 amps.-continuous welding current, with all accessories and electrode holder.	As required
143.	Welder cable to carry 200 amps. With flexible rubber cover	
144.	Lungs for cable	
145.	Earth clamps.	
146.	Arc welding table (all metal top) 122cm x 12cm x 60mm with positioner.	
147.	Oxy-acetylene gas welding set equipment with hoses, regulator and other accessories.	
148.	Gas welding table with positioner	
149.	Welding torch tips of different sizes	
150.	Gas lighter.	
151.	Trolley for gas cylinders.	
152.	Chipping hammer.	

153.	Gloves (Leather)	
154.	Leather apron.	
155.	Spindle key for cylinder valve.	
156.	Welding torches 5 to 10 nozzles.	
157.	Welding goggles.	
158.	Welding helmet with coloured glass.	
159.	Tip cleaner	

The specifications of the items in the above list have been given in Metric Units. The items which are available in the market nearest of the specification as mentioned above, if not available as prescribed should be procured Measuring instruments such as steel rule which are graduated both English and Metric Units may be procured, if available.

General Machinery Installation

1. Drilling machine pillar sensitive 0-20 mm cap with chuck & key
2. Drilling machine pillar sensitive 0-12 mm cap motorized with chuck and key.
3. Grinding machine (general purpose) D.E. pedestal with 20 cm dia. wheels rough and smooth with twist drill grinding- attachment.

INFRASTRUCTURE FOR WORKSHOP CALCULATION & SCIENCE AND ENGINEERING DRAWING

TRADE: Fitter (Steel Plant)
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 (700mm x500 mm) IS: 1444		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	Workplace hygiene	Attendance/ Punctuality	Ability to follow Manuals/ Written instructions	Application of Knowledge	Skills to handle tools & equipment	Economical use of materials	Speed in doing work	Quality in workmanship	VIVA	**Total internal assessment Marks**	**Result (Y/N)**
Maximum Marks (Total 100 Marks)			**15**	**5**	**10**	**5**	**10**	**10**	**5**	**10**	**15**	**15**		
1														
2														