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

COMPETENCY BASED CURRICULUM

FITTER (INTEGRATED STEEL PLANT)

Duration: (One-Year)

CRAFTSMEN TRAINING SCHEME (CTS)

(Flexi MoU)

NSQF LEVEL- 4

SECTOR – CAPITAL GOODS & MANUFACTURING

Directorate General of Training

Skill India
कौशल भारत - कुशल भारत

FITTER
(INTEGRATED STEEL PLANT)

(Engineering Trade)

(Designed in 2019)

Version: 1.0

CRAFTSMEN TRAINING SCHEME (CTS)

(Flexi MoU)

NSQF LEVEL - 4

Developed By
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1. COURSE INFORMATION

Flexi- MoU is one of the pioneer programmes under DGT on the basis of the MoU in between DGT & NISP-NAGARNAR for propagating vocational training to allow industries to take advantage of various schemes for conducting training programme in higher employment potential courses according to needs of industries. The concept of Flexi- MoUs was introduced in June-July 2014. DGT and NISP-NAGARNAR have decided to sign this memorandum of understanding to provide an opportunity to the youth to acquire skills related to FITTER (INTEGRATED STEEL PLANT) through specially designed "Learn and Earn" approach consisting a mix of theoretical and On-the-Job Training (OJT) components and hence improve their employability potential & to contribute in the overall growth of Steel industry by creating a pool of skilled resources.

During the one-year duration, a candidate is trained on subjects Professional Skill, Professional Knowledge, Engineering Drawing, Workshop Science & Calculation and Employability Skills. . The practical skills are imparted in simple to complex manner & simultaneously theory subject is taught in the same fashion to apply cognitive knowledge while executing task.

The content broadly covers skills in maintenance process of INTEGRATED STEEL PLANT in today's steel industry. The one year course coverage is categorized as below:

The contents covered are safety aspects related to trade, familiarization with working in integrated steel Plant covering production and maintenance process such as basic fitting operation (marking, filling, sawing, chiseling, drilling tapping & grinding), basic use of lifting tackles such as(chain pulley block, jacks, max pullers etc.) basic blanking & stamping operations (sheet metal work), basic knowledge of pumps, compressors, hydraulics, bearings, lubrication will be given through trade theory and practical. The practical training starts with practice of using tools & measuring instruments viz. Vernier calliper, micrometer, height gauge, dial gauge, slip gauge, feeler gauge, go-no go gauges etc. This is followed by on job training in practice in coke ovens and bye product Plant, sintering Plant, blast furnaces, steel melting shop, thin slab caster, hot strip mill, raw material handling section, power and blowing station and other sections of integrated steel Plant.

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2. TRAINING SYSTEM

2.1 GENERAL

Directorate General of Training (DGT) under Ministry of Skill Development & Entrepreneurship offers range of vocational training courses catering to the need of different sectors of economy/ Labour market. DGT is futuristic in preparing the prospective Indian workforce in building skills and capabilities as per the needs of the industry. In this quest, it has changed the paradigm of growth to a job oriented training by partnering with industry to be an enabler of responsible, sustainable and inclusive growth. Towards this end, DGT signed this MOU with the NMDC (NISP)

NMDC shall conduct courses at NISP Nagarnar in its training institute. On the job training will be conducted inside the Plant premises. It will also ensure the eligible trainees take up Apprenticeship / higher education in suitable streams and shall also guide the students to become Entrepreneurs. NISP will strictly follow the policy guidelines for Flexi - MoU as in place from time to time. No deviation for the same would be permitted. Admission and Exam for trades run under Flexi MoU at training locations of NISP Nagarnar. Theory content to be 25% and practical content to be 75%.

Broadly candidates need to demonstrate that they are able to:

- Read & interpret technical parameters/documentation, 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 knowledge, core skills & employability skills while performing the job and maintenance work.
- Check the task/job for functioning, identify and rectify errors in task/job.
- Document the technical parameters related to the task undertaken.

2.2 CAREER PROGRESSION PATHWAYS

- Can work as technician – fitter in any integrated steel Plant
- Can join Apprenticeship programme in different types of industries leading to National Apprenticeship certificate (NAC).

2.3 COURSE STRUCTURE

Table below depicts the distribution of training hours across various course elements during a period of one year:

S No.	Course Element	Notional Training Hours
1	Professional Skill (Trade Practical)	290
2	Professional Knowledge (Trade Theory)	155
3	Workshop Calculation & Science	80
4	Engineering Drawing	80
5	Employability Skills	160
	Total	**765 hrs**

B- On The Job Training ; (900 hrs)

Revision and Examination (100 hrs)

Total duration hrs. - 765 + 900 + 100= 1765 hrs.

2.4 ASSESSMENT & CERTIFICATION

I. Conducting training of selected candidates is the sole responsibility of Industrial Training Partner (ITP).
II. Assessment will be jointly done by ITP and DGT. Practical and formative assessment shall be conducted by ITP, and Computer Based theoretical exams shall be conducted by DGT.
III. ITP must refer to the latest examination reform guidelines issued by DGT dated 4thOctober 2018 any changes or revisions to the same shall be applicable to flexi-MoU scheme.
IV. Maximum attempts for clearing the exam and obtaining NTC shall be in line with CTS.
V. For practical examination and formative assessment, ITP has been given flexibility to design the questions, assess the candidates and upload their marks in the scheme portal.
VI. ITP shall develop a comprehensive Question Bank (in English and Hindi) of minimum 1000 questions, grouped by chapters and difficulty level. The same shall be vetted by NIMI experts and then be handed over to DGT for conducting theory exams. DGT may add some questions to the same before conducting actual exams.

VII. Theoretical exams shall be conducted by DGT in Computer Based Test format. Upon completion of course and payment of requisite examination fee by ITP, admit cards shall be generated by scheme portal.

VIII. DGT shall arrange for conduct of computer based theory exam at designated examination centres & certify the successful trainees with e-NTC under flexi-MoU scheme with mention of ITP name in the Certificate.

IX. Students, who have successfully appeared in the final exam after completion of course, are eligible to register as apprentices.

The trainee will be tested for his skill, knowledge and attitude during the period of the course and at the end of the training program as notified by the Government of India (GoI) from time to time. The employability skills will be tested in the first year itself.

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 has to maintain an individual trainee portfolio as detailed in assessment guideline. The marks of internal assessment will be as per the template (Annexure –II).

The learning outcome and assessment criteria will be the basis for setting question papers for final assessment. The examiner during final examination will also check the individual trainee's profile as detailed in assessment guideline before giving marks for practical examination.

2.4.1 PASS REGULATION

The minimum pass percentage for practical is 60% & minimum pass percentage of theory subjects is 33%.

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 the assessment. Due consideration should be given while assessing for teamwork, avoidance/reduction of scrap/wastage and disposal of scrap/waste as per procedure, behavioral attitude, sensitivity to the 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

Evidences of internal assessments are to be preserved until forthcoming yearly examination for audit and verification by examining 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 should produce work which demonstrates attainment of an acceptable standard of craftsmanship with occasional guidance, and due regard for safety procedures and practices	• Demonstration of good skill in the use of hand tools, machine tools and workshop equipment. • 60-70% accuracy achieved while undertaking different work with those demanded by the component/job. • A fairly good level of neatness and consistency in the finish. • Occasional support in completing the project/job.
(b) Weightage in the range of 75%-90% to be allotted during assessment	
For this grade, a candidate should produce work which demonstrates attainment of a reasonable standard of craftsmanship, with little guidance, and regard for safety procedures and practices	• Good skill levels in the use of hand tools, machine tools and workshop equipment. • 70-80% accuracy achieved while undertaking different work with those demanded by the component/job. • A good level of neatness and consistency in the finish. • Little support in completing the project/job.
(c) Weightage in the range of more than 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% accuracy achieved while undertaking different work with those demanded by the component/job. • A high level of neatness and consistency in the finish. • Minimal or no support in completing the project.

3. JOB ROLE

Fitter- Hydraulic

- Identification and Inspection of various hydraulic systems and its components
- Inspection of hydraulic leakages & grease leakages of Hyd. & Lub. system.
- Dismantling and Assembly of hydraulic pipes and tube fittings & Hoses.
- Dismantling and Assembly of hyd. Pumps, Valves, Cylinders, Motors, Filters & other hyd. related components.
- Identification of various lubricants & its application.
- Ability and idea about various gadgets used for Filling, Greasing and Improvising.
- Knowledge about safety aspects while working on hydraulic system
- Knowledge about Cleanliness of Oil in hydraulic system and mental attitude to maintain that.
- Knowledge on various Tools & Tackles and its application in the Field of Hydraulics.
- Ability to understand Emery paper and its Fineness and its usage while salvaging Hyd. components and servicing it.
- Idea about various threads used in hydraulic system like, BSP, Metric, UNF & NPT types of threads and able to recognize them and distinguish them while working.
- Use of various spanners, its selection while opening / tightening pipe line joints and Flanges.
- Use of various Allen-Keys, its selection while opening / tightening pipe line joints and Flanges.
- Skill to remove the old seals from Piston Head and Glands without damage, Ability to fit the New Seals on Piston Head and Glands without damaging it.
- Skill to read and measure Scales, Vernier Caliper, & Micrometer of both Inside & Outside.
- Skill & Knowledge for operating the Power-packs while testing. Interpretation of various observations like Pressure, Flow, Temperature and interpret them into a useful inference.

FITTER -CRANE MAINTENANCE

- Ability to dismantle, overhauling and assembling of different gear boxes .
- Measurement with the help of micrometer and vernier of different parts of crane items.
- Drilling and trapping knowledge.
- Cutting of packing material to the size.

- Marking on work piece for different operations like drilling.
- Jacking of assembly for dismantling of parts welding, assembly etc.
- Oiling, greasing and lubrication of different assemblies and system.
- Break adjustment of cranes.
- Nut bolt fitting in case of break down.
- Alignment of the different part for assembly.
- Coupling changing, wheel changing, rope changing
- Inspection of crane limit, switches, break assembly, oil level in gear box.

FITTER- SHIFT WORKING

- Opening of assembly with recognized tools and tackles.
- Changing of worm and part/ broken part with new/repaired part.
- Alignment of the new/part with the original assembly.
- Packing up of the assembly with new packing material/seal/ropes etc.
- Tightening of rope of different systems in case of loosening.
- Changing of broken volumes of pneumatic, hydraulic or water supply system.
- Changing of pipe in case of brake down.
- Lubrication of different systems in case of low lubrication.
- Lubrication the jam assemblies for free movement.
- Changing fitters of different systems.
- Hammering activities in different repair job

FITTER- MECHANICAL FABRICATION

- Study of drawing.
- Material management for the required assembly.
- Marking of the required dimensions on the material
- Gas cutting and grinding.
- Drilling of the required hole size.
- Assembly by tacking
- Alignment of the fabrication part
- Stress balancing
- Welding in different position
- Nut and bolt tightening all the required places.

FITTER –WATER SUPPLY

- Lubrication of pump bearings and vibration checking.
- Ground packing adjustment / replacement.

- Pump maintenance.
- Pumps Replacement.
- Run check of pumps for vibration, bearing condition.
- Opening of V/V^{s}, closing an isolation of systems.
- Periodic log of all the operating parameters.
- Monitoring of levels of various systems.(Different types water quality)
- Preparation of chemicals for dozing.
- Jar test for deciding the right dozing.
- Monitoring of water quality.

FITTER –RIGGING

- Use of maxpull for rope pulling
- Use of sling based on angle and size
- Balancing of the load to be lifted
- Signaling to the Crane Operator
- Selection of rope for handling the material
- Use of safety signals during handling of the material.

4. GENERAL INFORMATION

Name of the Trade	**FITTER-INTEGRATED STEEL PLANT (Flexi MoU)**
NCO – 2015	**N/A**
NSQF Level	Level-4
Duration of Craftsmen Training	One year
Entry Qualification	Passed 10th Class examination with science and Mathematics or its equivalent
Unit Strength (No. Of Student)	20
Space Norms	192 Sq. m.
Power Norms	17 KW
Instructors Qualification for	
1. THEORY & PRACTICAL	Degree in Mechanical Engineering from recognized Engineering College /university with one year experience in the relevant field. **OR** Diploma in Mechanical Engineering from recognized board of technical education with two years' experience in the relevant field. **OR** NTC/NAC in the Trade of "Fitter**-INTEGRATED STEEL PLANT**" with 3 years' post-qualification experience in the relevant field. **Desirable: -** Preference will be given to a candidate with NCIC (National Craft Instructor Certificate) in Fitter trade. ***Out of two Instructors required for the unit of 2(1+1), one must have Degree/Diploma and other must have NTC/NAC qualifications.***
2. Workshop Calculation & Science	B.Voc/Degree in Engineering from AICTE/ UGC recognized Engineering College/ University with one year Experience in the relevant field. OR 03 years Diploma in Engineering from AICTE/ recognized Board of Technical Education or relevant Advanced Diploma (Vocational) from DGT with two years' experience in the relevant field. OR NTC/ NAC in any one of the engineering trades with three years' experience in the relevant field.

	Essential Qualification: National Craft Instructor Certificate (NCIC) in relevant trade OR NCIC in RoDA or any of its variants under DGT.
3. Engineering Drawing	B.Voc/Degree in Engineering from AICTE/ UGC recognized Engineering College/ University with one year Experience in the relevant field. OR 03 years Diploma in Engineering from AICTE/ recognized Board of Technical Education or relevant Advanced Diploma (Vocational) from DGT with two years' experience in the relevant field. OR NTC/ NAC in any one of the relevant engineering group of trades categorized under Engineering Drawing / D'man (Mech. / Civil) with three years' experience. **Essential Qualification:** National Craft Instructor Certificate (NCIC) in relevant trade OR NCIC in RoDA / D'man (Mech. / Civil) or any of its variants under DGT.
4. Employability Skill	MBA/ BBA /any Graduate / Diploma in any discipline with Two years' experience with short term ToT course in Employability Skills from DGT institutes. (Must have studied English/ Communication Skills and Basic Computer at 12th / Diploma level and above). **OR** Existing Social Studies Instructors in ITIs with short term ToT course in Employability Skills from DGT institutes.
List of Tools and Equipment	As per Annexure – I

Distribution of training on Hourly basis: (Indicative only)

Total Hours/ Week	Trade Practical	Trade Theory	Work shop Cal. & Sc.	Engg. Drawing	Employability Skills
32 Hours	12Hours	08Hours	06 Hours	04 Hours	02Hours

5. NSQF LEVEL COMPLIANCE

NSQF LEVEL- FITTER **(Integrated Steel Plant)** CTS (Flexi MoU): **Level -4**

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
e. Responsibility

The broad learning outcome of FITTER (Integrated Steel Plant) Trade under CTS (Flexi MoU) mostly matches with the Level descriptor at Level- 4.

The NSQF Level-4 descriptor is given below:

Level	Process Required	Professional Knowledge	Professional Skill	Core Skill	Responsibility
Level 4	Job that requires to work in familiar predictable routine situation of clear choice	Factual Knowledge of field of working	Recall and demonstrate practical skill , routine and repetitive in narrow range of application using appropriate rule and tool, using quality concept.	Language to communicate written or oral with required clarity. Skill to basic arithmetic and algebraic principles, basic understanding of social political and natural environment.	Responsibility for own work and learning .

6. LEARNING OUTCOME

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

6.1 GENERIC LEARNING OUTCOME

1. Recognize & comply general safe working practices, environment regulation and housekeeping.
2. Explain & perform different mathematical calculation & science in the field of study including basics and apply in day to day work. *[Calculation of area, volume, Percentage, Ratio & proportions, Heat & Temperature, Basic Electricity, mathematical calculation, engineering materials, ferrous and non-ferrous]*
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, Lettering and numbering, Free hand sketch and drawing]*
4. Select and ascertain measuring instrument and measure dimension of components and record data.
5. Interpret & use formal and technical communication.
6. Apply the concept in productivity & quality management in day to day work to improve productivity & quality.
7. List and interpret various acts of labour welfare legislation.
8. Explain energy conservation, global warming and pollution and contribute in day to day work by optimally using available resources.
9. Explain personnel finance, entrepreneurship and manage/organize related task in day to day work for personal & societal growth.
10. Utilize basic computer applications and internet to take benefit of IT developments in the industry.

6.2 SPECIFIC LEARNING OUTCOME

11. Recognize & comply safe working practices, environment regulation and housekeeping.
12. Plan and organize cutting of different semi finished part to the correct dimension to fit at the required place.
13. Plan and organize measurement of the different parts with the correct accuracy to take decision on assembly and bearing clearance.
14. Plan and organize the marking on different semi finished items for machining to the required dimension.

15. Study drawing of spare parts/assemblies and tolerance & allowance to prepare component to match with the required dimension for making new assembly.
16. Plan and organize dismantling of assembly at height, lowering it to the ground level and again lifting the new assembly /part to the required height and position using jack with tackles for dismantling of complicated assemblies.
17. Plan and organize repairing of damaged pumps, changing bearing, blades and assemblies to proper dimension checking the working of repaired pumps.
18. Plan and perform static and dynamic balancing, Measure weight and place at correct place and Check the balancing and vibration on the machine.
19. Plan and perform making of hole by different types of tools and tackles like drilling machines, reamers and external and internal threads in different types of parts.
20. Plan and organize use of different types of nut, bolt, spring washer, check nut washer, circlip, for tightening of part/ assembly.
21. Plan and organize the use of different types couplings, clutches, bushes for assembly and transmission of motion in different systems.
22. Plan and organize the dismantling and positioning of new bearings, checking the clearance for bearing fitting. Use of different types of bearings in different assemblies. Surface finish before fitting the bearings.
23. Plan and organize lubrication in different assemblies, Operate lubrication systems, flow of lubricants in different systems/ assemblies and check Proper function of lubricants for different operations.
24. Plan and organize the use of different types of gears in different assemblies, dismantling of gear boxes, cleaning, use of fresh lubricants, use of proper gear in position and alignment as per drawing.
25. Plan and organize levelling, alignment and balancing using different tools and tackles for these operations.

7. LEARNING OUTCOME WITH ASSESSMENT CRITERIA

GENERIC LEARNING OUTCOME (CORE SKILL)	
LEARNING OUTCOME	**ASSESSMENT CRITERIA**
1. Recognize & comply with general safe working practices, environment regulation and housekeeping.	Follow and maintain procedures to achieve a safe working environment in line with occupational health and safety regulations and requirements.
	Recognize and report all unsafe situations according to site policy.
	Identify and take necessary precautions on fire and safety hazards and report according to site policy and procedures.
	Identify, handle and store/ dispose of dangerous/unsalvageable goods and substances according to site policy and procedures following safety regulations and requirements.
	Identify and observe site policies and procedures in regard to illness or accident.
	Identify safety alarms accurately.
	Report supervisor/ competent authority in the event of accident or sickness of any staff and record accident details correctly according to site accident/injury procedures.
	Identify and observe site evacuation procedures according to site policy.
	Identify Personal Protective Equipment (PPE) and use the same as per related working environment.
	Identify basic first aid and use them under different circumstances.
	Identify different fire extinguisher and use the same as per requirement.
	Identify environmental pollution and contribute to avoidance of same.
	Take opportunities to use energy and materials in an environmentally friendly manner.
	Avoid waste and dispose waste as per procedure.
	Recognize different components of 5S and apply the same in the working environment.
2. Explain & perform different mathematical calculation & science in the field of study	Explain concept of basic science related to the field such as Material science, Mass, weight, density, speed, velocity, heat & temperature, force, motion, pressure, heat treatment, center of gravity, friction.

including basic and apply in day-to-day work.*[Different mathematical calculation & science- Calculation of area, volume, Percentage, Ratio & proportions, Heat & Temperature, Basic Electricity, mathematical calculation, engineering materials, ferrous and non-ferrous]*	Measure dimensions as per drawing.
	Use scale/ tapes to measure for fitting to specification.
	Comply with given tolerance.
	Prepare list of appropriate materials by interpreting detail drawings and determine quantities of such materials.
	Ensure dimensional accuracy of assembly by using different instruments/gauges.
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, Lettering and numbering, Free hand sketch and drawing*]	Read & interpret the information on drawings and apply in executing practical work.
	Read & analyse the specification to ascertain the material requirement, tools, and machining/ assembly/ maintenance parameters.
	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 component and record data.	Select appropriate measuring instruments such as micrometers, vernier callipers, dial gauge, bevel protector and height gauge, feeler gauge (as per tool list).
	Ascertain the functionality & correctness of the instrument.
	Measure dimension of the components & record data to analyse with the given drawing/measurement.
5. Interpret & use formal and technical communication.	Identify and use appropriate words for communication.
	Choose proper tools to communicate.
	Use Positive body language while communicating.
	Maintain proper eye contact to built trust and confidence.
6. Apply the concept in productivity & quality management in day to day work to improve	Identify the trades and critical ingredients.
	Identify factors affecting productivity.
	Awareness on quality concepts.
	Maintain quality management systems (QMS) via using PDCA, Fishbone, 5S, 5D,Kaizen.

productivity & quality.	
7. List and interpret various acts of labour welfare legislation.	Explain benefits guaranteed under various applicable Acts.
	Interpret applicable labour and industrial laws.
8. Explain energy conservation, global warming and pollution and contribute in day to day work by optimally using available resources.	Explain energy conservation, cause of global warming and pollution.
	Show protective measures to balance the resources of nature.
	Explain effects of global warming and its precautions from damage. Dispose waste following standard procedure.
9. Explain personnel finance, entrepreneurship and manage/organize related task in day to day work for personal & societal growth.	Explain personnel finance and entrepreneurship.
	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 familiarize with the Policies / Programmes, procedure and available schemes.
	Prepare Project report to become an entrepreneur for submission to financial institutions.
10. Utilize basic computer applications and internet to take benefit of IT developments in the industry.	Work with MS Office viz., word, excel, etc.
	Use internet for finding out various data pertaining to the trade.

SPECIFIC LEARNING OUTCOME (BASIC SKILL)	
LEARNING OUTCOME	**ASSESSMENT CRITERIA**
11. Recognize & comply safe working practices, environment regulation and housekeeping.	Recognize and report all unsafe situations according to site policy.
	Report supervisor/ competent authority in the event of accident or sickness of any staff and record accident details correctly according to site accident/injury procedures.
	Identify Personal Protective Equipment (PPE) and use the same as per related working environment.

	Identify environmental pollution and contribute to avoidance of same.
12. Plan and organize cutting of different semi finished part to the correct dimension to fit at the required place.	Identification of different precision instruments
	Calculation of list count of different precision instruments
	Identification of uses of these instruments in different area
	Use of marking tools
	Knowledge of different types of punches
	Use of different tools for cutting the metal
13. Plan and organize measurement of the different parts with the correct accuracy to take decision on assembly and bearing clearance.	Working with inside, outside and depth micrometer.
	Working with inside and outside vernier.
	Use of try square
	List count calculation of micrometer, vernier.
	Understanding the uses of different measuring instrument in steel industry.
	Knowledge of steel rule
	Basic concept of zero error
14. Plan and organize the marking on different semi finished items for machining to the required dimension.	Knowledge of surface plate , angle plate ,marking black and 'V' block
	Understanding lapping and horning process .
	Understanding and knowledge of centre making on a surface
	Knowledge of jigs and fixtures
	Working with different types of jigs and fixtures
15. Study drawing of spare parts/assemblies and tolerance & allowance to prepare component to match with the required dimension for making new assembly.	Basic knowledge of tolerance and allowance
	Understanding the different symbols and importance of the symbols and given in the drawings
	Knowledge of different view from the drawing like front view/end view , missing line etc.
	Study of dimensions
	Knowledge of conversion of drawing dimensions to the actual taking into constitution of tolerances and allowances
16. Plan and organize dismantling of assembly at height, lowering it to the ground level and again lifting the new assembly /part to the required height and position using jack with tackles for dismantling of	Working with chain pulley block
	Application of jack in lifting/dismantling the assemblies
	Use of pulley in shifting the material
	Use of different type of rope for shifting the materials
	Use of winch for lifting and loading the load
	Knowledge of operation of maxpull

complicated assemblies.	
17. Plan and organize repairing of damaged pumps, changing bearing, blades and assemblies to proper dimension checking the working of repaired pumps.	Knowledge of different types of pumps
	Features of centrifugal pumps
	Features of reciprocating pumps
	Features of gear pump
	Knowledge of mounting of pumps
	Understanding the wear pattern of different parts of different pumps
18. Plan and perform static and dynamic balancing, Measure weight and place at correct place and Check the balancing and vibration on the machine.	Knowledge of vibration and its measurement
	Working with the equipment used in measuring the vibration
	Basic understanding of erosion
	Understanding the concept of trial and error method in fixing the weight on blades in dynamic balancing
	Basic understanding of different types of fans and exhausters.
19. Plan and perform making of hole by different types of tools and tackles like drilling machines, reamers and external and internal threads in different types of parts.	Basic understanding of tools
	Hardness required in different types of tools for machinery operation
	Working with reamers , tapes and dies
	Alignment of tools with the drilling centre
	Knowledge of working of drilling machine
	Use of different tools in drilling machine
	Knowledge of jigs and fixtures used in drilling operation
20. Plan and organize use of different types of nut, bolt, spring washer check nut washer, circlip, for tightening of part/ assembly.	Understanding of types and sizes of fasteners and picking of define numbers of fasteners
	Gap setting and checking feeler gauge
	Understanding and working with torque wrench
	Application of different types of spanners
	Mechanical tightening of nut with automatic tightening machine
	Balancing of stress during tightening of assembly
	Knowledge of circlip for holding the movement of parts of the assemblies
	knowledge of different standard bolt
	Application of spring washer in tightening

21. Plan and organize the use of different types couplings, clutches, bushes for assembly and transmission of motion in different systems.	Understanding the different types of couplings like -
	Knowledge , application and working of flange coupling
	Knowledge , application and working of flexible coupling
	Knowledge , application and working of chain coupling
	Knowledge , application and working in bush coupling
	Knowledge , application and working gear coupling
	Knowledge , application and working of spider coupling
	Knowledge , application and working of tyre coupling
	Knowledge , application and working of universal coupling
	Basic concept of power transmission
	Power transmission through gear drive, belt drive, chain drive, rope drive
	Understanding the basic concept of clutches
	Relation between knowledge of different power systems like mechanical, electrical.
22 Plan and organize the dismantling and positioning of new bearings, checking the clearance for bearing fitting. Use of different types of bearings in different assemblies. Surface finish before fitting the bearings.	Knowledge of application of different types of bearings like solid bush, split bush, roller bearing , cylindrical needle roller , tapper roller , spherical roller, self aligning and spherical roller thrust bearing
	Knowledge of different tackles use for dismantling and mounting the bearings
	Knowledge of surface finish required for bearing fitting
	Knowledge of lubricant systems used for bearings
	Knowledge of safety precautions to be taken during mounting of parts on the bearings
23 Plan and organize lubrication in different assemblies, Operate lubrication systems, flow of lubricants in different systems/ assemblies and check Proper function of lubricants for different operations.	Concept of lubrication
	Knowledge of different types of oils and greases used in steel industries for different type of applications.
	Working knowledge of centralize lubrication systems , different types of pumps, grease guns, packing's, seals , cylinder etc. used in steel industry
24. Plan and organize the use of different types of gears in	Knowledge description and function of different types of gears -
	Spur gear

different assemblies, dismantling of gear boxes, cleaning, use of fresh lubricants, use of proper gear in position and alignment as per drawing.	Single helical gear
	Double helical gear
	Spiral gear
	Bevel gear
	Straight and spiral bevel gear
	Worm gear
	Knowledge of rack and pinion
	Working knowledge of different types of gear boxes
25 Plan and organize levelling, alignment and balancing using different tools and tackles for these operations.	Explain concept of leveling, alignment and balancing.
	Demonstrate the different tools
	Demonstrate the use of tools
	Explain the difference between alignment and balancing
	Demonstrate the use of tackles.

8. SYLLABUS-(BASIC SKILLS)

Duration	Reference learning outcome	Professional Skills (290 hrs.)	Professional Knowledge (155 hrs.)
Professional Skill 22Hrs; Professional Knowledge 11 Hrs	Recognize & comply safe working practices, environment regulation and housekeeping.	Implementation of various safety measures at the shop floor. Monitoring of safety and health hazards.	Importance of safety. Use of PPEs.(Personal Protective equipment) , Road safety, Behavior, over all steel manufacturing process about steel making , different machinery used in the trade. Health and environment.
Professional Skill 22Hrs; Professional Knowledge 12 Hrs	Plan and organize cutting of different semi finished part to the correct dimension to fit at the required place.	Measurement by Precision instruments, Marking, cut metal.	Different measurement system.
Professional Skill 22Hrs; Professional Knowledge 12 Hrs	Plan and organize measurement of the different parts with the correct accuracy to take decision on assembly and bearing clearance.	Checking and setting of micrometer, Vernier calipers setting. Filling of regular and irregular in shape with an accuracy of 0 .4 mm.	Functional details of all basic measuring tools : i. Micrometer: Inside, Outside and depth micrometer. ii. Vernier iii. Steel rule Least count calculation Tools: Steel rule, Callipers, Try square , Marking punch.
Professional Skill 22Hrs; Professional Knowledge 12 Hrs	Plan and organize the marking on different semi finished items for machining to the required dimension.	Marking practices, finding center of a round object with the help of 'V' block and marking block. Centre Marking for hole making in a coupling. Key way marking on shaft.	Functional details of surface plate, angle plate marking block and 'V' block. Lapping & horning process Jigs & fixtures-type & uses (

Professional Skill 22Hrs; Professional Knowledge 12 Hrs	Study drawing of spare parts / assemblies and tolerance & allowance to prepare component to match with the required dimension for making new assembly.	Drawing and marking from drawings Tolerance, allowance	Interchangeability and its requirement Limit and tolerance, basic size and actual size , surface finish and its importance , symbol, measuring techniques. Hole and shaft basis (BIS standard)
Professional Skill 12Hrs; Professional Knowledge 06 Hrs	Plan and organize dismantling of assembly at height , lowering it to the ground level and again lifting the new assembly /part to the required height and position using jack jack with tackles for dismantling of complicated assemblies.	Use of chain pulley block maxpull, Jack for lifting material. Use of lifting tackles for assembly and dismantling of equipment. Lifting and taking down materials from the height with the help of chain pulley block.	Lifting tackles. Various types of lifting tackles, their features and applications in steel Plants. (Pulley, rope, chain pulley bock, maxpull, slings, mechanical jacks, turn buckles etc.) Safety Aspects during use. Common defects in tackles and rectification. General upkeep & maintenance, Storage.
Professional Skill 12Hrs; Professional Knowledge 06 Hrs	Plan and organize repairing of damaged pumps, changing bearing, blades and assemblies to proper dimension checking the working of repaired pumps.	Repair of different types of pumps. Dismantling and assembly of different types of pumps, valves.	Purpose, types and general features.(Centrifugal, reciprocating & gear pumps.) Basic concepts of suction an delivery. Functional difficulties and rectification.
Professional Skill 22Hrs; Professional Knowledge 12 Hrs	Plan and perform static and dynamic balancing, Measure weight and place at correct place and Check the balancing and vibration on the machine.	Balancing of fans and exhausters.	Purpose, types and application. ID and FD fan. Exhausters. Specific use in various shops of steel Plants. Upkeep and maintenance.

Professional Skill 22Hrs; Professional Knowledge 12 Hrs	Plan and perform making of hole by different types of tools and tackles like drilling machines, reamers and external and internal threads in different types of parts.	Drilling machine, Use of drill, reamer, tap and dies. Use of drill machine.	Different types of drilling machine bench, pillar and radial. Drilling operation, functional detail of drill, tap, dies & reamer. Cutting speed, depth of cut and feed.
Professional Skill 22Hrs; Professional Knowledge 12 Hrs	Plan and organize use of different types of nut, bolt, spring washer, check nut washer, circlip, for tightening of part/ assembly.	Identification of various types of fasteners and locking devices. Various types of spanners, Torque wrench.	Introduction of different types of fasteners , there specification , different type of nuts, bolt , studs, locking devices for nut, wrench and spanner, pliers, screw drivers, Circlip, split pin, concept of torque & torque wrench.
Professional Skill 22Hrs; Professional Knowledge 12 Hrs	Plan and organize the use of different types of couplings, clutches, bushes for assembly and transmission of motion in different systems.	Mechanical power transmission system, coupling bore for finding out taper.	Positive and non positive, friction drive, gear drive, belt drive, chain drive and rope drive. Basic concept of clutches. **Coupling :-** Concept of coupling and its type viz. Rigid coupling-muff coupling, Flange coupling, Flexible coupling , chain sprocket coupling, Gear coupling, spider coupling, Tyre coupling, Universal coupling .
Professional Skill 22Hrs; Professional Knowledge 12 Hrs	Plan and organize the dismantling and positioning of new bearings, checking the clearance for bearing fitting. Use of different types of bearings in different assemblies. Surface	Bearing and tools-tackles used for mounting and dismounting.	Sliding and rolling bearing : Solid bush, Split bush Roller bearing: Cylindrical-Needle roller, Taper roller, spherical roller, self aligning and spherical roller thrust bearing. Bearing fitting: fitting of bearing , requirement of surface finish where bearing is fitted.

	finish before fitting the bearings.		
Professional Skill 22Hrs; Professional Knowledge 12 Hrs	Plan and organize lubrication in different assemblies, Operate lubrication systems, flow of lubricants in different systems/ assemblies and check Proper function of lubricants for different operations.	Lubrication (oil and grease)	Concept of wear and tear, Concept of lubrication , types and properties of oils and grease, different type of lubricant method like: Centralized system, Grease gun, By opening flanges.
Professional Skill 12Hrs; Professional Knowledge 06 Hrs	Plan and organize the use of different types of gears in different assemblies, dismantling of gear boxes, cleaning, use of fresh lubricants, use of proper gear in position and alignment as per drawing.	Gear	Different type of gear used in steel Plant and there function: Type, description and function of gears-spur, single helical, Double helical, spiral, bevel, straight & spiral bevel, worm gears, rack and pinion. Gear terminology. Gear train- simple, compound, reverted and epicyclic. Types of gear box gear meshing.
Professional Skill 12Hrs; Professional Knowledge 06 Hrs	Plan and organize levelling, alignment and balancing using different tools and tackles for these operations.	Alignment, balancing and leveling.	Understanding importance of leveling, alignment and balancing.

9. CORE SKILL

9.1 WORKSHOP CALCULATION SCIENCE

Sl. No.	Syllabus	Time in hrs.
I.	**Unit, Fractions**	**4**
1	Classification of Unit System	
2	Fundamental and Derived Units F.P.S, C.G.S, M.K.S and SI Units	
3	Measurement Units and Conversion	
4	Factors, HCF, LCM and Problems	
5	Fractions – Addition, Subtraction, Multiplication and Division	
6	Decimal Fractions - – Addition, Subtraction, Multiplication and Division	
8	Solving Problems by using calculator	
II.	**Square Root: Ratio and Proportions, Percentage**	**6**
1	Square and Square Root	
2	Simple problems using calculator	
3	Application of Pythagoras Theorem and related problems	
4	Ratio and Proportions	
5	Direct and Indirect proportion	
6	Percentage	
7	Changing percentage to decimal	
III.	**Material Science**	**8**
1	Types of metals	
2	Physical and Mechanical Properties of metals	
3	Types of ferrous and non-ferrous metals	
4	Introduction of iron and cast iron	
5	Difference between iron and steel, alloy steel and carbon steel	
6	Properties and uses of rubber, timber and insulating materials	
IV.	**Mass, Weight, Volume, and Density**	**4**
1	Mass, volume, density, weight & specific gravity	
2	Related problems for mass, volume, density, weight & specific gravity	
V.	**Speed and Velocity, Work Power and Energy**	**12**
1	Rest, motion, speed, velocity, difference between speed and velocity, acceleration and retardation	
2	Related problems on speed and velocity	
3	Potential energy, Kinetic Energy and related problems with related problems	
4	Work, power, energy, HP, IHP, BHP and efficiency	
VI.	**Heat &Temperature and Pressure**	**12**
1	Concept of heat and temperature, effects of heat, difference between heat and temperature	

2	Scales of temperature, Celsius, Farenhieght, Kelvin and Conversion between scales of temperature	
3	Temperature measuring instruments, types of thermometer, pyrometer and transmission of heat - Conduction, convection and radiation	
4	Co-efficient of linear expansion and related problems with assignments	
5	Problem of Heat loss and heat gain with assignments	
6	Thermal conductivity and insulators	
7	Boiling point and melting point of different metals and Nonmetals	
8	Concept of pressure and its units in different system	
VII.	**Basic Electricity**	**12**
1	Introduction and uses of electricity, molecule, atom, how electricity is produced, electric current AC, DC and their comparison, voltage , resistance and their units	
2	Conductor, Insulator, types of connections- Series and Parallel,	
	Ohm's Law, relation between VIR & related problems	
3	Electrical power, energy and their units, calculation with assignments	
4	Magnetic induction, self and mutual inductance and EMF generation	
5	Electrical Power, HP, Energy and units of electrical energy	
VIII.	**Mensuration**	**10**
1	Area and perimeter of square, rectangle and parallelogram	
2	Area an Perimeter of Triangle	
3	Area and Perimeter of Circle, Semi-circle , circular ring, sector of circle, hexagon and ellipse	
4	Surface area and Volume of solids- cube, cuboids, cylinder, sphere and hollow cylinder	
5	Finding lateral surface area , total surface area and capacity in liters of hexagonal, conical and cylindrical shaped vessels	
IX.	**Levers and Simple Machines**	**6**
1	Simple machines, Effort and load, mechanical advantage, velocity ratio, efficiency of machine, relation between efficiency, velocity ratio and mechanical advantage	
2	Lever and its types	
X.	**Trigonometry**	**6**
1	Measurement of Angle, Trigonometrical Ratios, Trigonometric Table	
2	Trigonometry-Application in calculating height and distance (Simple Applications)	
	Total	**80**

ENGINEERING DRAWING

Sl. No.	Topic	Time in hrs.
1.	Engineering Drawing – Introduction Introduction to Engineering Drawing and Drawing Instruments – • Conventions • Viewing of engineering drawing sheets. • Method of Folding of printed Drawing sheet as per BIS SP: 46-2003	1
2.	Drawing Instrument • Drawing board, T-square, Drafter (Drafting M/c), Set squares, Protector, Drawing Instrument Box (Compass, Dividers, Scale, Diagonal Scales etc.), pencils of different grades, Drawing pins/ Clips.	1
3.	Free hand drawing of – • Lines, polygons, ellipse etc. • Geometrical figures and blocks with dimension • Transferring measurement from the given object to the free hand sketches. • Solid objects – Cube, Cuboids, Cone, Prism, Pyramid, Frustum of Cone with dimensions. • Free hand drawing of hand tools and measuring tools, simple fasteners (nuts, bolts, rivets etc.) trade related sketches	10
4.	Lines • Definition, types and applications in drawing as per BIS: 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	2
5.	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 • Different polygon and their values of included angles. Inscribed and circumscribed polygons	8

6.	Lettering & Numbering – • Single Stroke, Double Stroke, Inclined.	6
7.	Dimensioning and its Practice • Definition, types and methods of dimensioning (functional, non-functional and auxiliary) • Position of dimensioning (Unidirectional, Aligned) • Types of arrowhead • Leader line with text • Symbols preceding the value of dimension and dimensional tolerance.	4
8.	Sizes and layout of drawing sheets • Selection of sizes • Title Block, its position and content • Item Reference on Drawing Sheet (Item list)	2
9.	Method of presentation of Engg. Drawing • Pictorial View • Orthographic View • Isometric View	2
10.	Symbolic representation – different symbols used in the trades • Fastener (Rivets, Bolts and Nuts) • Bars and profile sections • Weld, Brazed and soldered joints • Electrical and electronics element • Piping joints and fitting	6
11.	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 in 3rd angle.	15
12.	Orthographic projection from isometric projection	15
13.	Reading of fabrication drawing	8
	Total	**80**

9.2 CORE SKILL - EMPLOYABILITY SKILLS

Syllabus for Employability Skills (160 Hrs.)		
Module	Topics	
1. Behavioural Skills	Duration: 10 Hrs.	Marks: Nil
Expectation Setting	Creating a focused and responsible learning environment	
Personal Strength Analysis/Strength Blindness	Self -awareness and confidence building	
Perception Management	Display Professionalism at the institute and work place	
Ethics, Values& Etiquette	Increased social initiations relationships and networks Acceptance of peers from different cultures and social groups and work with them. Collaboration with team to prioritize the common goal and compromise individual priorities.	
Social Etiquette	Characteristic of a responsible citizen- Display the same by respecting self, others, environment, care for duty and value for time.	
Role Modeling	Adopting best practices and aspire to follow success stories of individual for personal development.	
2. English Literacy	Duration: 30 Hrs.	Marks: 10
Functional English	Importance of Learning English Different Naming words, Words used for replacing names, Action words, Describing people, place and their use. Introduction to punctuation - Comma, Full stop, Question mark. Singular plural Change of tense - Simple present, past; present, past progressive Construction of simple sentences - Kinds of sentences Usage of appropriate words to express themselves Greetings & Self Introduction Asking &responding to questions Sharing information with others Formal & Informal communication Speak and provide information about workplace Discussions on current happenings.	
Reading	Reading simple sentences about: a) Self b) Work c) Environment	
Written English	Simple writing skills	
3. Communication Skills	Duration: 20 Hrs.	Marks: 8

Self- Introduction	Interview Skills/Confidence Building
Perception Management	Professionalism and Display of same at the institute and work place.
a. Verbal Communication	Understand the usage of appropriate words to express themselves Communicate effectively on telephone.
b. Non-Verbal Communication	Manage Personal Hygiene and Presentation
	Positive body language: adopt and use it appropriately to build a positive impression
	Different spatial zones: Understanding and need to maintain it, create safe zones for communication
	Maintaining appropriate eye-contact in building trust and confidence
	Impact of touch in a formal environment. Acceptable and unacceptable touch.
	Role of tone in any communication.
Campus to Work	Time Management and Planning Skills
	Interview skills- its phases & ways to crack interview.
	Handling setbacks/rejection and recover from it with an action plan.
	Developing strong professional contacts/network to gain support in learning process and career as a whole.
4. I.T. Literacy	Duration: 20 Hrs. Marks: 08
Basics of Computers	Introduction to Computers and its applications Hardware and peripherals Starting and shutting down of computer Basic of computer Networks.
Operating System	Basics of Operating System Types of Operating Systems User interface of Windows 10 OS/ latest Create, Copy, Move and delete Files and Folders Use of External memory like pen drive, CD, DVD etc, Introduction to inbuilt windows apps, Tools and features.
MS-Word	Basic operating of Word Processing Creating, opening and closing Documents Use of shortcuts, Creating and Editing of Text, Formatting the Text Creating simple document like - resume, letter writing, job application etc., Printing document
MS-Excel	Basics of Excel worksheet & its importance Creating simple worksheets Adding and average functions Printing of simple excel sheets
Web browsers & Search Engines	Introduction to world wide web (WWW), Useful websites, web browser - usage, search engine etc. Using popular sites like Bharat Skills, Skill Training related Government portals, naukri.com and other job portals, CITS applications, Apprenticeship portal (NAPS), resize images, signing up, Online fund transfer using UPI gateway.

Email	Creating & using an email account –like Gmail or any other. Usage of CC & BCC. Attaching documents Checking email and composing Email.
Mobile application	Scanning QR/AR code, Sharing best practices and downloading trade related videos using Wi-Fi, Fund transfer through App like BHIM.
5. Entrepreneurship Skills Duration: 20 Hrs. Marks: 06	
Entrepreneur	Need of becoming entrepreneur
	Ways to become a good entrepreneur
	Enabling environment available to become an entrepreneur. Different Govt. institutions/schemes promoting Entrepreneur viz., Gramin banks, PMMY-MUDRA loans, DIC, SIDA, SISI, NSIC, SIDO. Ways to set up an enterprise and different aspects involved viz., legal compliances, Marketing aspect, Budgeting, etc. Day to day monitoring mechanism for Maintaining an enterprise. Different Government schemes supporting entrepreneurship. Examples of successful and unsuccessful entrepreneurs.
6. Maintaining Efficiency at Workplace Duration: 10 Hrs. Marks: 03	
Maintaining Efficiency at Workplace	Factors affecting productivity
	Improving Productivity
	Personal finance literacy Planning, Saving, Tax, Govt. schemes for financial safety e.g. Pradhan Mantri Jeevan Jyoti Bima Yojana (PMJJBY), etc.
7. Occupational Safety, Health and Environment Education Duration: 10 Hrs. Marks: 03	
Safety and Health	Introduction to Occupational Safety & health at work place, Occupational Hygiene
Occupational Hazards	Basic Hazards. Chemical ,Physical (Electrical, Temperature, Illumination) Ergonomic, Biological, Vibro acoustic, Mechanical, Psychosocial Hazards, Prevention of hazards
Accident and Safety	Different types of Personal Protective Equipment (PPE) Accident Prevention techniques
First-aid	Care of injured & Sick at the workplace First-Aid & Transportation of sick person
Basic provisions on safety and Health	Basic provisions of safety & health
Environmental Issues	Introduction to Environment, ecosystem and factors causing imbalance Pollution and pollutants including liquid, gaseous, solid and hazardous waste Protecting the environment - Energy Conservation, ground water, global warming Responsibility about the environment Segregation and disposal of waste
Environmental ethics	Different actions people that affect others and the environment.
Disaster Management	Types, causes & effects, areas in India that are prone to be affected, preparedness & mitigation, dos and don'ts- Before, During and After any Disaster, how to reduce

	man-made disasters.
8. Essential skills for success	Duration: 10 Hrs. Marks: 03
Essential skills for success	Building basic skills to navigate life and career. Self-Awareness, articulating personal values, Value-based decision making, Dilemma situations. Identify sources and types of stress (positive / negative stress), Managing stress (long-term / short-term), Handling rejection and building resilience, Identify day wasters.
9. Labour Welfare Legislation	Duration: 05 Hrs. Marks: 1.5
Labour Welfare Legislation	Benefits guaranteed under various acts- Factories Act, Apprenticeship Act, Employees State Insurance Act (ESI), Payment Wages Act, Employees Provident Fund Act, The Workmen's compensation Act, POSH. Interpret applicable labour and industrial laws.
10. Quality Management	Duration: 05 Hrs. Marks: 1.5
Quality Concept and Consciousness	Create awareness on introduction of quality Concepts.
Concept of Quality Management (QMS) & PDCA	Concept of Quality Management (QMS), PDCA, Fishbone, 5S, 5D, KAIZEN
Concept of ISO	Introduction of ISO
11. Preparation to the world of work	Duration: 10 Hrs. Marks: 03
Career Plan	Identify the difference between job and career
Basic Professional Skills	Job roles available in respective trades
Career Pathways	Awareness of industries, and the respective professional pathways
Search and apply for a job	Awareness of higher education / up skilling (short-term) options Steps involved in online application for Instructor course, Apprenticeship and different jobs in popular site like theindiajobs.com, naukri.com, monsterindia.com, Govt. website.
12. Customer Interaction / service	Duration: 10 Hrs. Marks: 03
Greeting customers	Forms of greeting
Probing-understanding customer requirements	Use of positive body language
Handling grievances	Handling grievances (Use of ask-listen-repeat technique)
Relationship building with customers	Relationship building with customers, importance of probing.
To identify the importance of probing	Use of open-ended/ close-ended questions to gauge requirement

10. DETAILS OF COMPETENCIES (ON-JOB TRAINING)

Learning to be covered in Industry for Fitter Trade (Integrated steel Plant).

1. Safety and best practices/ Basic culture (5s/Kaizen)
2. Log book writing and maintaining records.
3. Storing of different tools and consumables.

ON THE JOB TRAINING:-

1. COKE OVEN Duration:- 100 hrs.

- **Battery machines**
- **Pusher Car**:- **Functions-** Pushing hard coke from oven and levelling of coal in oven. **Fitter job-** Hydraulic cabin cleaning, loose bolt checking/tightening , leakage checking /arresting.
- **Charging Car**: - **Functions-** Receiving of coal from bunker and unloading (charging) in oven. **Fitter job-** Hydraulic cabin cleaning, loose bolt checking/tightening, leakage checking / arresting.
- **Coke guide Car**:- **Functions-** While pushing of hot coke from oven to bucket car , passage for coke is made by guide car cage . **Fitter job-** Hydraulic cabin cleaning, leakage checking / arresting, loose bolt checking/tightening,.
- **Coke Bucket Car**:- **Functions-** Hot coke from oven is received in bucket car and transported to CDCP for cooling purpose . **Fitter job-** Loose bolt checking. Bucket plates inspection/ reporting.
- **Stand pipe and goose neck and attachment related to hydraulic main:- Functions-** Gases released while carbonization of coal are passed through stand pipe to collecting main. **Fitter job-** Gas passage inspection/checking.
- **Flushing liquor pump**:- **Functions-** This creating suction in the gas main during charging of oven. **Fitter job-** Pump house cleaning.
- **Coal tower equipment** :- **Functions-** For loading of required coal from coal tower into charging car. **Fitter job-** Gases free movement checking, Nut bolts checking/ tightening.
- **Pipe line, pumps, gas coolers**:- **Functions-** For pumping/ creating head to reach the fluid to required height for necessary use. **Fitter job-** Pumps, gas coolers, pump house cleaning, leakage checking/ reporting.

- **CDCP** –Lifting arrangement and Mill fan:- **Functions-** For cooling of hot coke received from 1050°C to 180°C in cooling chamber and discharging to coke belt. **Fitter job-** Track checking/ cleaning, cleaning of dust/ dirt near nil fan area.

2. <u>BLAST FURNACE</u> Duration:- 150 hrs.

- **Tuyere Stack:-Functions**-Convey the hot blast from hot blast stove to Blast furnace with 1100°C.**Fitter job**-Loose bolt checking/tightening, leakage checking/arresting.
- **Drill machine:-Function**-Tap hole is one of the most highly stressed area of blast furnace ,drill machine is used to open tap hole with the air pressure of 6 kg/cm2.**Fitter job**-Hydraulic cabin cleaning, leakage checking/arresting, loose bolt checking/tightening.
- **Mudgun**:-**Function**-To close the blast furnace tap hole by mudgun mass with the hydraulic pressure of 200 Bar. Fitter job-Hydraulic cabin cleaning, leakage checking/arresting, loose bolt checking/ tightening.
- **Cooling system(Valves and pipes, pumps and filters)**:-**Function**-For pumping/creating head to reach the fluid to required height for necessary use and valves are used to control the flow of fluid. **Fitter job**-Leakage checking/arresting, loose bolt checking/tightening.
- **Heat exchanger**:-**Function**-To maintain the required temperature of the system with the help air orwater. **Fitter job**-Leakage checking/arresting.
- **Hot blast stove**:-**Function**-To increase the cold blast temperature from 100°Cto 1100°Cand supply continuously the hot air blast to blast furnace. **Fitter job-** Inspection/leakage checking/arresting, loose bolt checking/tightening.
- **Conveyo**r:-**Function**- For conveying material from one place to other place. **Fitter job**-Inspection.

3. <u>SINTERING PLANT</u> Duration:- 100 hrs.

- Eirich mixture Function; It is used for mixing of raw charge. Fitter job; Rotor tool changing, lubrication and hydraulics
- Sinter Screens ;Function- Screening of sinter. Fitter Job; Deck changing, cardan shaft and exciter changing

- High capacity fan- Function; It is used for cooling of sinter. Fitter Job; Bearing fitting, fan assembly making
- Water pump house maintenance Function; supply of cooling and process water . Fitter job.- Pump repairing and changing

- Pallets Function ; Sinter making Fitter Job; Pallet parts revisioning and changing
- Sinter Crusher- Function- Sizing of hot sinter. Fitter job, Spikes changing, condition monitoring, Crusher rotor changing

- Sinter Cooler- function- Cooling of hot sinter, Fitter job; Dip rail maint. Alignment checking, trough changing

4. <u>STEEL MELTING SHOP</u> Duration:- 150 hrs.

- Lance setting and maintenance; Function; lance is used for oxygen blowing in side the convertor. Fitter job-To change the lance tip, Outer pipe and inner pipe as per the need, rectify gland leakage, assembly of new lance.
- Chute maintenance , Function-It is used to supply required material inside the convertor. Fitter job- Cleaning of jam chutes and vibrators, monitoring and repair of weighing systems.
- Gas cleaning system –Function; It is used to clean the convertor gas. Fitter job- Cleaning of sticky material at the blades by water jets. Lubrication of gas ID Fan. Vibration monitoring and duct repair
- **Crane maintenance**; Function- It is used to transfer material from one place to other place. Fitter Job- Proper lubrication of crane wheels, Periodical checking of limit switches, braking regulation, component changing, changing of brake assembly.
- **Track alignment**; Track is used as path way for cranes. Fitter job- Cleaning and preventive restoration of clamps and fish plate. Application of dry lubrication on the side surface of crane tracks.
- **Slag Car and metal car**-It is used for transfer of metal / slag from convertor area to LH/ SLAG yard. Fitter Job- Shift wise checking of drive couplings and bolt, Regular track cleaning and bolt tightening, Changing the heat shield, Monitoring of wheel conditions
- **Electrode changing in Ladle furnace** ; Fitter Job; Operating of pneumatic systems for changing of electrodes.

- **Rope regulation in RH drive**; Fitter Job- Tightening of rope, Changing of Rope

5. <u>THIN SLAB CASTER</u> Duration:- 100 hrs.

- Operation and maintenance of Turret Car:- **Function:** It is used to lift steel ladle from LF side and to put in proper position for teeming in concast process. **Fitter job:** To fix hydraulic cylinder in the bottom of the ladle and to remove it after teeming is over.
- Caster Cranes and their units. **Function:** It is use for the movement of the tundish in concast operation. **Fitter job:** Lifting of tundish and removal of tundish , hitting of tundish , inspection of crane, tightening the nut and bolt.
- Tundish Car and its maintenance. **Function:** It is used for transferring the molten steel into pre designed moulds. **Fitter job:** Fixing of tundish car with the system and removing it in case its life is over.
- Dummy Bar: **Function:** It is used to guide the cast metal until it solidifies. **Fitter job:** Tightening of different links and tightening of nut and bolt in engaged in the system.
- Slab cutting machine : **Function:** It is used to cut the slab to the required size. **Fitter job:** Tightening of the assembly, arresting of the leakages of the hydraulic line.
- Assembly and dismantling of segments. **Function:** It is use for given poises to the cast metal .**Fitter job:** alignment of segments with the dummy bar .

6. <u>HOT STRIP MILL</u> Duration:- 100 hrs.

- Tunnel furnace- The function of TF is to raise the temp from a lower temp to rolling temp at Mill. **Fitters Job:- Checking and lubricating Roller Assy, Brg & its fasteners, Drive coupling etc. Replacing Roller-Assy, checking the shuttle car & its drive mechanism etc. Blower working condition & recording/monitoring.**
- Rolling stands- R1,R2,F1,F2,F3,F4- The functioning of these stands are to reduce the slab thickness from cast thickness(say 90 mm) to reqd thickness (say 1.6 mm-16 mm). **Fitters Job:- Checking and tightening lub & hyd lines for any leakage, Checking & tightening fasteners, checking and aligning entry guide & exit guide, water spray etc.**

Replace cylinders, Guides, Rolls, Hoses, Cooling Nozzle Header assy etc.

- Rollers and guides- Function is to guide the slab being rolled from one stand to another sequentially to get the final product. **Fitters Job:- Checking and tightening roller brgs, checking lubrication of Roller Brg, Cooling water Rotary Unions proper functioning & its fasteners, Drive coupling etc. Replacing Roller-Assy, Rotary Union drive coupling etc. Recording/monitoring etc.**
- Coiler- The rolled strip from Rolling Stands are coiled onto a drum for ease of handling. **Fitters Job:- Checking and lubricating various Roller Assy, Checking oil leakage & stopping it, Check for loose fasteners & tighten them, Drive coupling etc. Replacing Roller-Assy, checking the Coil car & its drive mechanism etc.**
- Hydraulic and pneumatic system- Function is to operate various Roll movement, Guide movement, Clamping force etc. Also to control thickness of rolling strip. **Fitters Job:- Checking oil level, temp, in Hyd. tank and top-up. Check for any oil leakage and arrest. Check Pimp running sound, temp etc. Check for loose joints & tighten them, Drive coupling etc.**

7. RMHS Duration:- 100 hrs.

- Drive side pulley block changing and bearing changing**. Fitter job; Checking and replacement if required. Drive system alignment. Checking and tightening of bolt**
- Reducer changing and inspection; Opening of nut of old reducer. Dismantling and putting new reducer to the place. Alignment of new reducer.
- Belt changing and their running maintenance. Use of winches to replace the damaged belt. Placing of new belt.

8. **POWER AND BLOWING STATION** Duration:- 50 hrs.

- Centrifuging operation and maintenance. **Fitter job:** Tightening of nut bolt and lubrication of the system , repair of the worn out blades.
- Matching and fitting of white metal bearing . **Fitter job:** Scrapping of the bearing , matching to the exact size with the help of template.

- High pressure valve changing with packing material. **Fitter job:** Safety precautions during the changing of high pressure valve, dismantling and lowering with the help of chain pulley block , changing the packing material and putting the new high pressure valve with the help of winches/ chain pulley block.
- High pressure pipe line . **Fitter job:** coordination with energy management for changing the high pressure pipe line. Proper testing before changing the pipe line, placing of new pipe line with flanges mount on it, proper tightening and alignment.
- Heat exchanger. **Fitter job:** Guage glass cleaning fitting and replacement)

9. <u>GENERAL TRAINING</u> Duration:- 50 hrs.

i. Storing of tools, tackles, packing, lubricant, welding electrode etc.
ii. Installation and Alignment of belts, chain, sprockets.
iii. Checking size of solid bush bearing, journal and housing for proper fit.
iv. Overhauling of gear box (Pre cleaning, dismantling, clearing, inspection, repair/ replacement, assemble).
v. Preventive and schedule maintenance of valves.
vi. Dismantling, cleaning assembly of fans, Blowers their parts.
vii. Overhauling of Valves, Hydraulic pumps and Hydraulic actuators.
viii. Overhauling/Assembly practice of Gear box, Pump and Valve.
ix. Overhauling/Assembly practice of Jack, Hydraulic cylinder, Lifting hoist and Belts.
x. Maintenance of Fans, Blowers and compressor.

ANNEXURE-I

List of tools and tackles required for
Fitter (Integrated Steel Plant)

S.no	Name of the Tool & Equipments	Specification	Qty
A.	**TRAINEES TOOL KIT**		
1	Steel Rule with metric & British graduation	150 mm, Stainless steel	20
2	Try Square.	150 mm blade	20
3	Caliper inside spring type.	150 mm	20
4	Caliper hermaphrodite spring type	150 mm	20
5	Caliper outside spring type	150 mm	20
6	Divider spring type	150 mm	20
7	Scriber	150 mm	20
8	Centre Punch	10 mm and Length - 120 mm	20
9	Screw driver	150mm insulated flat type	20
10	Chisel cold flat	20 mm X 150 mm High carboon	20
11	Hammer ball peen With handle	450 grams (1 lb)	20
12	Hammer ball peen With handle.	220 grams (1/2 lb)	20
13	File flat - second cut	250 mm	20
14	File flat smooth	250 mm.	20
15	File half round second cut	150 mm.	20
16	Hacksaw frame fixed type	300 mm	20
17	Safety goggles.		20
18	Dot punch	100 mm	20
B. INSTRUMENTS AND GENERAL SHOP OUTFIT -			
19	Steel Rule Graduated both in Metric and English Unit	300 mm Stainless steel	4
20	Straight edge steel	300 mm or above	2
21	Spirit Level metal Type - 2	300 mm Basic Length Accuracy 0.1mm/Meter	1
22	Stud Extractor EZY - out	Set of 8	2
23	Combination Set	300 mm	2
24	Micrometer outside.	0 - 25 mm	2
25	Micrometer outside.	25 - 50 mm	2
26	Micrometer outside.	50 - 75 mm	2

27	Micrometer inside with extension rods.	Accuracy 0.01 mm with extension rods upto 150 mm	1
28	Vernier calliper	150 mm	4
29	Vernier height gauges	0 - 300 mm with least count 0.02 mm	1
30	Vernier bevel protractor Blade with Acute Angle Attachment	300 mm	1
31	Screw pitch gauge Metric	0.25 to 6 mm	1
32	Wire gauge, metric standard.		1
33	Surface plate C.I/Granite with Stand and Cover	600 x 600 mm	1
34	Marking table (Mild steel)	900X900X900 mm	1
35	Universal scribing block.	220 mm	2
36	V-Block pair with clamps	150 x 100 x 100 mm	2
37	Angle plate	150 X 150 X 250 mm	2
38	Punch letter set.	3 mm	1
39	Punch number set.	3 mm	1
40	Portable hand drill (Electric)	0 to 13 mm Capacity	1
41	Drill twist straight shank	3 mm to 12 mm by 0.5 mm H.S.S.	2
42	Drill twist Taper shank	8 mm to 20 mm by 0.5 mm H.S.S.	2
43	Taps and dies complete set in box.	Wit-worth	1
44	Taps and dies complete set	5, 6, 8, 10 & 12 mm set of 5	2
45	File knife edge smooth	150 mm	4
46	File feather edge smooth	150 mm	4
47	File triangular smooth	200 mm	4
48	File round second cut	200 mm	4
49	File square second cut	250 mm	4
50	Feeler gauge	Gauge Feeler / Thickness - 0.05 mm to 0.3 mm by 0.05 and 0.4mm to 1 mm by 0.1 mm - 13 leaves set	1
51	File triangular second cut.	200 mm	4
52	File flat second cut safe edge.	300 mm	4
53	File flat bastard	200 mm	5
54	File flat bastard.	300 mm	5
55	File Swiss type needle	Set of 12, Length = 150 mm set	2
56	File half round second cut.	250 mm	5
57	File half round bastard.	250 mm	5
58	File round bastard.	250 mm	5

59	File hand second cut.	150 mm	4
60	File card.	3"x5" size, brass or steel wire	4
61	Oil Can	250 ml	2
62	Pliers combination insulated	150 mm	2
63	Wooden handle forged Soldering Iron copper bit.	230V, 250 W, 350 gm	2
64	Blow Lamp	0.5 litre	2
65	Spanner- Double Ended	6x7, 8x9, 10x11, 12x13, 14x15,16x17, 18x19, 20x22	1
66	Spanner adjustable	150 mm	2
67	Interchangeable ratchet socket set	12 mm driver, sized10-32 mm set of 18 socket & attachments. Set	1
68	Double Ended tubular Box spanner set with Tommy bar.	A/F 6-25 mm set of 10 Tommy Bar Dia 6, 8, 10, 12, 14, 16 set	1
69	Glass magnifying	75 mm	2
70	Clamp toolmaker	5 cm and 7.5 cm set of 2.	2
71	Clamp "C"	100 mm	2
72	Clamp "C"	200 mm	2
73	Hand Reamer set	Nominal Dia 6, 8, 10, 12,	1
74	Machine Reamer parallel (Helical flute)	12 - 16mm set of 5.	1
75	Scraper flat	150 mm	4
76	Scraper triangular	150 mm	4
77	Scraper half round	150 mm	4
78	Chisel cold cross cut & diamond point.	9 mm X 150 mm	4
79	Chisel cold flat	9 mm X 100 mm	4
80	Chisel cold round noze.	9 mm X 100 mm	4
81	Drill chuck with key	12 mm.	1
82	Pipe wrench	400 mm	1
83	Pipe vice	100 mm	1
84	Adjustable pipe die set BSP	cover pipe size 1" or 3/4" SET	1
85	Wheel dresser (One for 4 units) Star/Dresser with Holder	Length 150 mm, diamond point	1
86	Machine vice - Swivel Base	100 mm	1
87	Machine vice - Swivel Base	125 mm	1
88	Sleeve drill Morse	No. 0 - 1, 1 - 2, 2 - 3, 3 - 4, 4 -	1
89	Bench working.	2400 x 1200 x 900 mm	4
90	Almirah.	1800 x 900 x 450 mm	2

91	Lockers with 8 drawers (standard size).	One locker for each trainee	3
92	Metal rack	1820 x 1820 x 450 cm	1
93	Instructor Table		1
94	Instructor Chair		1
95	Black board with easel.		1
96	Fire buckets.		8
97	Machine vice.	100mm	2
98	Wing compass.	254 mm or 300 mm	2
99	Hand hammer with handle.	1000 gm	1
100	Torque wrench (Standard/Ratchet type)	14 to 68 Nm	1
101	Power tools for fastening	Capacity 10-18mm	1
102	Different Profile gauges (Plate type) - For demonstration	Metric standard	4
103	Knurling tool (Diamond, straight & Diagonal)		3
104	Indexable boring bar with inserts	1" shank	4
106	Temperature gauge	Range 0 - 150°C	1
109	Lapping plate	Dia. -6"	2
112	Drill gauges	Letter drill gauge (A to Z) , Number drill gauge (1 to 60) , Metric drill gauge (1.5mm to 12.5mm, 30 holes)	2
119	Hollow punch	Straight Shank Hollow Punch Sets 5-12mm	1
120	Drill Drift (May be manufactured in-house)	200mm hardened and black finish	2
121	Bearing different types	each type of diameter 25mm (min.) set	3
122	Lifting sling	8mm Nominal Dia.Single leg Sling	2
123	Bearing extractor	Universal gear puller 2 or 3 jaws Adjustable	1
124	Pulley extractor	- do –	1
C. GENERAL MACHINERY INSTALLATION			
1	Pillar Type Drilling machine	Sensitive 0-20 mm cap. with swivel table motorised with chuck & key.	1
2	Drilling machine bench	Sensitive 0-12 mm cap motorised with chuck and key.	2
3	D.E. pedestal Grinding machine with wheels rough and smooth	2 H.P.-3Phase-415V, 1500rpm,250 Dia wheel	1

LIST OF TOOLS AND EQUIPMENT FOR ENGINEERING DRAWING

S No.	Name of the items	Specification	Quantity
1.	Drawing instrument box	Containing - Compass with pencil point, divider, protractor, scale, etc.	01 set per trainee
2.	Set square celluloid 45°	250 X 1.5 mm	01 no. per trainee
3.	Set square celluloid 30°-60°	250 X 1.5 mm	01 no. per trainee
4.	French-curves (set of 12 celluloid)		4 sets.
5.	T-Square or Mini drafter	750mm	01 no. per trainee
6.	Drawing board IS: 1444	700mm x 500 mm	01 no. per trainee
7.	Almirah steel	As required	As required

LIST OF TOOLS & EQUIPMENT FOR EMPLOYABILITY SKILLS		
S 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 (Licensed) (all softwares should either be latest version or one/two version below)	01 computer for two trainees
2.	UPS	As required
3.	Scanner cum Printer	1 no.
4.	Computer Tables	As required
5.	Computer Chairs	01 no. for each trainee
6.	LCD Projector	1 no.
7.	White Board 1200mm x 900mm	1 no.
Note: Above Tools &Equipment not required, if Computer LAB is available in the institute.		

ANNEXURE-II

NISP Training Center

Trainee Internal Assessment Report

Name :		**Batch No:**	
Card ID No :		**Dept:**	
Attendance % :			

Quarters	Month	Attend %	Month	Attend %	Month	Attend %	Quarterly Average Attend. %
Qtr-1							
Qtr-2							
Qtr-3							
Qtr-4							

General Assessment **Assessment Period :**

S.No	ATTRIBUTES		Score Qtr-1	Score Qtr-2	Score Qtr-3	Score Qtr-4	Score Sum of 4-Qtrs
1	**Safety**	Knowledge, follow safety precautions and rules					
2	**Sense of Responsibility**	Does he obey Sup/Line i/c instructions					
		Does he attend shift start meetings regularly					
		Does he take supervisors feedback properly					
		Whether he takes planned leaves					
		Does he participates in new drives					
		Does he take care in handling tools					
		Is Punctual					
		Positive, Behaviour, response, learning					
		Maintain 5S at his work station					
		Co-operation - Consider team work, willingness to work with and for others					
		Able to identify and report irregularities at his work place					
3	**Method**	Follow WIS/MOS					
		Able to check faults of previous station					
		Understands tools/equipment functions and its different parts					
		Able to perform the job independently					
4	**Speed**	Able to match line "TACT" time					
		Willingness to learn/flexibility for alternate job					
		Work completion/target achievement					
5	**Quality**	Able to contain defects					
		Awareness about GCA/PDI					
		Skill acquired during "On job training"					
		Total Score					
		Max. Marks					

Fill score in relevant box	**Exellent:4**	**Very Good:3**	**Good:2**	**Fair:1**	**Need Improvement:0**
Remark of Supervisor: Mention Achievement					
Remark of Shift In charge/Dept, Mgr.					
Remark of NISP Training In charge					
Any Remark					

12. COMMITTEE OF TRADE EXPERT

S.N.	Name(S/Shri.)	Qualification	Experience	Status
1.	Dr. S.N.Singh Ex. ED, SAIL Bokaro Steel Plant	BE , Phd.	40 years experience of steel industry	Chairman
2.	S.K.Saha Ex. ED, MEL(SAIL)	BE (Mech.)	25 years experience of mechanical maintenance of steel industry	Member
3.	K.K.Tripathi Sr.Mgr. , NISP, NMDC	BE(Mech.) , MBA	15 years experience of mechanical maintenance	Member
4.	R.R.Bitra Ex. DGM(Maint.) Roukela Steel Plant	BE (Mech.)	35 years experience of mechanical maintenance of steel industry	Member
5.	P. Agarkar DGM(Mech.) NISP. Nagarnar	BE (Mech.)	20 years experience of mechanical maintenance of steel industry	Member