CURRICULUM

FOR THE TRADE OF

FITTER

UNDER

APPRENTICESHIP TRAINING SCHEME (ATS)

सत्यमेव जयते
Government of India

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

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. RATIONALE

(Need for Apprenticeship in Fitter trade)

The revised Apprenticeship Training Scheme (ATS) shall make the students more adapt to industry requirement through latest theoretical & practical inputs as:

1. It offers a good synergy between BT (Theoretical Inputs) & PT (On the Job training) unlike earlier scheme where students need to complete two year's classroom training before undergoing PT (On The Job training).
2. It will enhance knowledge about scientific principles, familiarization with industrial culture, and basics of fitting and its need.
3. It will enhance the ability to work with help of hand tools, power tools and machines. At the same time it creates the base for achieving hard skills.
4. It will enhance knowledge about different types of machine, machine tools, Zig Fixture used in industries.
5. It will enhance the ability to work on conventional as well as latest machines and to make advance fitting exercise or machine parts etc.
6. It will enhance knowledge about industrial terminology, industrial practices and revitalize previous learning.
7. It will enhance the ability of problem solving related to product and machines.

3. JOB ROLES: REFERENCE NOS & NCO

Brief description of Job roles:

Fitter General sizes metal parts to close tolerances and fits and assembles them using hand tools for production or repairs of machines, or other metal products. Studies drawings to understand specification of different parts, fittings or assembles to be made and their functions. Cuts and shapes required parts dimensions and specifications by processes of sawing, chipping, filing, grinding, drilling holes, screw cutting, scraping etc., Assembles parts by riveting, screwing, pining etc. so as to make complete unit according to drawing. Dismantles or removes worn out, broken or defective parts using hand tools and replaces them by repaired or new ones. Tests completed article to ensure correct performance. May do simple turning of parts on machines and perform welding, brazing, annealing, hardening, tempering and like operations. May specialize in particular type of machine or product and be designated accordingly. May suggested alterations.

Sizes metal accurately to required dimension by sawing, chipping, filing, etc, using hand tools for making specimens or finished components. Studies drawing or measures sample to record dimensions of part to be made. Holds specified material in vice and sizes it by processes of sawing, chipping and filing. Measures object while working using foot rules, calipers, gauges etc. and checks for correct filing with square. Gets half-finished object marked or marks it himself using face plate, marking block scriber, vernier, height gauges, vice-blocks, angle plate, sine plate, slip gauges, combination set, etc, depending on accuracies required, to indicate guide lines for finished sizes, holes to be drilled and pitch centres, threads to be cut and other working details as specified in drawing or sample. Clamps object securely in correct position in vice and files it to required dimensions according to punch marks and guide lines frequently measuring it with clippers, micrometer, vernier, gauges etc, Drills holes with hand drill, cuts threads with taps and dies ensuring that they are square or at required angle to base. Measure finished article with dial indicator, micrometer, vernier, height gauges, screw gauges, plug gauges, sine plate slip gauge, etc according to prescribed accuracies. May make parts separately and assemble those screws, rivets, pins, etc. as specified. May check dimension with shadow graph. May be designated as FITTER TOOL ROOM or Filer according to nature of work done.

Plan and organize assigned work and detect & resolve issues during execution. Demonstrate possible solutions and agree tasks within the team. Communicate with required clarity, understand and implement technical English. Sensitive to environment, self-learning and productivity.

Reference NCO & NOS:

i) NCO-2004: 7233.10
ii) NCO-2004: 7233.20

NOS:-

i) Sheet Metal Worker
Qualification Pack Code: CSC/Q 0301

ii) Fitter- Mechanical Assembly

Qualification Pack Code: CSC/Q 0304

iii) Operator Conventional turning
Qualification Pack Code: CSC/Q 0110

iv) Maintenance- Fitter Mechanic
Qualification Pack Code: CSC/Q 0901

v) Fitter fabrication
Qualification Pack Code: CSC/Q 0303

4. LEARNING OUTCOMES

A. GENERIC OUTCOME

1. Recognize & comply safe working practices, environment regulation and housekeeping.
2. Work in a team, understand and practice soft skills, technical English to communicate with required clarity.
3. Illustrate concept and principles of basic arithmetic calculation, algebraic, trigonometric, statistics and apply knowledge of specific area to perform practical operations which requires well developed skills.
4. Explain basic science in the field of study including basic electrical, and hydraulics & pneumatics.
5. Read and apply engineering drawing for different application in the field of work.
6. Explain the knowledge of general concept, principles of productivity, quality tools, and labour welfare legislation and apply such in day to day work to improve productivity & quality.
7. Explain the general concept and process of energy conservation, global warming and pollution and contribute in day to day work by optimally using available resources.
8. Explain and display sensitivity towards personnel finance, entrepreneurship and manage/organize related task in day to day work for personal & societal growth.
9. Apply the general concept of basic computer, basic operating system and uses of internet services to take benefit of IT developments in the industry.

B. SPECIFIC OUTCOME

Block-I

10. Develop profiles as per drawing using standard procedure & tools to ensure appropriate accuracy.
11. Carry out marking out the components as per specification and standard procedure for Hack-sawing, filing, drilling, riveting, fitting and allied operations in familiar context.
12. Plan and organize the work in familiar context to make job as per specification and observing standard procedure by applying different types of basic fitting operations viz., Hack-sawing, Filing, grinding, drilling, reaming, tapping, riveting, sheet metal work and check for work result.
13. Explain the constructional features and working principles of lathe, drilling machine and apply the same to produce components using standard procedure that requires well developed skills and check for quality standard.
14. Apply a range of skills and processes to execute pipe joints, dismantle and assemble valves & fittings in pipes and test for leakages.

15. Explain and apply working principle of welding, perform Arc & Gas welding and Brazing operation as per standard procedure to join and cut mechanical components / metals by Gas cutting.

Block-II

16. Produce components on drill machine by using different jigs and observing appropriate procedure, methods, tools, information and check for correctness.
17. Explain and apply general concept of Limits, Fits and tolerance necessary for fitting applications which requires well developed skills and check interchangeability of components using clear procedure.
18. Make sliding fit of components, assemble them in familiar context by standard procedure and check for functionality.
19. Maintain required tolerance of different mating surfaces viz., gauges, dowel pin, dovetail slide fitting by scraping and lapping by applying appropriate procedure in the of field of work and ensure for quality standard.
20. Dismantle and repair damaged mechanical components used for power transmission or any assembly and assemble & check the same for appropriate functioning.
21. Perform the basic day to day repair and maintenance along with erection of general machine tools like lathe, drilling machine as per standard procedure and check for functionality.

NOTE: Learning outcomes are reflection of total competencies of a trainee. Each learning outcome may include multiple assessment components. However assessment will be carried out as per assessable outcome and assessment criteria.

5. NSQF LEVELCOMPLIANCE

NSQF level for Fitter 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 trade under ATS mostly matches with the Level descriptor at Level- 5.

. The NSQF level-5 descriptor is given below:

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

6. GENERAL INFORMATION

1. **Name of the Trade** **: FITTER**

2. **N.C.O. / N. O. S. Code No.** : 7233.10, 7233.20, CSC/Q 0301, CSC/Q 0304, CSC/Q 0110, CSC/Q 0901, CSC/Q 0303

3. **Duration of Apprenticeship Training (Basic Training + Practical Training):** 2years

4. **Duration of Basic Training**: -

a) Block –I : 3 months

b) Block – II : 3 months

Total duration of Basic Training: 6 months

5. **Duration of Practical Training (On -job Training): -**

a) Block–I: 9 months

b) Block–II : 9 months

Total duration of Practical Training: 18 months

6. **Entry Qualification** : Passed 10th Class with Science and Mathematics under10+2 system of Education or its equivalent

7. **Selection of Apprentices:** The apprentices will be selected as per Apprenticeship Act amended time to time.

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.

7. COURSE STRUCTURE

Training duration details: -

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

Components of Training	Duration of Training in Months																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Basic Training Block - I																								
Practical Training Block - I																								
Basic Training Block - II																								
Practical Training Block - II																								

8. ASSESSABLE OUTCOME/ LEARNING OUTCOME WITH ASSESSMENT CRITERIA

Competencies after completion of 02years FITTER trade:

A. GENERIC ASSESSABLE OUTCOME

ASSESSABLE OUTCOMES	REF. SYLLABI	ASSESSMENT CRITERIA
1. Recognize & comply safe working practices, environment regulation and housekeeping.	BLOCK-I (BT-Wk. No.1 & OJT-Wk.No.1)	1.1 Follow and maintain procedures to achieve a safe working environment in line with occupational health and safety regulations and requirements and according to site policy.
		1.2 Recognize and report all unsafe situations according to site policy.
		1.3 Identify and take necessary precautions on fire and safety hazards and report according to site policy and procedures.
		1.4 Identify, handle and store / dispose off dangerous goods and substances according to site policy and procedures following safety regulations and requirements.
		1.5 Identify and observe site policies and procedures in regard to illness or accident.
		1.6 Identify safety alarms accurately.
		1.7 Report supervisor/ Competent of authority in the event of accident or sickness of any staff and record accident details correctly according to site accident/injury
		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 the avoidance of instances of environmental pollution.
		1.13 Deploy environmental protection legislation & regulations
		1.14 Take opportunities to use energy and materials in an environmentally friendly manner
		1.15 Avoid waste and dispose waste as per procedure
		1.16 Recognize different components of 5S and apply the same in the working environment.
2. Work in a team, understand and practice soft skills, technical English to communicate with required clarity.	BLOCK-I, OJT-Wk. No.2 & Item No. 9.1.3.1 Block –I	2.1 Obtain sources of information and recognize information.
		2.2Use and draw up technical drawings and documents.
		2.3 Use documents and technical regulations and occupationally related provisions.
		2.4 Conduct appropriate and target oriented discussions with higher authority and within the team.
		2.5 Present facts and circumstances, possible solutions &use

		English special terminology.
		2.6 Resolve disputes within the team
		2.7 Conduct written communication.
3. Illustrate concept and principles of basic arithmetic calculation, algebraic, trigonometric, statistics and apply knowledge of specific area to perform practical operations which requires well developed skills.	Item No. 9.1.1 Block – I & II	3.1 Semester examination to test basic skills on arithmetic, algebra, trigonometry and statistics.
		3.2Their applications will also be assessed during execution of assessable outcome and also tested during theory and practical examination.
4. Explain basic science in the field of study including basic electrical, and hydraulics & pneumatics.	Item No. 9.1.1 Block – I & II	4.1 Semester examination to test basic skills on science in the field of study including basic electrical and hydraulics & pneumatics.
		4.2 Their applications will also be assessed during execution of assessable outcome and also tested during theory and practical examination.
5. Read and apply engineering drawing for different application in the field of work.	Item No. 9.1.1 Block – I & II	5.1 Semester examination to test basic skills on engineering drawing.
		5.2 Their applications will also be assessed during execution of assessable outcome and also tested during theory and practical examination.
6. Explain the knowledge of general concept, principles of productivity, quality tools, and labour welfare legislation and apply such in day to day work to improve productivity & quality.	Item No. 9.1.3.1 Block –II	6.1 Semester examination to test the concept in productivity, quality tools and labour welfare legislation.
		6.2 Their applications will also be assessed during execution of assessable outcome.
7. Explain the general concept and process of energy conservation, global warming and pollution and contribute in day to day work by optimally using available resources.	Item No. 9.1.3.1 Block –II	7.1 Semester examination to test knowledge on energy conservation, global warming and pollution.
		7.2 Their applications will also be assessed during execution of assessable outcome.
8. Explain and display sensitivity towards personnel finance, entrepreneurship and manage/organize	Item No. 9.1.3.1 Block –II	8.1 Semester examination to test knowledge on personnel finance, entrepreneurship.
		8.2 Their applications will also be assessed during execution of assessable outcome.

related task in day to day work for personal & societal growth.		
9. Apply the general concept of basic computer, basic operating system and uses of internet services to take benefit of IT developments in the industry.	Item No. 9.1.3.1 Block –I	9.1 Semester examination to test knowledge on basic computer working, basic operating system and uses internet services. 9.2 Their applications will also be assessed during execution of assessable outcome.

B. SPECIFIC ASSESSABLE OUTCOME:

Block – I

ASSESSABLE OUTCOMES	REF. SYLLABI	ASSESSMENT CRITERIA
10. Develop profiles as per drawing using standard procedure & tools to ensure appropriate accuracy.	BT-Wk No.2,3	10.1 Identify tools and equipment's for measuring and makes this available for use in a timely manner.
		10.2 Select raw material and visual inspect for defects.
		10.3 Identify basic Hand Tools for filing, chiseling and make this available for use in a timely manner.
		10.4 Mark as per specification applying desired mathematical calculation and observing standard procedure.
		10.5 File the job using different methods and perform filing in accordance with standard specifications and tolerances
		10.6 Follow standard procedures.
		10.7 Measure all dimensions in accordance with standard specifications and tolerances.
11. Carry out marking out the components as per specification and standard procedure for Hack-sawing, filing, drilling, riveting, fitting and allied operations in familiar context.	BT-Wk No.4,5	11.1 Identify tools, instruments and equipments for marking and make this available for use in a timely manner.
		11.2 Select raw material and visual inspect for defects.
		11.3 Mark as per specification applying desired mathematical calculation and observing standard procedure.
		11.4 Measure all dimensions in accordance with standard specifications and tolerances.
12. Plan and organize the work in familiar context to make job as per specification and observing standard procedure by applying different types of basic fitting operations viz., Hack-sawing, Filing, grinding, drilling, reaming, tapping, riveting, sheet metal work and check for work result.	BT-Wk No.6 & OJT-Wk No. 3-18	12.1 Identify Hand Tools for different fitting operations and make this available for use in a timely manner.
		12.2 Prepare the job for Hacksawing, filing, drilling, tapping, grinding, riveting and sheet metal work.
		12.3 Identify different materials to be used for above work, collect necessary information and use as per requirement.
		12.4 Mark as per specification applying desired mathematical calculation and observing standard procedure.
		12.5 Perform basic fitting operations viz., Hacksawing, filing, drilling, tapping, grinding, riveting and sheet metal work to close tolerance as per specification to make the job.
		12.6 Observe safety procedure during above operation as per standard norms and company guidelines.
		12.7 Check for work result as per standard procedure.
		12.8 Avoid waste, ascertain unused materials and components for disposal, store these in an environmentally appropriate manner and prepare for disposal.
13. Explain the constructional features and working principles of lathe, drilling machine and apply the same to produce	BT-Wk No.7-10 & OJT-Wk No. 19-28	13.1 Acquaintance of basic working principles and safety aspect of lathe and grinding machine.
		13.2 Explain functional application of different levers, stoppers, adjustment etc.
		13.3 Identify different lubrication points of lathe and drilling machine.

to components that requires well developed skills using standard procedure and check for quality standard.		13.4 Identify lubricants and their usage for application in lathe and drilling machine as per machine manual.
		13.5 Identify different work and tool holding devices and collect information for functional application of each device.
		13.6 Mount the work and tool holding devices with required alignment and check for its functional usage to perform drilling and lathe operations.
		13.7 Solve problem by applying basic methods, tools, materials and information during setting.
		13.8 Produce components observing standard procedure.
		13.9 Observe safety procedure during mounting as per standard norms.
		13.10 Check accuracy/ correctness of job using appropriate equipment/gauge.
		13.11 Avoid waste, ascertain unused materials and components for disposal, store these in an environmentally appropriate manner and prepare for disposal.
14. Apply a range of skills and processes to execute pipe joints, dismantle and assemble valves & fittings in pipes and test for leakages.	BT-Wk No.11 & OJT-Wk No. 29-32	14.1 Ascertain and select tools and materials for the job and make this available for use in a timely manner.
		14.2 Plan to Dismantle and assemble valves and pipe fittings.
		14.3 Demonstrate possible solutions and agree tasks within the team.
		14.4 Dismantle valves and fittings in pipes applying range of skills and check for defect as per standard procedure.
		14.5 Demonstrate possible solutions in case of defect and agree tasks within the team for repair or replacement.
		14.6 Assemble valves and various pipe fittings using range of skills and observing standard procedure.
		14.7 Test for leakage and appropriate functioning of valves.
		14.8 Avoid waste, ascertain unused materials and components for disposal, store these in an environmentally appropriate manner and prepare for disposal.
15. Explain and apply working principle of welding, perform Arc & Gas welding and Brazing operation as per standard procedure to join and cut mechanical components / metals by Gas cutting.	BT-Wk No.12,13& OJT-Wk No. 33-36	15.1 Explain working principles and safety aspect of Arc & Gas welding, Gas cutting, Soldering, Brazing operation.
		15.2 Explain functional application of different components/parts of these machines.
		15.3 Identify different components/parts of these machines, collect desired information and set each components/parts as per standard procedure.
		15.4 Observe safety/ precaution during operation.
		15.5 Select appropriate material & plan for welding, gas cutting, & Brazing operation.
		15.6 Weld/cut metal parts / mechanical components as per specification observing standard procedure.
		15.7 Check joined part/cut portion to ascertain proper welding.

Block – II

ASSESSABLE OUTCOMES	REF. SYLLABI	ASSESSMENT CRITERIA
16. Produce components on drill machine by using different jigs and observing appropriate procedure, methods, tools, information and check for correctness.	BT-Wk No.1 & OJT-Wk No. 1	16.1 Set up workplace/ assembly location with due consideration to operational stipulation
		16.2 Ascertain and select tools and materials for the job and make this available for use in a timely manner.
		16.3 Select suitable jigs for drilling considering desired result and collecting necessary information.
		16.4 Produce component by using jig observing standard procedure and check the correctness of the job.
		16.5 Comply with safety rules when performing the above operations.
17. Explain and apply general concept of Limits, Fits and tolerance necessary for fitting applications which requires well developed skills and check interchangeability of components using clear procedure.	BT-Wk No.2-5 & OJT-Wk No. 2-5	17.1 Explain general concept of Limits, Fits and tolerance necessary for fitting applications and functional application of these parameters.
		17.2 Ascertain and select tools and materials for the job and make this available for use in a timely manner.
		17.3 Plan to check interchangeability by collecting necessary information.
		17.4 Use gauges applying a range of cognitive, practical skills and observing standard procedure to check for interchangeability.
18. Make sliding fit of components, assemble them in familiar context by standard procedure and check for functionality.	BT-Wk No.2-5 & OJT-Wk No. 6-11	18.1 Ascertain and select tools and materials for the job and make this available for use in a timely manner.
		18.2 Plan work in compliance with standard safety norms and collecting desired information.
		18.3 Make components according to the specification for slide fit using a range of practical skills and observing standard.
		18.4 Assemble components applying a range of skills to ensure proper slide fit.
		18.5 Check functionality of components.
		18.6 Avoid waste, ascertain unused materials and components for disposal, store these in an environmentally appropriate manner and prepare for disposal.
19. Maintain required tolerance of different mating surfaces viz., gauges, dowel pin, dovetail slide fitting by scraping and lapping as per appropriate procedure in the of field of work and	BT-Wk No.6-10 & OJT-Wk No. 12-18)	19.1 Ascertain and select tools and materials for the job and make this available for use in a timely manner.
		19.2 Plan work in compliance with standard safety norms and collecting necessary information.
		19.3 Demonstrate possible solutions and agree tasks within the team.
		19.4 Produce gauge, pin & hole and components of dovetail with appropriate accuracy by observing standard procedure &

ensure for quality standard.			method as per specification using appropriate tools & machines.
		19.5	Perform scraping and lapping of gauge, dowel pin and components of dovetail slide to obtain required finish using a range of skills.
		19.6	Comply with safety rules when performing the above operations.
		19.7	Check tolerance and accuracy of gauge, dowel pin and components of dovetail slide with appropriate tools and equipment observing standard procedure.
20. Dismantle and repair damaged mechanical components used for power transmission or any assembly and assemble & check the same for appropriate functioning.	BT-Wk No.11-13 & OJT-Wk No. 19-29	20.1	Ascertain and select tools and materials for the job and make this available for use in a timely manner.
		20.2	Plan to dismantle, repair and assemble mechanical components use for power transmission or any assembly as per drawing and collecting necessary information.
		20.3	Perform dismantling and appropriate repairing of mechanical components with accuracy applying range of skills and appropriate machining processes.
		20.4	Check the accuracy of the repaired components with appropriate tools, instrument & equipments.
		20.5	Assemble the repaired mechanical components observing standard procedure.
		20.6	Comply with safety rules when performing the above operations.
		20.7	Check different parameters of power transmission or any assembly e.g. R.P.M, slackness of belts, matching of gears/ clutches, loss of RPM etc.
		20.8	Check for functionality of power transmission system or any assembly as per standard parameters.
		20.9	Analyze & perform appropriate trouble shooting and put the transmission system or any assembly in the operations.
21. Perform the basic day to day repair and maintenance along with erection of general machine tools like lathe, drilling machine as per standard procedure and check for functionality.	BT-Wk No.11-13 & OJT-Wk No. 30-33	21.1	Interpret and explain repair /erection procedure as per manual of machine and select appropriate tools & equipment for undertaking job.
		21.2	Interpret construction, alignment and assembly of different parts of machine.
		21.3	Plan to carry out the repair task with appropriate accuracy or appropriate erection of simple machine by collecting necessary information.
		21.4	Demonstrate possible solutions and agree tasks within the team.
		21.5	Dismantle and Assemble sub-assemblies and repair of parts using mechanical processing/ erect simple machine as per layout plan and standard procedure.

		21.6 Put the machine in operation.
		21.7 Comply with Standard operating procedure when operating the machine.
		21.8 Check for proper functioning of repaired machine/ Check alignment of erected machine and other parameters of simple machine as per manual after erection.
		21.9 Analyze and conduct Trouble shooting of machine.

***Note*: - BT – BASIC TRAINING**

OJT – ON JOB TRAINING

9. SYLLABUS
9.1 BASIC TRAINING
(BLOCK – I & II)
DURATION: 06 MONTHS

GENERAL INFORMATION

1) **Name of the Trade** : **FITTER**
2) **Hours of Instruction** : 1040 Hrs. (40 hrs./week X 26 weeks)
3) **Batch size** : 20
4) **Power Norms** : 3.5 KW for Workshop
5) **Space Norms** : 88 Sq.m.

6) **Examination** : The internal examination/ assessment will be held on completion of each Block.
7) **Instructor Qualification** :

i) Degree/Diploma in Mechanical Engg. from recognized university/Board with one/two year post qualification experience respectively in the relevant field.

OR

ii) NTC/NAC in the trade of Fitter with three year post qualification experience in the relevant field.

Preference will be given to a candidate with Craft Instructor Certificate (CIC)

8) **Tools, Equipments & Machinery required** : - As per Annexure – I

9.1.1 DETAIL SYLLABUS OF CORE SKILL

Block– I
Basic Training

Topic No.	a) Engineering Drawing	Duration (in hours)	b) 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		**Unit**: Systems of unit- FPS, CGS, MKS/SI unit, unit of length, Mass and time, Conversion of units	
2	**Drawing Instruments : their uses** Drawing board, T-Square, Drafter (Drafting M/c), Set Squares, Protractor, Drawing Instrument Box (Compass, Dividers, Scale, Diagonal Scales etc.), Pencils of different Grades, Drawing pins / Clips.		**Fractions**: Fractions, Decimal fraction, Addition, Subtraction, Multiplication and Division of Fractions and Decimals, conversion of Fraction to Decimal and vice versa. Simple problems using Calculator.	
3	**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		**Properties of Material** : 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 Alloys.	
4	**Drawing of Geometrical Figures:** Drawing practice on: - Angle: Measurement and its		**Average :** Problems of Average. **Ratio & Proportion** : Simple calculation on related problems.	

	types, method of bisecting. - Triangle -different types - Rectangle, Square, Rhombus, Parallelogram. - Circle and its elements.		**Mass, Weight and Density**: Mass, Unit of Mass, Weight, difference between mass and weight, Density, unit of density.	
5	**Dimensioning:** - Definition, types and methods of dimensioning (functional, non-functional and auxiliary) - Types of arrowhead - Leader Line with text			
6	**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.			
7	**Method of presentation of Engineering Drawing** - Pictorial View - Orthogonal View - Isometric view		**Percentage**: Introduction, Simple calculation. Changing percentage to decimal and fraction and vice-versa.	
8	**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		- Forces definition. - Definition and example of compressive, tensile, shear forces, axial and tangential forces. Stress, strain, ultimate strength, factor of safety for MS. **Speed and Velocity**: Rest and motion, speed, velocity, difference between speed and velocity, acceleration, retardation.	
9	**Dimensioning practice:** - Position of dimensioning (unidirectional, aligned, oblique as per BIS SP:46-2003) - Symbols preceding the value of dimension and dimensional tolerance.		**Mensuration:** Area and perimeter of square, rectangle, parallelogram, triangle, circle, semi circle. Volume of solids – cube, cuboids, cylinder and Sphere. Surface area of solids – cube, cuboids, cylinder and Sphere. - Area of cut-out regular surfaces: circle and segment and sector of circle.	

			- Volume of cut-out solids: hollow cylinders, frustum of cone, block section. - Volume of simple solid blocks.	
10	**Construction of Geometrical Drawing Figures:** - Polygons and their values of included angles. Conic Sections (Ellipse)		**Algebra** : Addition, Subtraction, Multiplication, Division, Algebraic formula, Linear equations (with two variables). - Circular Motion: Relation between circular motion and Linear motion, Centrifugal force, Centripetal force.	
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 as per IS specification. Drawing of Orthographic projection from isometric/3D view of blocks		**Work, Power and Energy**: work, unit of work, power, unit of power, Horse power, mechanical efficiency, energy, use of energy, potential and kinetic energy, examples of potential energy and kinetic energy.	

Block- II
Basic Training

Topic No.	a) Engineering Drawing	Duration (in hours)	b) Workshop Science & Calculation	Duration (in hours)
1	- Machined components; concept of fillet & chamfer; surface finish symbols.	30	**Trigonometry:** Trigonometric ratios, Trigonometric tables. - Finding the value of unknown sides and angles of a triangle by Trigonometrical method. - Finding height and distance by trigonometry.	20
			Friction and its application in Workshop practice.	
2	- Screw thread, their standard forms as per BIS, external and internal thread, conventions on the features for drawing as per BIS.		**Heat & Temperature**: Heat and temperature, their units, difference between heat and temperature, boiling point, melting point, scale of temperature, relation between different scale of temperature, Thermometer, pyrometer, transmission of heat, conduction, convection, radiation.	
3	- Reading & interpretation of assembly drawing and detailing.		**Basic Electricity**: Introduction, use of electricity, Types of current_ AC, DC, their comparison, voltage, resistance, their units. Conductor, insulator, Types of connections – series, parallel, electric power, Horse power, energy, unit of electrical energy. Concept of earthing.	
			Heat treatment – Necessity, different common types of Heat treatment.	

			<u>Graph:</u> - Read images, graphs, diagrams – bar chart, pie chart. - Graphs: abscissa and ordinates, graphs of straight line, related to two sets of varying quantities.	
4	- Reading of drawing. Simple exercises related to missing lines, dimensions and views. How to make queries.		**Transmission of power:** By belt, pulleys & gear drive.	
5	- Simple exercises related to trade related symbols. - Solution of NCVT test papers.		**Concept of pressure** – units of pressure, atmospheric pressure, gauge pressure – gauges used for measuring pressure. **Introduction to pneumatics & hydraulics systems.** Solution of NCVT test papers	

9.1.2 DETAIL SYLLABUS OF PROFESSIONAL SKILLS & PROFESSIONAL KNOWLEDGE

Block –I

Basic Training

Week No.	Professional Skills	Professional Knowledge
1	Importance of trade training, List of tools & Machinery used in the trade. **Occupational Safety & Health** **Importance of housekeeping & good shop floor practices.** Health & Safety: Introduction to safety equipments and their uses. Introduction of first aid, operation of Electrical mains. Basic injury prevention, Basic first aid, Hazard identification and avoidance, safety signs for Danger, Warning, caution & personal safety message. Preventive measures for electrical accidents & steps to be taken in such accidents. Health, Safety and Environment guidelines. Disposal procedure of waste materials like cotton waste, metal chips/burrs etc. Personal protective Equipments(PPE):- Use of Fire extinguishers. Identification of tools & equipments as per desired specifications for marking & sawing. Selection of material as per application. Marking out lines, gripping suitably in vice jaws, hack-sawing to given dimensions, sawing different types of metals of different sections.	Importance of safety and general precautions observed in the in the industry/shop floor. All necessary guidance to be provided to the new comers to become familiar with the working of Industrial Training Institute system including stores procedures. **Soft Skills: its importance and Job area after completion of training.** Introduction of First aid. Operation of electrical mains. Introduction of PPEs. Introduction to 5S concept & its application. Environment guidelines. Legislations & regulations as applicable. Response to emergencies eg; power failure, fire, and system failure. Linear measurements- its units, dividers, calipers, hermaphrodite, centre punch, dot punch, their description and uses of different types of hammers. Description, use and care of 'V' Blocks, marking off table. Measuring standards (English, Metric Units), angular measurements, subdivisions, try square, ordinary depth gauge, protractor-description, uses and cares. Bench vice types, uses, care & maintenance, vice clamps.
2	Filing- Parallel, Flat and Square (Rough finish). Filing practice: Filing Channel, Surface filing. Marking of straight and parallel lines with odd leg calipers and steel rule, marking practice with dividers, odd leg calipers and steel rule (circles, arcs, parallel lines). Marking straight lines and arcs using scribing block and dividers & punching Saw along a straight line, curved line, on different sections of metal. File and saw on M.S. Square and pipe. Straight saw on thick section, M.S. angle and pipes. Filing flat, square, and parallel to an accuracy of 0.5mm.	Files- specifications, description, materials, grades, cuts, file elements, uses. Types of files- convex, taper, needle, care and maintenance of files, Special files: types, description. Hacksaw frames and blades, material, parts and grade of blade, care & maintenance. Marking off and layout tools: dividers, scribing block, odd leg calipers, punches- description, classification, types and material. Caliper- Types, Uses, Care & Maintenance. Surface plate and auxiliary marking equipment, 'V' block, angle plates, parallel block, description, types and uses.

		Workshop surface plate- their uses, accuracy, care and maintenance.
3	File steps and finish with smooth file with an accuracy of ± 0.25 mm.	Vernier calipers, graduations, reading, use and care. Micrometer- outside and inside –parts graduation, leading, use and care. Description of Digital micrometer. Vernier height gauge : material construction, parts, graduations (English & Metric) uses, care and maintenance, Vernier micrometer, parts, graduation, use, care and maintenance. Screw thread micrometer: graduation and use. Dial test indicator, parts, graduation, Method of use,. Care and maintenance. Digital dial indicator. Vernier bevel protractor, graduations, reading, use and care, Description of dial Vernier Caliper & Digital vernier caliper Inside micrometer: parts, graduations ,LC, reading , uses, care and maintenance, Depth Micrometer : parts, graduations ,LC, reading , uses, care and maintenance
4	Marking of straight lines, circles, profiles and various geometrical shapes and cutting the sheets with snips. Bend sheet metal into various curvature forms, fold sheet metal at angle using stakes. Make simple square container with wired edge.	Safety precautions to be observed in a sheet metal workshop, sheets and sizes, Commercial sizes and various types of metal sheets, coated sheets and their uses as per BIS specifications. Marking and measuring tools, wing compass, Prick punch, snips, types and uses. Stakes types, parts & their uses. Various types of sheet metal joints, their selection and applications, tolerance for various joints, their selection & application. Wired edges – Types, sizes, and selection for various works. Riveting tools, dolly & snaps description and uses. Method of riveting. Shearing machine-description, parts and uses.
5	Marking according to simple blue prints for locating position of holes, scribing lines on chalked surfaces with marking tools, finding center of round bar with the help of 'V' block and marking block. Joining straight line to an arc. Chipping flat surfaces along a marked line. More difficult work in marking out including tangents, templates involving use of vernier protractor.	Chisels- materials, types, cutting angles. Power Saw, band saw, Circular saw machines used for metal sections cutting. Drill- material, types, parts and sizes (fraction, metric, number, letter drill). Drill angle-cutting angle for different materials, cutting speed feed for different materials. Drill holding devices-their uses. Counter sink, counter bore and spot facing-tools and nomenclature. Determining hole size. Drilling machine: Sensitive (bench type, pillar type) upright, radial, gang and multi spindle drilling machine.

		Drill troubles: causes and remedy. Equality of lips, correct clearance angle & grinding of drill Reamer & Reaming procedure. Different types of thread.
6	Make & assemble simple job by different basic fitting operations. File thin metal to an accuracy of 0.5 mm. Chipping, Chamfering, grooving and slotting. Make riveted lap and butt joint. Use of counter sunk head rivet.	Physical properties of engineering material: colour, weight, structure, and conductivity, magnetic properties, fusibility, specific gravity. Mechanical properties: ductility, malleability hardness, brittleness, toughness, tenacity, and elasticity. Cast Iron: types, properties and uses. Wrought iron- : properties and uses. Steel: types, properties and uses. Composition of ferrous alloy like HSS, stainless steel etc. Non-ferrous metals (copper, aluminum, tin, lead, zinc) properties and uses. Aluminium and its alloys. Uses, advantages and limitation.
7	Drill through & blind holes, Drill holes at an angle using swivel table of drilling machine. Cutting threads using dies.	Description of tap, material, types and using method of hand tap. Taps- British standard and metric /BIS. Determination of tap drill size. Tap wrench: types and their uses. Removal of broken tap, studs (tap stud extractor). Dies: British standard, metric and BIS standard, material, parts, types Grinding wheel: Types & Specification (Abrasive type, grit size, grade, structures & bond) use, mounting and dressing.
8-9	True job on four jaw chuck using knife tool. Face both the ends for holding between centers, Using roughing tool parallel turn ± 0.1 mm. Measure the diameter using outside caliper and steel rule. Holding job in three jaw chuck- deburr, chamfer-corner, round ends.	Safety precautions to be observed while working on a lathe. Main parts of Lathe - bed, head stock, carriage, tail stock. Cutting tools- Brief study of the nomenclature of Lathe cutting tools and necessity of correct grinding. Solid, tipped and throw away type tools. Cutting speed and feed and depth of cut. Comparison for H.S.S. and carbide tools. Use of coolants and lubricants. Chucks – Three jaw, four-jaw, self centering and independent chucks and application. The back plate and application. General turning operations- Facing, parallel or straight turning. Step turning, grooving, chamfering and shape of tools for the above operations. Appropriate method of holding the tool on tool post.
10	Bore holes –spot face, pilot drill, enlarge hole using boring tools.	Knurling: - tools description, grade, uses, speed and feed, coolant for knurling. Taper – definition, use and method of

		expressing tapers. Standard tapers- calculations of Morse taper.
11	Cutting & Threading of pipe. Flaring of pipes and pipe joints. Fitting of pipes as per sketch.	Pipes and pipe fitting- commonly used pipes. Pipe schedule and standard sizes. Use of tools such as pipe cutters, pipe wrenches, pipe dies, and tap, pipe bending machine etc. Conditions used for pipe work to be followed.
12-13	Welding - Striking and maintaining arc, laying Straight-line beads by Manual Metal Arc welding. Setting up of Oxy-acetylene flames and making fusion runs with and without filler rod. Practice to make straight beads and "T' joint by Gas and Arc welding. Making square butt joint on MS by brazing. Make straight cutting by Gas.	Safety-importance of safety and general precautions observed in a welding shop. Precautions in electric and gas welding. (Before during and after welding). Welding Machines and Accessories. Description, method of operating CO_2 welding. Method of operating Gas welding equipment: Types of Joints-Butt and fillet. Oxygen acetylene cutting-machine parts, uses, method of handling, cutting torch-description, parts, function and uses. Description of brazing process and its application. Metallurgical and metal working processes such as Heat treatment, various heat treatment methods -normalizing, annealing, hardening, case hardening and tempering.
	Assessment/Examination 03days	

Block –II
Basic Training

Week No.	Professional Skills	Professional Knowledge
1	Precision drilling, reaming and tapping. Counter sink, counter bore and ream on M.S flat. Practice the Grinding of drill angle. Locate and make accurate hole for stud fit.	Explain Jig & Fixture: definition, material types, and applications. Drilling jig-constructional features, types and uses. Fixtures: Constructional features, types and uses. Difference between jig and fixture. Different types of jig bush .Care & maintenance of jig and fixture.
2-3	File and fit, combined fit with straight, angular surface with ± 0.05 mm accuracy, check taper angle of tapered job with sine bar.	Interchangeability: Necessity in Engg, field. Limits, fits & tolerance- terminology of limits and fits, basic size and zero line, fundamental deviation, unilateral & bilateral tolerance, three basic types of fits in hole/shaft basis system and ascertaining dimensional tolerance from standard tables for a given fit. Templates and gauges- Introduction, necessity, types and materials. Limit gauge: Ring gauge, snap gauge, plug gauge, feeler gauge, screw pitch, radius gauge, standard wire gauge- description, uses, care and maintenance.
4-5	Make & assemble sliding fit with straight sides 'T' fit. Make simple Limit Gauges and Templates.	Slip gauge: Necessity of using, classification & accuracy, set of blocks (English and Metric). Details of slip gauge. Metric sets 46: 103: 112. Wringing and building up of slip gauge and care and maintenance. Application of slip gauges for measuring, Sine bar-Principle, application & specification. Procedure to check adherence to specification and quality standards.
6-7	Scrape angular mating surface, scrape on internal surface. Scrape on flat surfaces, scrape on curved surfaces and scrape surface parallels and test. Blue matching of scraped surfaces (flat and curved bearing surfaces) Simple scraper- circular, flat, half round, triangular and hook scraper and their uses. Practice in dovetail fitting assembly and dowel pins and cap screws assembly.	Bearing-Introduction, classification (Journal and Thrust), Description of each, ball bearing: Single row, double row, description of each, and advantages of double row. Roller and needle bearings: Types of roller bearing. Description & use of each Synthetic materials for bearing: The plastic laminate materials, their properties and uses in bearings such as phenolic, teflon polyamide (nylon). Bearing metals – types, composition and uses,

8	Sliding fitting, Lapping flat surfaces using lapping plate.	Lapping: Lapping principles, applications of lapping, lapping methods, lapping machines, lapping plates, lapping abrasives and lapping procedure. Honing: Application of honing, material for honing, tools shapes, grades, honing abrasives. Frosting- its aim and the methods of performance. Terms relation to surface finish, symbol and methods of checking surface finish with their equipments.
9	Fitting of dowel pin, scrape on cylindrical bore.	Concept of Hydraulics & pneumatic system in machinery, Hydraulics & pneumatic circuits, symbols & valves. Lubrication and lubricants- Method of lubrication. A good lubricant, viscosity of the lubricant, Main property of lubricant. How a film of oil is formed in journal. Bearings, method of lubrication-gravity feed, force (pressure) feed, splash lubrication. Cutting lubricants and coolants: Soluble off soaps, suds-paraffin, soda water, common lubricating oils and their commercial names, selection of lubricants.
10	Make dovetail fitting with in accuracy of ±1º.	Working material with finished surface as aluminium, duralumin, stainless steel, the importance of keeping the work free from rust and corrosion. The various coatings used to protect metals, protection coat by heat and electrical deposit treatments. Introduction of chromium silver plating and nickel plating and galvanising.
11	Fasten mechanical components / sub assemblies together using screws, bolts and collars using hand tools Making, replacing damaged keys.	Introduction to mechanical fasteners and its uses. Elements of bolts types and uses, Nuts- types, castle nut, slotted nuts, swam nut, grooved nut, Description and use. Washers-Types and calculation of washer sizes. Screws: material, different types (inch & metric), uses. Various types of keys, allowable clearances & tapers, types. Dowel pins: types, accuracy and uses. Power transmission elements. The object of belts, their sizes and specifications, materials of which the belts are made, selection of the type of belts with the consideration of weather, load and tension . Study of power transmission system in machine tools. Practical method of obtaining mechanical advantage.

		Vee belts and their advantages and disadvantages, dressing, resin, creep and slipping of belt. Coupling types-flange coupling,-Hooks coupling-universal coupling and their different uses. Clutch: Type, positive clutch (straight tooth type, angular tooth type).
12	Repair & replacement of belts.	Pulleys-types-solid, split and 'V' belt pulleys. Types of drives-open and cross belt drives. Power transmission –by gears, most common form spur gear, Helical gear, herringbone gears, bevel gearing, spiral bevel gearing, hypoid gearing, pinion and rack, worm gearing. Care and maintenance of gears.
13	Inspection of Machine tools. Accuracy testing of Machine tools. Simple repair work, simple assembly of machine parts from blue prints. Rectify possible assembly faults during assembly.	Installation, maintenance and overhaul of machinery and engineering equipment. Preventive maintenance-objective and function of P.M., section inspection. Visual and detailed, lubrication survey, system of symbol and colour coding. Revision, simple estimation of materials, use of handbooks and reference table. Possible causes for assembly failures and remedies. Foundation bolt: types (Rag, Levis cotter bolt) description of each erection tools, pulley block, crow bar, spirit level, Plumb bob, pipe 2 X 4', wire rope, manila rope, wooden block.
	Assessment / Examination 03 days	

9.1.3 EMPLOYABILITY SKILLS

GENERAL INFORMATION

1)	**Name of the subject**	**:**	**EMPLOYABILITY SKILLS**
2)	**Applicability**	**:**	ATS- Mandatory for fresher only
3)	**Hours of Instruction**	**:**	**110 Hrs.**
4)	**Examination**	**:**	The examination will be held at the end of two years Training by NCVT.
5)	**Instructor Qualification**	**:**	

i) MBA/BBA with two years experience or graduate in sociology/social welfare/Economics with two years experience and trained in Employability skill from DGET Institute.

And

Must have studied in English/Communication Skill and Basic Computer at 12th /diploma level

OR

ii) Existing Social Study Instructor duly trained in Employability Skill from DGET Institute.

9.1.3.1 SYLLABUS OF EMPLOYABILITY SKILLS

Block – I
Basic Training

Topic No.	Topic	Duration (in hours)
	English Literacy	**15**
1	**Pronunciation :** Accentuation (mode of pronunciation) on simple words, Diction (use of word and speech)	
2	**Functional Grammar** Transformation of sentences, Voice change, Change of tense, Spellings.	
3	**Reading** Reading and understanding simple sentences about self, work and environment	
4	**Writing** Construction of simple sentences Writing simple English	
5	**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.	
	I.T. Literacy	**15**
1	**Basics of Computer** Introduction, Computer and its applications, Hardware and peripherals, Switching on-Starting and shutting down of computer.	
2	**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.	
3	**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	
4	**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.	
	Communication Skill	**25**
1	**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. Case study/Exercise	
2	**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.	
3	**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. Case study/Exercise	
4	**Facing Interviews** Manners, Etiquettes, Dress code for an interview Do's & Don'ts for an interview	
5	**Behavioral Skills** Organizational Behavior Problem Solving Confidence Building Attitude Decision making Case study/Exercise	

Block– II
Basic Training

Topic No.	Topic	Duration (in hours)
	Entrepreneurship skill	**10**
1	**Concept of Entrepreneurship** **Entrepreneurship**- 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.	
2	**Project Preparation & Marketing analysis** Qualities of a good Entrepreneur, SWOT and Risk Analysis. Concept & application of Product Life Cycle (PLC), Sales & distribution Management. Different Between Small Scale & Large Scale Business, Market Survey, Method of marketing, Publicity and advertisement, Marketing Mix.	
3	**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.	
4	**Investment Procurement** Project formation, Feasibility, Legal formalities i.e., Shop Act, Estimation & Costing, Investment procedure - Loan procurement - Banking Processes.	
	Productivity	**10**
1	**Productivity** Definition, Necessity, Meaning of GDP.	
2	**Affecting Factors** Skills, Working Aids, Automation, Environment, Motivation How improves or slows down.	
3	**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.	
4	**Personal Finance Management** Banking processes, Handling ATM, KYC registration, safe cash handling, Personal risk and Insurance.	
	Occupational Safety, Health & Environment Education	**10**
1	**Safety & Health** Introduction to Occupational Safety and Health importance of safety and health at workplace.	
2	**Occupational Hazards** Basic Hazards, Chemical Hazards, Vibro-acoustic Hazards, Mechanical Hazards, Electrical Hazards, Thermal Hazards. Occupational health, Occupational hygienic, Occupational Diseases/ Disorders & its prevention.	

3	**Accident & safety** Basic principles for protective equipment. Accident Prevention techniques - control of accidents and safety measures.	
4	**First Aid** Care of injured & Sick at the workplaces, First-Aid & Transportation of sick person	
5	**Basic Provisions** Idea of basic provision legislation of India. of safety, health, welfare under legislation of India.	
6	**Ecosystem** Introduction to Environment. Relationship between Society and Environment, Ecosystem and Factors causing imbalance.	
7	**Pollution** Pollution and pollutants including liquid, gaseous, solid and hazardous waste.	
8	**Energy Conservation** Conservation of Energy, re-use and recycle.	
9	**Global warming** Global warming, climate change and Ozone layer depletion.	
10	**Ground Water** Hydrological cycle, ground and surface water, Conservation and Harvesting of water	
11	**Environment** Right attitude towards environment, Maintenance of in -house environment	
	Labour Welfare Legislation	**5**
1	**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.	
	Quality Tools	**5**
1	**Quality Consciousness :** Meaning of quality, Quality Characteristic	
2	**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.	
3	**Quality Management System :** Idea of ISO 9000 and BIS systems and its importance in maintaining qualities.	
4	**House Keeping :** Purpose of Housekeeping, Practice of good Housekeeping.	
5	**Quality Tools** Basic quality tools with a few examples	
	Leadership and Team Building skills.	**5**
	Leadership Discipline and Morale Team Work Case Study/ Exercise	
	Meet the Mentor **Role - play as a Supervisor**	**5**
	Organizing and Planning.	**5**
	Time Management Group Dynamics Case Study/ Exercise	

9.2 PRACTICAL TRAINING (ON-JOB TRAINING)
(BLOCK – I & II)
DURATION: 18 MONTHS

GENERAL INFORMATION

1) **Name of the Trade** : **FITTER**

2) **Duration of On-Job Training** : As per Apprentices Act amended time to time.

3) **Batch size** : 20

4) **Examination** : i) The assessment/examination will be held on completion of each block

ii) NCVT exam will be conducted at the end of 2nd year.

5) **Instructor Qualification** :

i) Degree/Diploma in Mechanical Engg. from recognized university/Board With one/two year post qualification experience in the relevant field.

OR

ii) NTC/NAC in the trade of Fitter with three year post qualification experience in the relevant field.
Preference will be given to a candidate with Craft Instructor Certificate (CIC)

6) **Tools, Equipments & Machinery required** : - As per Annexure – II

9.2.1 DETAIL SYLLABUS OF PROFESSIONAL SKILL& PROFESSIONAL KNOWLEDGE

Block – I
On-Job Training

Week No.	Professional Skills	Professional Knowledge
1	Familiarization with the industry. **Health, Safety & Environment:** Introduction to safety Equipments and their uses. Demonstration of 5S Concept on shop floor. Use of Personal protective Equipments (PPE).	Importance of safety and general precautions observed in the industry/shop floor. All necessary guidance to be provided to the new comers to become familiar with the working of industry system, stores procedures. Introduction of First aid, operation of electrical mains. Behaviour based safety, unsafe act & situations.
2	Prepare different types of documentation as per industrial need by different methods of recording information	Importance of Technical English terms used in industry (in simple definition only)- Technical forms, process charts, activity logs, in required formats of industry, estimation, cycle time, productivity reports, job cards.
3	Repair and maintain ordinary fitters tools such chisel, Hammer, Screw driver, Scriber, Centre punches, dividers,	Introduction to work simplification related to the trade-job study, job analysis, planning of sequence of operation.
4-5	Marking of circles, profiles and various geometrical shapes and cutting the sheets with snips and shearing machine. Marking out of simple development, marking out for flaps for soldering and sweating.	Further support or demonstration if required during performing related skills.
6-7	Make various joints: wiring, hemming, Soldering, form locked, grooved and knocked up single hem straight and curved edges form double hemming,. Punch holes-using hollow and solid punches.	Explain sheet metal joints, their selection and application, tolerance for various joints, their selection & application. Wired edges single and double hem.
8-9	Bend sheet metal into various curvature form, wired edges- straight and curves, fold sheet metal at angle using stakes. Bend sheet metal to various curvatures. Make simple Square, container with wired edge and fix handle.	Further support or demonstration if required during performing related skills.
10-11	Make square tray with square soldered Corner. Do soft soldering and silver soldering. Make lap and butt joint.	Explain soldering iron, types, surface preparation of sheet and make joints.
12-13	Make funnel as per development and soldering their joints. Punch holes-using hollow and solid punches.	Further support or demonstration if required during performing related skills.

14-15	Riveting with as many types of rivet as available, use of counter sunk head rivets. Make riveted lap and butt joint.	Explain various Rivets, material, types, sizes, and selection for various works. Demonstrate Riveting tools: Rivet set , Rivet dolly, Rivet snaps description and uses. Method of riveting,
16-17	Cocking & Fullering operation after riveting Demonstration of power riveting tools. Demonstration of hand riveter and Pop riveting tools. Practice of pop riveting on a sheet metal.	Discuss the various rivets shape and form of heads, riveting tools for drawing up the importance of correct head size. The spacing of rivets. Flash riveting, use of correct tools, compare hot and cold riveting. Further support or demonstration if required during performing related skills.
18	Exercises on finished material like as aluminium and stainless steel, marking out, cutting to size, drilling etc. without damage to surface of finished articles.	The various coatings used to protect metals, protection coat by heat and electrical deposit treatments like Anodizing. Oxidising ,Electroplating, Galvanising, Metal spraying etc.
19-20	Perform Lathe machine operations- the facing, parting and form turn, plain turn, step turn with in accuracy of ± 0.05mm	Further support or demonstration if required during performing related skills.
21	Perform step and form turning using four jaw chuck. Shoulder turn: square, filleted, beveled undercut shoulder, turning-filleted under cut, square beveled.	Further support or demonstration if required during performing related skills.
22-23	Perform Parallel turning, step turning, grinding of tools for above operations. Cut grooves- square, round 'V' groove, Make a mandrel-turn diameter to sizes. Knurl the job.	Further support or demonstration if required during performing related skills.
24-25	Make a bush step bore-cut recess, turn hole diameter to sizes. Turn taper (internal and external). Turn taper pins. Turn standard tapers to suit with gauge	Explain kind of Taper. Method of expressing taper. Explain taper turning methods on lathe m/c.
26-27	Prepare a nut and match with the bolt. Make thread plug gauge using die. Cutting thread external and internal on lathe, and match them.	Further support or demonstration if required during performing related skills.
28	Perform drill machine operations. Make male and female fitting parts, drill and ream holes not less than 12.7 mm. Fit parts together in set order using nuts, bolts, screws and pins etc. with necessary wrenches, spanners and other special tools.	Demonstrate locking nut such as castle nut, swan nut, check nut, wire lock method, uses, care and maintenance.
29-30	Perform standard pipe fitting or replacing the fitting, repairs and erection on rainwater, drainage pipes and house hold taps and pipe work	Further support or demonstration if required during performing related skills.
31-32	Bending of pipes- cold and hot. Cut outer standard thread on pipe using pipe die.	Explain & demonstrate Pipe bending methods. Use of bending fixture, pipe threads-Standard

	Join pipes and make pipe assemble. Practice-dismantling & assembling – globe valves sluice valves, stop cocks, seat valves and non-return valve, fitting of pipes and testing for leakage	Pipe threads, Die and Tap, pipe vices.
33-34	Making square, butt joint and 'T' fillet joint- arc Make butt weld and corner, fillet in arc welding.	Further support or demonstration if required during performing related skills.
35	Make rectangular box by arc welding Make lap and butt joint.	Demonstrate welding defect like blowhole, porosity, slag inclusion etc in welding bead.
36	Make T fillet joint by gas welding Gas cutting of MS plates	Further support or demonstration if required during performing related skills.
37-38	**Revision**	
39	**Assessment/Examination**	

Block – II
On-Job Training

Week No.	Professional Skills	Professional Knowledge
1	Demonstration of jig & fixture. Use jig & fixture for drilling to produce different components.	Further support or demonstration if required during performing related skills.
2	File radius along a marked line (Convex & concave) and match. Making centre and drill angle gauge.	Further support or demonstration if required during performing related skills.
3	Make simple Limit Gauges and Templates.	Further support or demonstration if required during performing related skills.
4	Make Snap gauge with in accuracy 20±.04mm. Make sliding fits assembly with parallel and angular mating surface. (± 0.1 mm)	Further support or demonstration if required during performing related skills.
5	Make Snap gauge for checking a dia of 10±.02 mm.	Explain different testing of material (destructive & non destructive) and machine and equipment used for such testing.
6	Make sliding fit with angles other than $90^{o,}$ File radius and profile to suit gauge. Preparation of gap gauges.	Further support or demonstration if required during performing related skills.
7	Test angular match up. Make a angular fitting with in accuracy of $\pm 1^{o}$	Demonstration of gauge , difference among workshop, inspection & master(reference) gauge.
8	Hexagonal fitting. Check adherence to specification and quality standards using equipments like Vernier calipers, micrometers etc.,	Further support or demonstration if required during performing related skills.
9	File & fit angular mating surface within an accuracy of ± 30 minutes. Prepare a 'V' block and a clamp.	Demonstrate scrapping bearing surface, common types fixture used in industry.
10	Make sliding fits assembly with parallel and	Explain key and cotter joints

	angular mating surface. (± 0.04 mm) Make simple bracket by bending and twisting of non-ferrous metal. Drill small holes (2mm)	Demonstrate removing key from assembly using key pullers.
11	Assembly sliding for using keys and dowel pin and screw ± 0.02 mm accuracy on plain surface. Scrape on two flat surfaces and curved surfaces.	Demonstrate Testing scraped surfaces: ordinary surfaces without a master plate.
12	Practice in dovetail fitting assembly and dowel pins and cap screws assembly Checking run out of cylindrical Rod .	Further support or demonstration if required during performing related skills.
13	Assemble simple fitting using dowel pins and tap screw assembly using torque wrench.	Further support or demonstration if required during performing related skills.
14	Scraping cylindrical taper bore, check taper angle with sine bar Identify different ferrous metals by spark test, make 'H' fitting. Perform fitting and removing of ball and roller bearings in a shaft.	Further support or demonstration if required during performing related skills.
15	Scrape on flat surfaces, scrape on curved surfaces and scrape surface parallels and test. Check for blue match of bearing surfaces- both flat and curved surfaces.	Further support or demonstration if required during performing related skills.
16	Stepped keyed fitting-test job. Lapping on flat surface using lapping plate Lapping holes and cylindrical surfaces.	Demonstrate lapping on flat surface, charging of lapping tool. Procedure of lapping & Surface finish importance,
17	Perform testing surface quality using surface tester. Scrapping cylindrical bore and to make a fit-make a cotter jib assembly.	Demonstrate equipment for testing surfaces quality – dimensional tolerances of surface finish. Explain honing.
18	Marking out on the round sections for geometrical shaped fittings. Finishing and fitting to size, checking up the faces for universality.	Further support or demonstration if required during performing related skills.
19-20	Practice to develop sensory skill – in view of seen, smell and touching for inspection purpose. Mounting of grinding wheel after balancing. Check crack on grinding wheel Grinding practice of Drill, turning and shaping tool. Dress up and truing of wheel.	Explain sensory skill and benefit of effective use of such skills. Explain various types and shape of grinding wheels, specification Explain mounting, balancing and truing of grinding wheel.
21	Carry out calibration of measuring and checking instruments such as Vernier caliper, Vernier height gauge, o/s Micrometer etc.	Explain and Demonstrate Calibration of measuring instruments
22-23	Complete exercises covering the assembly of parts working to details and arrangements as per drawings. Dismantling and mounting of pulleys.	Demonstrate dismantling and mounting of pulley and belt, types, care and maintenance.
24	Practice removal of broken stud/bolt Form external threads with dies to standard size. prepare studs and bolt. Prepare nuts and match with bolts.	Demonstrate of various type of gauge such as plug gauge, Ring gauge , snap gauge, Drill Angle Gauge, and their uses. Demonstrate centre gauge, Screw Pitch Gauge, Standard Wire Gauge use, care and maintenance.

25	Repairing damaged gears and mounting them on shafts. joining belt using alligator.	Explain methods of joining leather belts. Further support or demonstration if required during performing related skills.
26	Male and female dovetail fitting repairs to geared teeth. Repair of broken gear tooth by stud.	Further support or demonstration if required during performing related skills.
27	Repair broken gear teeth by dovetail. Fitting of dovetail slides.	Further support or demonstration if required during performing related skills.
28	Simple repair work, simple assembly of machine parts from blue prints. Rectify possible assembly faults during assembly. Making of packing gaskets, use of hollow punches, extractor, drifts, various types of hammers and spanners, etc. Practicing, making various knots, correct loading of slings, correct and safe removal of parts. Erect sample machines.	Explain types of maintenance like preventive, schedule, Break down maintenance. Preventive maintenance-objective and function of preventive maintenance. Section inspection. Explain the Installation, testing and commissioning of machine. Further support or demonstration if required during performing related skills.
29	Repair damaged spares of machine tools like keys, cotters, keyways, oil groove, levers etc. Checking & filling the lubricant in machine tools.	Demonstration about lubrication survey, colour coding. Possible causes for assembly failures and remedies
30	Simple repair of machinery, making of packing gaskets, use of hollow punches, extractor ,drifts, various types of hammers and spanners, etc.	Further support or demonstration if required during performing related skills.
31	Practicing, making various knots, correct loading of slings, correct and safe removal of parts. Erect simple machines.	Demonstrate erection tools like pulley block, crow bar, spirit level, Plumb bob, pipe 2 X 4', wire rope, manila rope, wooden block. Explain Material Handling devices-different types of appliances and tackle for shifting, loading and unloading of machine and equipment. Screw Jack-use and working principle.
32-33	Practice with Power Tools used in industries such as hydraulics, pneumatics, DC tools (Impact runner, Impulse runner, DC runner).	Explain Mechanical, Hydraulic and Pneumatic drives. Explanation of power tools like pneumatic, hydraulic & DC tools. Explain hydraulic and pneumatic circuit and symbol.
34-35	**Project Work(Work in team)**	
36-37	**Revision**	
38-39	**NCVT Examination**	

10. ASSESSMENT STANDARD

10.1 Assessment Guideline:

Appropriate arrangements should be made to ensure that there will be no artificial barriers to assessment. The nature of special needs should be taken into account while undertaking assessment. Due consideration to be given while assessing for team work, avoidance/reduction of scrape/wastage and disposal of scarp/wastage as per procedure, behavioral attitude and regularity in training.

The following marking pattern to be adopted while assessing:

a) Weightage in the range of 60-75% to be allotted during assessment under following performance level:

For this grade, the candidate with occasional guidance and showing due regard for safety procedures and practices, has produced work which demonstrates attainment of an acceptable standard of craftsmanship.

In this work there is evidence of:

- good skill levels in the use of hand tools, machine tools and workshop equipment
- many tolerances while undertaking different work are in line 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 above75%- 90% to be allotted during assessment under following performance level:

For this grade, the candidate, with little guidance and showing due regard for safety procedures and practices, has produced work which demonstrates attainment of a reasonable standard of craftsmanship.

In this work there is evidence of:

- good skill levels in the use of hand tools, machine tools and workshop equipment
- the majority of tolerances while undertaking different work are in line with those demanded by the component/job.
- a good level of neatness and consistency in the finish
- little support in completing the project/job

c) Weightage in the range of above 90% to be allotted during assessment under following performance level:

For performance in this grade, the candidate, with minimal or no support in organization and execution and with due regard for safety procedures and practices, has produced work which demonstrates attainment of a high standard of craftsmanship.

In this work there is evidence of:

- high skill levels in the use of hand tools, machine tools and workshop equipment
- tolerances while undertaking different work being substantially in line 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

10.2 INTERNAL ASSESSMENTS (FORMATIVE ASSESSMENT)

COMP. NO.	COMPETENCY	INTERNAL MARKS
	GENERIC COMPETENCIES (Applicable to each Block)	
1.	Recognize & comply safe working practices, environment regulation and housekeeping.	
2.	Work in a team, understand and practice soft skills, technical English to communicate with required clarity.	
3.	Illustrate concept and principles of basic arithmetic calculation, algebraic, trigonometric, statistics and apply knowledge of specific area to perform practical operations which requires well developed skills.	
4.	Explain basic science in the field of study including basic electrical, and hydraulics & pneumatics.	
5.	Read and apply engineering drawing for different application in the field of work.	
6.	Explain the knowledge of general concept, principles of productivity, quality tools, and labour welfare legislation and apply such in day to day work to improve productivity & quality.	
7.	Explain the general concept and process of energy conservation, global warming and pollution and contribute in day to day work by optimally using available resources.	
8.	Explain and display sensitivity towards personnel finance, entrepreneurship and manage/organize related task in day to day work for personal & societal growth.	
9.	Apply the general concept of basic computer, basic operating system and uses of internet services to take benefit of IT developments in the industry.	
	SPECIFIC COMPETENCIES	
10.	Develop profiles as per drawing using standard procedure & tools to ensure appropriate accuracy.	
11.	Carry out marking out the components as per specification and standard procedure for Hack- sawing, filing, drilling, riveting, fitting and allied operations in familiar context.	
12.	Plan and organize the work in familiar context to make job as per specification and observing standard procedure by applying different types of basic fitting operations viz., Hack-sawing, Filing, grinding, drilling, reaming, tapping, riveting, sheet metal work and check for work result.	
13.	Explain the constructional features and working principles of lathe, drilling machine and apply the same to produce components using standard procedure that requires well developed skills and check for quality standard.	
14.	Apply a range of skills and processes to execute pipe joints, dismantle and assemble valves & fittings in pipes and test for leakages.	
15.	Explain and apply working principle of welding, perform Arc & Gas welding and Brazing operation as per standard procedure to join and cut mechanical	

	components / metals by Gas cutting.	
	SUB TOTAL FOR BLOCK I	**250**
16.	Produce components on drill machine by using different jigs and observing appropriate procedure, methods, tools, information and check for correctness.	
17.	Explain and apply general concept of Limits, Fits and tolerance necessary for fitting applications which requires well developed skills and check interchangeability of components using clear procedure.	
18.	Make sliding fit of components, assemble them in familiar context by standard procedure and check for functionality.	
19.	Maintain required tolerance of different mating surfaces viz., gauges, dowel pin, dovetail slide fitting by scraping and lapping by applying appropriate procedure in the of field of work and ensure for quality standard.	
20.	Dismantle and repair damaged mechanical components used for power transmission or any assembly and assemble & check the same for appropriate functioning.	
21.	Perform the basic day to day repair and maintenance along with erection of general machine tools like lathe, drilling machine as per standard procedure and check for functionality.	
	SUB TOTAL FOR BLOCK II	**250**
	TOTAL INTERNAL MARKS	**500**

10.3 FINAL ASSESSMENT- ALL INDIA TRADE TEST (SUMMATIVE ASSESSMENT)

	SUBJECTS	Marks	Internal assessment based on competency	Full Marks	Pass Marks	Duration of Exam.
Block – I & II	**Block - I**		**250**	**250**	**150**	
	Professional Skill	250		250	150	**08 hrs.**
	Professional Knowledge	100		100	40	3 hrs.
	Workshop Cal. & Sc.	50		50	20	3 hrs.
	Engineering Drawing	50		50	20	4 hrs.
	Employability Skill	50		50	20	3 hrs.
	Block - II		**250**	**250**	**150**	
	TOTAL for Block – I & II	**500**	**500**	**1000**	**550**	
	Grand Total		**500**			

Marks Distribution TOTAL: 1000 marks for I & II Blocks Pass marks: 550

Note: - The candidate pass in each subject conducted under all India trade test.

11. FURTHER LEARNING PATHWAYS

- On successful completion of the course trainees can opt for Diploma course (Lateral entry).
- On successful completion of the course trainees can opt for CITS course.

Employment opportunities:

On successful completion of this course, the candidates shall be gainfully employed in the following industries:

1. Production & Manufacturing industries.
2. Structural Fabrication like bridges, Roof structures, Building & construction.
3. Automobile and allied industries
4. Service industries like road transportation and Railways.
5. Ship building and repair
6. Infrastructure and defence organisations
7. In public sector industries like BHEL, BEML, NTPC, etc and private industries in India & abroad.
8. Self employment

12. LIST OF EXPERT MEMBERS

Sl. No.	Name & Designation Sh/Mr./Ms.	Organization	Expert Group Designation
1.	Jayant Krishna Principal Consultant	M/S TATA Consultancy Service Ltd., Lucknow	Chairman
2.	T. C. Saravanabava	DDG (AT), MSDE	Member
3.	Sandhya Salwan	Director (AT), MSDE	Member
4.	Satya Shankar B. P.	Director, CSTARI, Kolkata	Member
5.	Vivek Mehrotra AGM (HR)	TATA Motors Ltd., Lucknow	Group Leader
6.	Nirmalya Nath Asstt. Director (Trg.)	CSTARI, Kolkata	Member
7.	Ashok Kumar Mishra Vocational Instructor	ATI, Kanpur	Member
8.	R. K. Sharma,	TATA Motors Ltd., Lucknow	Industry Expert
9.	Manu Kumar Verma, Sr. Manager	Shavak Nanavati Technical Institute, M/S TATA Steel, Jamshedpur	Industry Expert
10.	Sridharan R.K., Manager	BAP/ BHEL, Ranipath	Industry Expert
11.	S. K. Mukhopadhyay, Sr. Supervisor	GRSE Ltd, Kolkata	Industry Expert
12.	M. Thamizharasan, JDT	CSTARI, Kolkata	Addl. Member
13.	Prasanta Kumar Kolay, ADT	CSTARI, Kolkata	Addl. Member
14.	R. N. Manna, T.O.	CSTARI, Kolkata	Addl. Member

ANNEXURE – I

TOOLS & EQUIPMENT FOR BASIC TRAINING

INFRASTRUCTURE FOR PROFESSIONAL SKILL & PROFESSIONAL KNOWLEDGE

TRADE: FITTER

LIST OF TOOLS & EQUIPMENTS FOR -20APPRENTICES

A : TRAINEES TOOL KIT:-

Sl. No.	Name of the items	Quantity (indicative)
1.	Steel Rule 15 cm with metric graduation	5 nos.
2.	Try Square 10 cm blade.	5 nos.
3.	Caliper inside 15 cm spring.	5 nos.
4.	Caliper 15 cm hermaphrodite	5 nos.
5.	Caliper outside 15 cm spring	5 nos.
6.	Divider 15 cm spring	5 nos.
7.	Straight Scriber 15 cm.	5 nos.
8.	Centre Punch 10 cm	5 nos.
9.	Screw driver 15 cm	5 nos.
10.	Chisel cold flat 10 cm	5 nos.
11.	Hammer ball peen 0.45 kg. With handle	5 nos.
12.	File flat 25 cm. second cut	5 nos.
13.	File flat 25 cm. smooth	5 nos.
14.	File half round second cut 15 cm.	5 nos.
15.	Hacksaw frame fixed 30 cm.	5 nos.
16.	Dot slot punch 10 cm.	5 nos.

B : TOOLS INSTRUMENTS AND GENERAL SHOP OUTFITS

Sl. No.	Name of the items	Quantity (indicative)
17.	Steel Rule 60 cm.	4 nos.
18.	Surface plate 45 x 45 cm CI / Granite.	1 nos.
19.	Marking table 91 x 91 x 122 cm.	1 no.
20.	Universal scribing block 22 cm.	2 nos.
21.	V-Block pair 7 cm and 15 cm with clamps	2 nos.
22.	Angle plate 10 x 20 cm.	1 nos.
23.	Spirit Level 15 cm metal	1 no.
24.	Punch round 3mm x 4 mm set of 2	2 nos.
25.	Portable hand drill (Electric) 0 to 6 mm	1 nos.
26.	Drill twist straight shank 1.5 to 12 mm by 0.5 mm	1 Set
27.	Taps and dies complete set in box whit worth.	1 no.
28.	Taps and dies complete set in box 3-18 mm set of 10	1 no.
29.	File knife edge 15 cm smooth	4 nos.
30.	File Rounded edge 15 cm smooth	2 nos.
31.	File round 20 cm second cut	4 nos.
32.	Feeler gauge 10 blades	1 set
33.	File triangular 15 cm second cut.	4 nos.
34.	File flat 20 cm bastard	4 nos.
35.	File Swiss type needle set of 12.	2 sets
36.	Pliers combination 15 cm	2 nos.
37.	Soldering Iron 350 gm.	2 nos.
38.	Spanner adjustable 15 cm	1 nos.
39.	Interchangeable ratchet socket set with a 12 mm driver, sized10-32 mm set of 18 socket & attachments.	1 set
40.	Box spanner set 6-25 mm set of 8 with Tommy bar.	1 set
41.	Clamp "C" 10 cm	2 nos.
42.	Reamer parallel 12 – 16mm set of 5.	1 no.
43.	Scraper flat 15 cm.	4 nos.
44.	Chisel cold 19 mm flat	2 nos.
45.	Stud Extractor EZY – out	2 nos.
46.	Combination Set 30 cm.	2 nos.
47.	Micrometer 0 – 25 mm outside.	2 nos.
48.	Micrometer inside 25 – 50 mm with extension rods.	1 no.
49.	Vernier caliper 15 cm	2 no.
50.	Screw pitch gauge.	1 no.
51.	Wire gauge, metric standard.	1 no.
52.	Pipe wrench 40 cm	1 no.
53.	Pipe vice 100mm	1 no.
54.	Adjustable pipe die set cover pipe size 15, 20, 25,32,38,50 mm with die stock	1 no.
55.	Wheel dresser (One for 4 units).	1 no
56.	Sleeve drill Morse 0 – 1, 1 – 2, 2 – 3.	1 Set
57.	Lathe tools H.S.S. tipped set.	2 nos.
58.	Lathe tools bit 6 mm x 75 mm.	2 nos.
59.	Bench working 240 x 120 x 90 cm.	4 nos.

60.	Almirah 180 x 90 x 45 cm.	2 nos.
61.	Instructor Table	1 no.
62.	Instructor Chair	1 no.
63.	Black board with easel.	1 no.
64.	Fire buckets.	2 nos.
65.	Hand hammers 1 kg. with handle.	2 nos.
66.	Torque wrench (14 to 68 Nm)	1 no.
67.	Class room Chair	20 nos.
68.	Class Room table	20nos
69.	First- aid box	As required
70.	Instructional Material – Ref. books	As required

C : GENERAL MACHINERY INSTALLATIONS:-

Sl. No.	Name & Description of Machines	Quantity (indicative)
1.	SS and SC centre lathe (all geared) with Minimum centre height 6"/150 mm & length 4.5 h/140 automatic cross with 3 jaw c arrangement, lightening lamp, taper turning attachment, safety guard & standard accessories.	2 Nos.
2	Drilling machine pillar sensitive 0-20 mm cap with swivel table motorized with chuck & key.	1 no.
3	Drilling machine bench sensitive 0-12 mm cap motorized with chuck and key.	2 nos.
4	D.E. pedestal Grinding machine with 200mm diameter wheels rough and smooth with twist drill grinding attachment.	1 no.
5	Transformer welding set 150 amps.-continuous welding current, with all accessories and electrode holder	1set
6	Oxy -acetylene gas welding set equipment with hoses, regulator and other accessories.	1set

INFRASTRUCTURE FOR WORKSHOP CALCULATION & SCIENCE AND ENGINEERING DRAWING

TRADE: FITTER

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	Quantity (indicative)
1.	Draughtsman drawing instrument box	20 sets
2.	Set square celluloid 45^0 (250 X 1.5 mm)	20 sets
3.	Set square celluloid 30^0-60^0 (250 X 1.5 mm)	20 sets
4.	Mini drafter	20 sets
5.	Drawing board (700mm x500 mm) IS: 1444	20 sets

B : FURNITURE REQUIRED

Sl. No.	Name of the items	Quantity (indicative)
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

ANNEXURE – II

TOOLS & EQUIPMENT FOR ON-JOB TRAINING

INFRASTRUCTURE FOR PROFESSIONAL SKILLS & PROFESSIONAL KNOWLEDGE

TRADE: FITTER

For Batch of 20 APPRENTICES

General Machinery Installations –

Sl. No.	Name & Description of Machines	Quantity
1	Transformer welding set 150 amps.-continuous welding current, with all accessories and electrode holder	As required
2	Oxy -acetylene gas welding set equipment with hoses, regulator and other accessories.	As required
3	SS and SC centre lathe (all geared) with Minimum centre height 6"/150 mm & length 4.5 "/1400 coolant arrangement, lightening lamp, taper turning attachment, safety guard & standard accessories.	As required
4	Drilling machine pillar sensitive 0-20 mm cap with swivel table motorized with chuck & key.	As required
5	Drilling machine bench sensitive 0-12 mm cap motorized with chuck and key.	As required
6	D.E. pedestal Grinding machine with 200mm diameter wheels rough and smooth with twist drill grinding attachment.	As required

ANNEXURE-III

GUIDELINES FOR INSTRUCTORS AND PAPER SETTERS

1. All the questions of theory paper for the trade will be in objective type format.

2. Due care to be taken for proper & inclusive delivery among the batch. Some of the following some method of delivery may be adopted:

A) LECTURE
B) LESSON
C) DEMONSTRATION
D) PRACTICE
E) GROUP DISCUSSION
F) DISCUSSION WITH PEER GROUP
G) PROJECT WORK
H) INDUSTRIAL VISIT

3. Maximum utilization of latest form of training viz., audio visual aids, integration of IT, etc. may be adopted.

4. The total hours to be devoted against each topic may be decided with due diligence to safety & with prioritizing transfer of required skills.

5. Questions may be set based on following instructions:-

Sl. No.	Question on different aspect	Weightage in %age	Key Words may be like
1	Information received	25	What, Who, When
2	Knowledge	50	Define, Identify, Recall, State, Write, List & Name
3	Understanding	15	Describe, Distinguish, Explain, Interpret & Summarize
4	Application	10	Apply, Compare, Demonstrate, Examine, Solve & Use

6. Due weightage to be given to all the topics under the syllabus while setting the question paper.