CURRICULUM

FOR THE TRADE OF

TURNER

UNDER

APPRENTICESHIP TRAINING SCHEME (ATS)

सत्यमेव जयते
Government of India

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

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1. BACKGROUND

1.1 Apprenticeship Training Scheme under Apprentice Act 1961

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

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

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

1.2 Changes in Industrial Scenario

Recently we have seen huge changes in the Indian industry. The Indian Industry registered an impressive growth during the last decade and half. The number of industries in India have increased manifold in the last fifteen years specially 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 **Turner** trade)

Success & Sustainability of the industry depends upon the availability of the skilled and knowledgeable man power. Skilled turners are required in the most of the manufacturing industry. Skilled turners are required in the …

- Automobile and allied industries.
- Service industries like road transportation and Railways.
- Ship building and repair.
- Infrastructure and defense organizations.
- Public sector industries like BHEL, BEML, NTPC, Army based workshops.
- Private industries in India & abroad.
- Self employment

Recognizing the importance of skill development more emphasis is given to the Trade Practical. The curriculum is designed in such a way that after successful completion of two years apprenticeship training in the trade, the apprentice will be responsible for his own work when employed in industry. Capabilities will be developed during apprenticeship training for further learning.

3. JOB ROLES : Reference NOS & NCO

Brief description of Job roles:

Turner - Lathe Operator makes metal articles to required specifications using lathe and cutting tools. Studies drawings and other specifications of parts to be made. Selects metal, holds it in chuck, jig or fixture on lathe as required, centres it by manipulating chuck jaws or otherwise using dial indicator or marking block and securely tightens it in position. Selects correct cutting tool, grinds it if necessary and holds it tight in tool post at correct height. Sets feed and speed and starts machine. Manipulates hand wheels or starts automatic controls to guide cutting tool into or along metal. Controls flow of coolant (cutting lubricant) on edge of tool. Arranges gears in machine to obtain required pitch for screw cutting. Calculates tapers and sets machine for taper turning, controls lathe during operation by means of hand wheels and levers and frequently checks progress of cutting with measuring instruments such as calipers and rule, micrometers, etc. Stops machine, removes completed part and checks it further with instruments to ensure accuracy. Repeats operations if necessary. Cleans and oils machine. Is designated as ROLL TURNER; RELIEVING LATHE OPERATOR; SURFACE LATHE OPERATOR etc. according to type of lathe on which worked. May improvise devices and make simple adjustments to machine. May recondition lathe tools.

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) Lathe Operator – QP ref. No. – ASC/Q 1901

(ii) Operator Conventional Turning – QP ref. no. – CSC / Q 0110

(iii) CNC Setter cum Operator – QP ref. no. – CSC/Q 0120

(iv) CNC Operator Turning – QP ref. no. – CSC / Q 0115

NCO:- Reference No. - 8211.15

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. Demonstrate knowledge of concept and principles of basic arithmetic, algebraic, trigonometric, statistics, co-ordinate system and apply knowledge of specific area to perform practical operations.
4. Understand and explain basic science in the field of study including basic electrical, hydraulics and pneumatics.
5. Read and apply engineering drawing for different application in the field of work.
6. Understand and explain the concept in productivity, quality tools, and labour welfare legislation and apply such in day to day work to improve productivity & quality.
7. Explain energy conservation, global warming and pollution and contribute in day to day work by optimally using available resources.
8. Explain personnel finance, entrepreneurship and manage/organize related task in day to day work for personal & societal growth.
9. Understand and apply basic computer working, basic operating system and uses internet services to get accustomed & take benefit of IT developments in the industry.

B. SPECIFIC OUTCOME

Block -I

10. Perform basic fitting operations that requires well developed skills in industrial workshop practices and inspect dimensions with standard procedures
11. Execute preventive maintenance of lathe machine maintaining proper procedures and test for functionality by appropriate maintenance method.
12. Produce job with well developed skills and proper procedures using various cutting tools involving different operations viz. Step turning, under cutting / Grooving, Knurling, Drilling, Reaming, Boring.
13. Produce taper (external & internal) components with well developed skills and proper procedures using different methods of taper turning and match with male / female part.
14. Manufacture components having eccentric turning with well developed skills and proper procedures.

15. Produce components with Trepanning operation with desired mathematical skills and with proper procedures.
16. Bore soft jaws for holding components with well developed skills.
17. Produce components with different thread forms viz. BSW, Metric, Square with well developed skills and maintaining proper procedures.

Block – II

18. Produce components with Scroll operation applying desired mathematical skills and with proper procedures.
19. Produce components with Acme, Buttress and Worm thread with well developed skills and maintaining proper procedures.
20. Manufacture components with specific Form with well developed skills and maintaining proper procedures.
21. Turn job having center/axial offset (castings/forgings) with well developed skills and maintaining proper procedures.
22. Turn Crank Shaft as per drawing applying desired mathematical skills and with proper procedures.
23. Make job having eccentric boring applying desired mathematical skills and with proper procedures.
24. Produce job having helical grooves /multi start thread form with well developed skills and maintaining proper procedures.
25. Produce components on CNC Lathe involving different operations applying desired mathematical skills and with proper procedures.
26. Manufacture and assemble work as per drawing (Project Work) with well developed skills, maintaining proper procedures and responsibility for own and other's work.

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 COMPLIANCE LEVEL

NSQF level for Turner 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 TURNER 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 problems 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 work and learning

6. GENERAL INFORMATION

1. **Name of the Trade** : **TURNER**
2. **N.C.O Code No.** : **8211.15**

   NOS Code No. : **ASC / Q 1901, CSC / Q 0110, CSC / Q 0120, CSC / Q 0115**

3. **Duration of Apprenticeship Training**

   (Basic Training + Practical Training): 02 Years.

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

   a) Block –I : 3 months

   b) Block – II : 3 months

   Total Duration of Basic Training – 06 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 under 10+2 system of Education or its equivalent
7. **Selection of Apprentices** : 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 TURNER 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 procedures.
		1.8 Identify and observe site evacuation procedures according to site policy.
		1.9 Identify Personal Productive Equipment (PPE) and use the same as per related working environment.
		1.10 Identify basic first aid and use them under different circumstances.
		1.11 Identify different fire extinguisher and use the same as per requirement.
		1.12 Identify environmental pollution & contribute to 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. Demonstrate knowledge of concept and principles of basic arithmetic, algebraic, trigonometric, statistics, co-ordinate system and apply knowledge of specific area to perform practical operations.	Item No. 9.1.1 Block – I & II	3.1 Terminal 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. Understand and explain basic science in the field of study including basic electrical, hydraulics and pneumatics.	Item No. 9.1.1 Block – I & II	4.1 Terminal 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 Terminal 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. Understand and explain the concept in 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 Terminal 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 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 Terminal 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 personnel finance, entrepreneurship and manage/organize related task in day to day work for personal & societal growth.	Item No. 9.1.3.1 Block –II	8.1 Terminal examination to test knowledge on personnel finance, entrepreneurship.
		8.2 Their applications will also be assessed during execution of assessable outcome.

9. Understand and apply basic computer working, basic operating system and uses internet services to get accustomed & take benefit of IT developments in the industry.	Item No. 9.1.3.1 Block –I	9.1 Terminal 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. Perform basic fitting operations that requires well developed skills in industrial workshop practices and inspect dimensions with standard procedures	BT WK No. 1 & 2, OJT WK No. 2-36	10.1 Mark according to drawing by using desired mathematical skills, marking tools on flat and round surfaces.
		10.2 File the job with well developed skills using different methods and perform in accordance with standard specifications and tolerances.
		10.3 Drill on flat and round surfaces maintaining proper procedures.
		10.4 Identify & use hand tools for threading (internal and external) with dies and taps with well developed skills.
		10.5 Measure all dimensions in accordance with standard specifications and tolerances with desired mathematical skills.
11. Execute preventive maintenance of lathe machine maintaining proper procedures and test for functionality by appropriate maintenance method	BT WK No. 3, OJT WK No. 2-36	11.1 Acquaintance of lathe machine operation with its components.
		11.2 Functional application of different parts, levers, stoppers etc.
		11.3 Identify different lubrication points, lubricants and their usage for application in Lathe machine as per machine manual.
		11.4 Plan for periodic and preventive maintenance of lathe collecting and organizing information and maintaining standard procedures.
		11.5 Select appropriate items and tools for maintenance.
		11.6 Demonstrate possible solutions and agree tasks within the team.
		11.7 Perform maintenance as per schedule of machine manual with responsibility for own and other's work.
		11.8 check for desired functionality.
12. Produce job with well developed skills and proper procedures using various cutting tools involving different operations viz. step turning, under cut / grooving, shouldering, knurling, drilling, reaming,	BT WK No. 4 & 5, OJT WK No. 2-36	12.1 Plan the work maintaining standard procedures and select tools, Work holding device / accessories to produce the job in compliance with standard safety norms.
		12.2 Hold the work on appropriate work holding device / using appropriate accessories and check for its functional usage to perform the operation.
		12.3 Select and Grind cutting tools, measure the tool angles as per tool signature applying desired mathematical skills.
		12.4 Select and apply cutting parameters for different turning operations with different work material and tool material applying desired mathematical skills for producing required quality output.

boring.		12.5 Perform turning, step turning, under cut / grooving, shouldering, knurling, drilling, reaming, boring with cognitive and practical skills in accordance with standard operating procedure.
		12.6 Plan and perform the job between centers with cognitive and practical skills and proper procedures.
		12.7 With desired mathematical skills check accuracy/ correctness of the job as per drawing using appropriate gauges and measuring instruments.
		12.8 Avoid waste, ascertain unused materials and components for disposal, store these in an environmentally appropriate manner and prepare for disposal with clear choice of procedures.

13. Produce taper (external & internal) components with well developed skills and proper procedures using different methods of taper turning and match with male / female part.	BT WK No. 6 & 7, OJT WK No. 2-36	13.1 Plan and select appropriate method to produce components with taper turning (external & internal).
		13.2 Evaluate angles with desired mathematical skills to set up the tool for machining.
		13.3 Demonstrate possible solutions and agree tasks within the team.
		13.4 Produce components as per standard operating procedure by using appropriate tools.
		13.5 With desired mathematical skills check accuracy/ correctness of job using appropriate gauge and measuring instruments for their functional requirement / match with male part.
14. Manufacture components having eccentric turning with well developed skills and proper procedures.	BT WK No. 8, OJT WK No. 2-36	14.1 Analyse eccentricity and plan for counter balance with desired mathematical skills while holding the work piece.
		14.2 select appropriate tools and plan with clear choice of procedures for eccentric turning.
		14.3 Comply with safety rules when performing the above operations.
		14.4 Demonstrate possible solutions within the team.
		14.5 Produce component as per standard operating procedure.
		14.6 Measure the dimensions with instruments/gauges as per drawing with desired mathematical skills.
15. Produce components with Trippening operation with desired mathematical skills and with proper procedures	BT WK No. 9, OJT WK No. 2-36	15.1 Plan and select appropriate method / procedures to produce components with trippening operation.
		15.2 Plan and produce cutting tools in compliance with desired mathematical skills to produce component
		15.3 Produce component as per standard operating procedure
		15.4 Check accuracy of product using appropriate gauge and measuring instruments with desired mathematical skills.
16.Bore soft jaws for holding components with well developed skills.	BT WK No. 9, OJT WK No. 2-36	16.1 plan and select appropriate soft jaws and tools as per the component to be held.
		16.2 Mount the jaws on to the chuck for machining
		16.3 Bore the soft jaws as per drawing with clear choice of procedures.

17. Produce components with different thread forms viz. BSW, Metric, Square with well developed skills and maintaining proper procedures.	BT WK No. 10, 11 & 12, OJT WK No. 2-36	17.1 Plan and select appropriate method to produce components with desired thread forms.
		17.2 Plan and prepare thread cutting tool in compliance to produce components with different thread forms conforming to Standard thread parameters.
		17.3 Demonstrate possible solutions and agree tasks within the team.
		17.4 Produce components as per standard operating procedure with cognitive and practical skills.
		17.5 Check accuracy/ correctness of job using appropriate gauge and measuring instruments with desired mathematical skills for their functional requirement and suit to male /female part.

Block – II

ASSESSABLE OUTCOME	REF. SYLLABI	ASSESSMENT CRITERIA
18. Produce components with Scroll operation with desired mathematical skills and proper procedures	BT WK No. 1, OJT WK No. 1-32	18.1 Plan and select appropriate method to produce components with scroll operation.
		18.2 Plan and produce cutting tools with desired mathematical skills in compliance to produce component
		18.3 Produce component as per standard operating procedure
		18.4 Check accuracy of product using appropriate gauge and measuring instruments with desired mathematical skills.

19. Produce components with Acme, Buttress and Worm thread with well developed skills and proper procedures.	BT WK No. 1 & 2, OJT WK No. 1-32	19.1 Plan and select appropriate method to produce components with desired thread forms.
		19.2 Plan and prepare thread cutting tool in compliance to produce components with different thread forms conforming to Standard thread parameters.
		19.3 Demonstrate possible solutions and agree tasks within the team.
		19.4 Produce components with cognitive and practical skills as per standard operating procedure.
		19.5 Check accuracy/ correctness of job using appropriate gauge and measuring instruments with desired mathematical skills for their functional requirement and suit to male /female part.
20. Manufacture components with specific Form with well developed skills and proper procedures.	BT WK No. 1, OJT WK No. 1-32	20.1 Plan and select appropriate method to produce components.
		20.2 Grind form cutting tool and check for its correctness.
		20.3 Produce components with cognitive and practical skills as per standard operating procedure and as per drawing.
		20.4 Check accuracy/ correctness of job using appropriate gauge and measuring instruments.
21. Turn job having center/axial offset	BT WK No. 3,	21.1 Plan and assemble the appropriate work holding device and balance the job rotation as per standard procedure and safety

(castings/forgings) with well developed skills and proper procedures	OJT WK No. 1-32	norms
		21.2 Demonstrate possible solutions and agree tasks within the team.
		21.3 Produce the job with standard operating procedure and cognitive and practical skills using appropriate tools.
		21.4 Check accuracy/ correctness of job using appropriate gauge and measuring instruments.
		21.5 Avoid waste, ascertain unused materials and components for disposal, store these in an environmentally appropriate manner and prepare for disposal with clear choice of procedures.

22. Turn Crank Shaft as per drawing with desired mathematical skills and proper procedures.	BT WK No. 4, OJT WK No. 1-32	22.1 Analyse eccentricity, prepare the work and plan for counter balance while holding the work piece applying desired mathematical skills.
		22.2 select appropriate tools and plan with clear choice of procedures for Crank Shaft turning.
		22.3 Demonstrate possible solutions within the team with responsibility for own and other's work.
		22.4 Produce component as per standard operating procedure observing safety rules.
		22.5 Measure the dimensions with instruments/gauges as per drawing applying desired mathematical skills.
23. Make job having Eccentric boring with desired mathematical skills and proper procedures.	BT WK No. 4, OJT WK No. 1-32	23.1 Analyse eccentricity, prepare the work and plan for counter balance while holding the work piece applying desired mathematical skills.
		23.2 select appropriate tools and plan with clear choice of procedures for Eccentric boring .
		23.3 Demonstrate possible solutions within the team with responsibility of own and other's work.
		23.4 Produce component as per standard operating procedure observing safety rules.
		23.5 Measure the dimensions with instruments/gauges as per drawing applying desired mathematical skills.
24. Produce the job having helical grooves / multi start thread form with well developed skills and proper procedures	BT WK No. 5 & 6, OJT WK No. 1-32	24.1 Plan and select appropriate method with clear choice of procedures to produce components with helical grooves /multi start threading.
		24.2 Prepare appropriate tool for generating required helical grooves / thread form applying desired mathematical skills.
		24.3 set the job and turn helical grooves / multi start thread (male and female) and match them for accurate fitting with cognitive and practical skills.
		24.4 Check accuracy/ correctness of job using appropriate gauge and measuring instruments applying desired mathematical skills.
25.Produce components on CNC Lathe involving different operations with desired mathematical skills	BT WK No. 7 to 11, OJT WK No. 1-32	25.1 Plan and prepare part programme as per drawing, simulate for it's correctness with appropriate software applying desired mathematical skills.
		25.2 Prepare tooling layout and select tools as required with cognitive and practical skills.
		25.3 Set selected tools on to the machine

and proper procedures		25.4 Test/Dry run the part programme on the machine
		25.5 Set up the job and machine the component as per standard operating procedure involving parallel, taper, step, radius, grooving and threading operations.
		25.6 Check accuracy/ correctness of job using appropriate gauge and measuring instruments applying desired mathematical skills.
		25.7 Observe safety/ precaution during machining.
26. Manufacture and assemble work as per drawing (Project Work) with well developed skills maintaining proper procedures and responsibility for own and other's work.	BT WK No. 12, OJT WK No. 33	26.1 Plan and select tools and materials for the part components and make this available for use in a timely manner.
		26.2 produce part components as per drawing with cognitive and practical skills.
		26.3 Check for accuracy of all the part components and suitability to the higher assembly applying desired mathematical skills.
		26.4 Assemble all the part components as per the guide lines given in the drawing with the responsibility for own and other's work.
		26.5 Check for functionality of the assembly as per standard operating procedure.
		26.6 Avoid waste, ascertain unused materials and components for disposal, store these in an environmentally appropriate manner and prepare for disposal with clear choice of procedures.

***Note*: - BT – BASIC TRAINING OJT – ON JOB TRAINING**

9. SYLLABUS
9.1 Basic Training (Block – I & II)
Duration: 06 Month (26 weeks)

GENERAL INFORMATION

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

2) **Hours of Instruction** : 1040Hrs. (40 hrs./week X 26 weeks)

3) **Batch size** : 16

4) **Power Norms** : 18.5 KW

5) **Space Norms** : 110 Sq.mt.

6) **Examination** : The internal examination/ assessment will be held on completion of each block.

7) **Instructor Qualification** :

i) Degree in Mechanical / Production Engineering from recognized university with one year post qualification experience in the manufacturing industry.

OR

ii) Diploma in Mechanical / Production Engineering from recognized board with two years post qualification experience in the manufacturing industry.

OR

iii) NAC/NTC in the trade of TURNER with three years post qualification experience in the manufacturing industry.

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

8) **Tools, Equipment & 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.	
			Graph: - 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.	Demonstration to: Safety equipments and their uses. First Aid Box. Personal Protective Equipments (PPEs). Safety signs. Operation of Electrical mains. Preventive measures for electrical Accidents & steps to be taken in such accidents. Use of Fire extinguishers. Disposal procedure of waste materials like cotton waste, metal chips/burrs etc. Use of basic Hand tools e.g. Pliers, Spanners, hammers, etc. & Measuring tools e.g. Steel Rule, Calipers, etc. Wire bending exercises to the given shape and dimensions. Marking out lines with Prick punch & Centre Punch. Gripping in vice jaws. Hack Sawing to given dimensions by Hand – De burring Use of Pedestal Grinder. Use of scale and outside calipers for measurement.	Importance of trade training. Safety and General precautions observed in the industry/shop floor and Training Centre. All necessary guidance to be provided to the new comers to become familiar with the working of Basic Training Centre system including stores procedures. Introduction of First Aid, Health & Safety. Response to emergencies e g. power failure, fire, and system failure. Housekeeping as per 5 S Principles. Electrical Hazards & their avoidance. Types , Classification & Use of - Hammer, Prick Punch & Centre Punch, Scriber & Scribing block, Steel rule, Calipers, Vice,
2	Chipping. Chisel Grinding. Filing practice on plain surfaces. Filing practice at Right angle. Use of Try square. Hack Sawing to given dimensions by Power Hack saw. Marking Practice (Including on Round jobs). Use of Scriber & Scribing block. Drilling operation on Drilling Machine. Threading with the help of Taps (Hand). Threading with the help Dies(Hand).	Types , Classification & Use of – Chisel, Files, Try square, V– block, Surface plate. Hacksaw & Hacksaw blades, Power Hacksaw. Vernier Caliper – Parts, Principles, Least Count and Reading Drill machine- different types, Parts. Drilling machine operations Material & Nomenclature of Drills & Taps, sleeves, Drill chuck. Calculation involved to find Out drill size (Metric and Inch) w.r.t. tap size. Vernier Height Gauge.

3	Lathe parts and functions, Lubrication points, Lever positions, Starting/Stopping and safety stoppers. Cleaning of Lathe. Preventive maintenance of lathe- Demonstration of different Check points. Dismounting & mounting of 3- jaw chuck, 4-jaw chuck. Job holding and Truing of job in 3-jaw and 4-jaw chuck. Turning of round stock on 3-jaw chuck. Grinding of Centre Punch, Drill bits, single point cutting tool RH, side knife tools and parting off tool. Facing operation to correct length. Center drilling operation. Truing & turning on 4-jaw chuck. Measurement with Scale, Outside Caliper, Vernier caliper.	Lathe – Types, Different parts & their Functions, Drivers, Head stock, 3-Jaw & 4-jaw chuck, Combination Set, Bevel Protractor and Vernier Bevel Protractor – Uses and reading. Lathe Cutting Tools- Material, Types, Shapes and different angles (clearances and rake), Digital vernier caliper. Micrometer – Types, Parts, Least Count and Reading. Error & how to avoid them. Types of grinding wheel and dressers used in pedestal grinders.
4	Parallel Turning. Step Turning. Under Cutting, Grooving and Parting off. Step Turning practice within +/- O.5 mm with SQ. shoulder. Measurement with vernier caliper & Outside micrometer. Knurling practice in lathe (Diamond, straight, helical & square).	Different methods of truing. Cutting speed, feed and depth of cut. Calculation of speed & feed. Factors affecting in deciding speed, feed and depth of Cut. Combination drill- appropriate selection of size from chart of combination drill. Digital micrometer. Coolant-types, necessity, Knurling- necessity, types, grade, cutting speed for knurling.
5	Drilling on Lathe-step drilling, Reaming Drill grinding practice. Boring practice-Plain & step, internal recessing. Boring and stepped boring (within +/- O.O5 mm). Reaming in lathe using solid and adjustable reamer. Measurement with scale and inside caliper. Measurement with inside micrometer	Counter sinking and Counter boring. Reamers-types and uses. Lathe accessories - Types, Construction and uses. Lathe mandrel- different types and their uses. Marking table-Construction and function. Angle plate- Construction and function. Eccentricity checking. Concept of feed and recommended feed rate in drilling. Calculation of spindle speed using formula. Inside micrometer – Construction, Use etc. Coolant and Cutting Fluid – properties of Ideal fluid, selection of coolant for different material.

6.	External and Internal taper turning by compound slide Swiveling method External and Internal taper turning by taper turning attachment. Blue matching. Checking of angles with angle gauge / bevel protractor. Checking alignment of lathe centers. Mounting job in between centers. Turning practice-between centers on mandrel (Gear blanks). Testing of accuracy of alignment. Procedure of checking accuracy of lathe.	Taper – different methods of expressing tapers, different standard tapers. Different methods of taper turning, important dimensions of taper and related calculation. Head stocks with different drives and back gear arrangements. Lathe centers-types and their uses. Lathe carrier-function, types & uses.
7	Taper turning by swiveling tail stock method. Use of sine bar & slip gauges. Morse taper- different number. Use ring gauge / suitable MT sleeve. Internal taper turning by taper turning attachment / cross slide. Taper matching exercise (application of Prussian blue, Plug gauge)	Sine bar. Slip Gauges- uses and selection. Checking of taper with sin bar and roller-calculation involved Driving plate, Face plate, Fixed & Traveling steadies- construction and use.
8	Use of Faceplate, Driving Plate. Eccentric marking practice. Eccentric turning. Use of Vernier height Gauge and V-block. Practice square block turning using 4-jaw chuck.	Templates-its function and construction. Methods of Eccentric turning. Mechanism in lathe – Half Nut Mechanism, Apron Mechanism, Nut & Gear box Mechanism Jig and fixture. Chip breaker on tool-purpose and type Effect of Centre height of tool – on Tool angle, On job and on machine.
9	Turning and boring practice on CI and cast steel. Soft jaw boring. Trepanning operation.	Preventive maintenance and Preventive maintenance schedule.
10	Screw thread cutting (B.S.W) external R/H & L/H, threading tool Grinding, Checking of thread by using thread gauge. Screw thread cutting (B.S.W) internal R/H & L/H, checking of thread by using thread gauge Fitting of male & female threaded components (BSW)	Screw thread-definition, purpose & its different elements. Fundamentals of thread cutting on lathe. Different types of screw thread- their forms and elements. Application of each type of thread. Gear train. Chain gear formula calculation. Different methods of forming threads. Calculation involved in finding core dia., gear train (simple gearing) calculation. Calculations involving driver-driven, lead screw pitch and thread to be cut. Thread chasing dial function, construction and use.

11	Screw thread cutting (External) metric & threading tool grinding Screw thread (Internal) metric & threading tool Grinding Fitting of male and female thread components (Metric)	Calculation involving pitch related to ISO profile. Conventional chart for different profiles, metric, B.A., Whitworth, pipe etc. Calculation involving gear ratios and gearing (Simple & compound gearing)
12.	Tool grinding for Square thread with the concept of leading and trailing angle (External & Internal), Square threading (External & Internal) practice Fitting of external and internal square threaded components. Turning at high speed using tungsten carbide tools including throw-away tips.	Lubricant-function, types. Frequency of Lubrication. Methods of lubrication.
13.	Revision	
	Assessment/Examination 03days	

Block – II
Basic Training

Week No.	Professional Skills	Professional Knowledge
1.	Scroll cutting operation Practice of negative rake tool on non-ferrous metal. Demonstration of Electrical Equipments/ Switches/Motors of Lathe/Drilling Machine/Power Hack Saw/Pedestal Grinder. Demonstration of Single and Three Phase Power Supply. Worm threading operation. Turning of long shaft using steady (within 0.l mm) using fixed & traveling steadies. Form turning practice by hand. Thread on taper surface (Vee form).	Tool life, negative top rake-its application and performance with respect to positive top rake. Brief about Electrical Equipments/ Switches/Motors of Lathe/Drilling Machine/Power Hack Saw/Pedestal Grinder. Single and Three Phase Power Supply. Steady and Follower rest - construction, uses, advantage and Disadvantages, etc. Cutting tool material-H.C.S., HSS, Tungsten. Carbide, Stellite, Ceramic etc. Form tools-function-types and uses. Setting of tool for taper threads-calculation of taper setting and thread depth.
2.	Acme threads cutting (external and Internal) & tool grinding. Fitting of external and Internal threaded Components Buttress thread cutting (external and Internal) & tool grinding. Fitting of male & female threaded components.	Calculation involved – depth, core dia., pitch proportion etc. of Acme thread. Concept of interchangeability, Limit, Fit and tolerance as per IS: 9l9(ISO 286) -unilateral and bilateral system of limit, Fits- different types, symbols for holes and shafts. Hole basis & shaft basis etc. Representation of Tolerance in drawing. Buttress thread cutting (male & female) & tool Grinding. Various procedures of thread measurement. Thread screw pitch gauge. Screw thread micrometer. Tool maker microscope.

3.	Cutting metric threads on inch lead screw and inch threads on Metric Lead Screw by proper change gear trains. Use of Screw thread micrometer. Setting and turning operation involving face and angle plate to turn job having centre / axial offset (castings / forgings) Use of Dial test indicator.	Calculation involving gear ratios metric threads Cutting on inch Lead Screw and vice-versa Use of thread plug gauges and snap gauges Use of different attachments on lathe for different operations.- demonstration only by audio visual aids Different types of attachments used in lathe. Accessories used on face plate –their uses. Balancing of face plate & its necessity.
4.	Holding and Turning of crank shaft – single throw (desirable) Eccentric boring. Use of Telescopic gauge.	Dial test indicator- construction, Types (Plunger and Lever type) & uses. Use of Dial test indicator for parallelism and concentricity Gauges – Snap, Ring, Plug – Plain, Taper and Screw. Telescopic gauge its construction and uses.
5	Continuation of thread cutting - Fractional odd & even threads by using thread chasing dials. Thread cutting on non-ferrous metals-copper aluminum brass etc. Use of - Screw pitch gauge, Screw thread micrometer,. Multi start thread cutting (B.S.W.) -external & internal. Multi start metric V –thread cutting (external & internal). (Selection of process/operations, Calculations involved, Inspection/ Measurement will be done by trainee himself)	Calculation involving fractional threads. Odd & even threads. Application and Use of thread chasing dials Sine bar and Slip gauges. Multi start thread function, use, difference between pitch & lead, formulae to find out start, pitch, lead. Gear ratio etc. Indexing of start - different methods tool shape for multi-start thread. Setting of a lathe calculation for required change wheel
6	Multi-start thread cutting Acme form (Male & Female) Multi-start thread cutting, square form (Male & Female) Multiple thread cutting work (External). Cutting of helical grooves in bearing and bushes (Oil groove) (Selection of process/operations, Calculations involved, Inspection/ Measurement will be done by trainee himself)	Calculation involving shape of tool, change wheel, core dia etc. Helix angle, leading angle & following angles. Thread dimensions-tool shape, gear, gear calculation, pitch, depth, lead etc.
7	Introduction to CNC Lathe. Lathe elements and functions - bed, spindle motor and drive, chuck, tailstock, tool changer, axes motor and ball screws, guide ways, LM guides, console, electrical, coolant system, hydraulic system, chip conveyor. Axes in CNC Lathes – X-axis, Z-axis, C-axis. Procedure of Switch ON and OFF – CNC machine. Axis referencing (homing) of Lathe axis by Manual and Jog mode.	About CNC machine – History, Introduction, Elements and applications. CNC technology basics: Difference between CNC, NC and Conventional lathes. Advantages and disadvantages of CNC machines. Axes convention. Programming – sequence, formats, different codes, canned cycles. Absolute and incremental programming. Cutting tools –Tool nose radius compensation (G4l/42). Cutting

	CNC mode functions.	tool materials, cutting tool geometry – insert types, holder types, insert cutting edge geometry, ISO nomenclature for turning tools, boring tools, inserts.
8	Manual Tool selection and tool changing practice. Mounting of tool on turret manually. Job setting on CNC lathe. Manual machining practices using MDI mode (Facing and plain turning)	Cutting parameters - cutting speed, feed rate, depth of cut, constant surface speed, limiting spindle speed. Process planning, tool selection and cutting parameters selection. Work holding, Machine setting. System features – machine operation – Closed and Open Loop Programming – axis definition – X,Y,Z,A,B,C. Feed back devices.
9	Retrieving programme and run the programme (Dry run and on job) Part programming exercises using G-codes, M-codes. Absolute and Incremental programming (G-90 & G-91)	Program execution in different modes like single block, manual and auto. Tool and work offsets setting. Prepare various programs as per drawing. Drive System – AC servo, DC servo Prepare various programs as per drawing. Programming practice on CNC programme simulator
10	Insert the programme and Edit the Programme Practicing the concept of Work offset and Tool offset Graphic Simulation (Dry run and on job) Practice of different operations related to trade on CNC machine. (Programming to be done by trainee himself) Initial practice on CNC machine simulator followed by practice on machine Use of Digital Varnier Caliper, Digital Micrometer, Digital Height Gauge.	Address characteristics A to Z, G-codes and M-codes (familiarization) Reason for referencing and homing (safe working mode)
11	Advance CNC using CAN cycles G-33 for thread cutting	Different types of programming techniques of CNC machine.
12	Project work – work in team (Selection process/operations, Calculations involved, Inspection/ Measurement will be done by trainee themselves independently). Evaluation to be done.	
13	**Revision**	
	Assessment/Examination 03days	

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	:	**110Hrs.**
4) Examination	:	The examination will be held at the end of two year Training.
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** : **TURNER**

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

3) **Batch size** : 16

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 in Mechanical / Production Engineering from recognized university with one year post qualification experience in the manufacturing industry.
	OR
ii)	Diploma in Mechanical / Production Engineering from recognized board with two years post qualification experience in the manufacturing industry.
	OR
iii)	NAC/NTC in the trade of Turner with three years post qualification experience in the manufacturing industry.
	Preference will be given to a candidate with Crafts Instructor Certificate (CIC)

6) **Tools, Equipment& 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	Familiarisation with the industry, Importance of trade training, List of tools & Machinery used in the trade. **Health, Safety & Environment:** Introduction to safety Equipments and their uses. Introduction of first aid, Occupational Safety & Health Importance of housekeeping & good shop floor practices .Demonstration of behaviour based safety. Health, Safety and Environment guidelines, legislations & regulations as applicable. Disposal procedure of waste materials like cotton waste, metal scraps etc. Basic safety introduction. Demonstration of 5S Concept on shop floor. Personal protective Equipments(PPE):- Basic injury prevention, Basic first aid, Hazard identification and avoidance, safety signs for Danger, Warning, caution & personal safety message. Preventive measures for electrical accidents & steps to be taken in such accidents.	Importance of 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. Safety at work. Accidents-their causes, General safety rules, Protective devices and guard, action taken in emergencies in industry perspective.

2-36	Hack sawing by Hand and Power Hacksaw. Filing on Surface and Right Angles. Drilling on drilling machine. Threading with hand Taps & Dies. Cleaning, Lubrication, Starting & stopping of Lathe. Preventive maintenance Check points of lathe. Loading & unloading of 3 Jaw & 4 Jaw Chuck. Truing, Plain Turning, Step Turning, Facing, Parting off, Grinding of cutting Tools, Drilling, Step Drilling, Drill Grinding, Knurling. Reaming, Internal Boring, recessing, Step Boring, Taper Turning by different methods on Lathe. Turning between Centers. Eccentric Turning. Turning of Square Block. Turning & Boring on different Materials. Tool grinding for Thread cutting. Thread Cutting on Lathe – BSW, Metric, and Square (External and Internal) Trippening operation, Use of Tungsten Carbide Tools. Turning of Non ferrous Metals. Use of Height Gauge. Measurement with Scale & Caliper, Vernier Caliper, Micrometer. Use of Try Square. Measurement of taper.	Further support or demonstration if required during performing related skills. 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.
37-38	**Revision**	
39	**Assessment/Examination**	

Block – II
On-Job Training

Week No.	Professional Skills	Professional Knowledge
1-32	Scroll cutting operation. Turning long shaft using steady. Form Turning, Turning of crank shaft. Turning of job having Centre / Axial offset (Castings / Forgings). Eccentric boring practice. Cutting of threads - Acme, Buttress (external and internal). Worm thread cutting, Checking/Inspection of threads and dimensions using gauges & measuring instruments. Threading on Taper surface (Metric). Fractional and Odd thread cutting, Thread cutting on Non – Ferrous metals. Multi start thread cutting-external & internal – BSW, Metric, Square, Acme, Cutting helical grooves in bearing and bushes (oil grooves). Various operations on CNC Turning Centre. Making & Feeding of programmes. Use of Digital Measuring Instruments. Off- Line Programming for CNC Turning Centre(If Available). In addition with all skills learnt in Block – I	Further support or demonstration if required during performing related skills.
33	Read a part drawing and make a process plan for turning operation	Terms used in part drawings and interpretation of drawings – Tolerances, Geometrical symbols – cylindricity, parallelism, etc.
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 scrap/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 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)

ASSES. NO.	ASSESSABLE OUTCOME	INTERNAL MARKS
	GENERIC OUTCOME (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.	Demonstrate knowledge of concept and principles of basic arithmetic, algebraic, trigonometric, statistics and apply knowledge of specific area to perform practical operations.	
4	Understand and explain basic science in the field of study including basic electrical, hydraulics and pneumatics.	
5	Read and apply engineering drawing for different application in the field of work.	
6	Understand and explain the concept in productivity, quality tools, and labour welfare legislation and apply such in day to day work to improve productivity & quality.	
7	Explain energy conservation, global warming and pollution and contribute in day to day work by optimally using available resources.	
8	Explain personnel finance, entrepreneurship and manage/organize related task in day to day work for personal & societal growth.	
9	Understand and apply basic computer working, basic operating system and uses internet services to get accustomed & take benefit of IT developments in the industry.	
	SPECIFIC OUTCOME	
10.	Perform basic fitting operations used in industrial workshop practices and inspection of dimensions	
11.	Execute preventive Maintenance of Lathe Machine and Test for Functionality by appropriate maintenance method	
12.	Produce job using various cutting tools involving different operations viz. Step turning, Grooving, Knurling, Drilling, Boring, and Reaming.	
13.	Produce taper (external & internal) components using different methods of taper turning and match with male / female part.	
14.	Manufacturing components having eccentric turning	
15.	Produce components with Trepanning operation	
16.	Bore soft jaws for holding components	
17.	Produce component with different thread forms viz. BSW, Metric, Square.	
	SUB TOTAL FOR BLOCK - I	**250**

18.	Produce component with scroll operation.	
19.	Produce components with Acme, Buttress and Worm thread	
20.	Manufacture component with specific form	
21.	Turn job having centre / axial offset (casting / forging)	
22.	Turn crank shaft as per drawing	
23.	Make job having eccentric boring	
24.	Produce job having helical groove / multi start thread form	
25.	Produce component on CNC lathe involving different operations	
26.	Manufacture and assemble work as per drawing (project work)	
	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 should 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. Automobile and allied industries.
2. Service industries like road transportation and Railways.
3. Ship building and repair.
4. Infrastructure and defence organizations.
5. Public sector industries like BHEL, BEML, NTPC, Army base workshops.
6. Private industries in India & abroad.
7. Self employment

12. LIST OF EXPERT MEMBERS

Sl. No.	Name & Designation Sh/Mr./Ms.	Organization	Expert Group Designation
1.	Jayant Krishnan, Principal Consultant	TATA Consultancy Services Ltd., Lucknow	Chairman
2.	T.C.Saravanabava, DDG(AT)	MSDE, New Delhi	Member
3.	Mrs. Sandhya Salwan, Director (AT)	MSDE, New Delhi	Member
4.	Narinder Kumar, Works Manager	Rail Coach Factory, Kapurthala	Member
5.	Satish Babu.V, Group Leader	Toyota Kirloskar Motor Pvt. Ltd., Bangalore	Industry expert
6.	Anandaram, Ex – JGM, R & D Centre	HMT Ltd. , Bangalore	Industry expert
7.	P.Dinesh, Manager	Sands Precision (P) Ltd., Bangalore	Industry expert
8.	Abdul Goffer, Manager	HMT Machine Tools Ltd., Bangalore	Industry expert
9.	G. Seetharamu, Manager (Training)	BOSCH Ltd., Bangalore	Industry expert
10.	Kashinath, Lead Advisor, Tech Centre	Micromatic Machine Tools, Bangalore	Industry expert
11.	Sathya Shankar. B.P., Director	CSTARI, Kolkata	Addl. Member
12.	M. Thamizharasan, Jt. Director of Training	CSTARI, Kolkata	Addl. Member
13.	Nirmalya Nath Asstt. Director (Trg.)	CSTARI, Kolkata	Addl. Member
14.	R. N. Manna, Training Officer	CSTARI, Kolkata	Member

ANNEXURE – I

TOOLS & EQUIPMENT FOR BASIC TRAINING

INFRASTRUCTURE FOR PROFESSIONAL SKILL & PROFESSIONAL KNOWLEDGE

TRADE: TURNER

LIST OF TOOLS & EQUIPMENTS FOR 16 APPRENTICES

A : TRAINEES TOOL KIT:-

Sl. No.	Name of the items	Quantity (Indicative)
1	Caliper out side (15 cm spring)	05 nos.
2	Caliper inside (15 cm spring)	05 nos.
3	Caliper odd-leg 15 cm	05 nos.
4	Steel Rule l50 mm & 300 mm	05 nos.
5	Scriber 15 cm	05 nos.
6.	Hammer ball peen 0.45 kg with handle	05 nos.
7	Centre punch 10 cm	05 nos.
8	Prick punch 10 cm	05 nos.
9	Divider (15 cm spring)	05 nos.
10	Safety goggles clear glass (Good quality)	05 nos.

B : Instruments & General Shop Outfit

Sl. No.	Name of the items	Quantity (Indicative)
11	Surface plate 45 X 45 cm CI/Granite	0l no.
l2	Work bench 240 X 120 X 90 cm	01 no.
l3	Marking table 91 X 91 X 122 cm	01 No.
l4	Bench vice 12 cm jaws	04 nos.
l5	V-Block with clamp 7 cm and 15 cm	02 pair
16	Chisel cold 19 mm flat	02 nos.
17	Hacksaw Frame Fixed 30 cm	04 nos.
18	File flat rough 20 cm	05 nos.
19	File flat 2nd cut 25 cm	05 nos.
20	File flat smooth 25 cm	05 nos.
21	Knurling tool revolving head (Rough, med, fine) diamond and Straight	02 Sets
22	Combination set 30 cm blade	02 Nos.
23	Caliper transfer inside l50mm	02 nos.
24	Micrometer Outside 0 to l inch Reading 0.0001 inch	02 set
25	Micrometer Outside 0 to 25 mm Reading 0.01 mm	02 sets

26	Micrometer Outside above 25mm	02 sets
27	Angle Gauge for tool grinding	04 Nos
28	Micrometer Inside 25-50 mm with extension rods	02 sets
29	Vernier Caliper with metric & inch scale 15 cm	05 nos.
30	Dial Vernier Caliper 15 cm	02 nos.
31	Vernier Bevel Protractor 15cm	02 nos.
32	Vernier Micrometer 0 - 25 mm o/s LC 0.001mm	02 nos.
33	Feeler Gauge l00 mm blade metric set	02 sets
34	Radius Gauge l to 7 mm	02 Sets
35	Radius Gauge 7.5 to l5 mm	02 Sets
36	Centre Gauge com. 60°, 55° and 29°	02 sets
37	Screw Pitch Gauge Whitworth & Metric each	02 sets
38	Drill Angle Gauge	02 sets
39	Dial Test Indicator 0.01 mm with magnetic base	02 sets
40	Vernier Height Gauge 30cm	01 set
41	Try Square 15 cm blade	04 nos.
42	Magnifying Glass	02 nos.
43	Plain Ring and Plug Gauge	02set each
44	Wheel Dresser Huntingon-type with star cutter	01 no.
45	Wheel Dresser Diamond	02 Nos.
46	Screw Driver 15 cm	02 nos.
47	Spanners Double Ended 6-26 mm set of 10 pcs.	02 sets
48	Adjustable Spanner 15 cm	02 nos.
49	Screw Thread micrometer interchangeable	01 no
50	Morse Taper Plug & Ring Gauge no. 0 to 7 MT	01 set
51	Sin Bar with centers 10cm	01 no
52	Slip Gauge metric set (Workshop grade)	01 set
53	Morse Taper Sleeves 1-2, 2-3, 3-4	01 set
54	Taps & Dies 3-18 mm set of 10	02 nos.
55	Reamer machine straight flute 9, 12 and 18 mm	01 set
56	Reamer Adjustable	01 set.
57	Tool Holder RH, LH & straight for 6, 8 and 10 mm square tool bit	02 sets.
58	Parting Tool Holder with H.S.S. blade	05 nos.
59	Tool Bits 6 mm, 8mm and 10 mm	05nos.each
60	Boring Tool holder	04 nos.
61	Dog Carrier 5cm and 10 cm	04 nos each
62	Angle Plate with slots 10X 20cm	02 nos.
64	Combination Drill	01 set
65	Telescopic Gauge 15 cm	02 nos
66	Revolving Center (to suit Lathe tailstock)	04 nos
67	Tool Cemented carbide	0lno.
68	Thread Plug Gauge	01 set
69	Thread Ring Gauge	01 no.
70	Gauge Drill Grinding	01 no
71	Magnetic Chuck	01 set
72	Lathe Mandrels (Diff. Types)	0lset.
73	Fire Extinguisher and buckets	02 nos.each
74	Digital Varnier Caliper 15 cm	01 no

75	Digital Micrometer 0-25 mm	01 no
76	Digital Height Gauge 150 cm	01 no
77	Digital Bore Gauge 10-25 cm	01 no

C : General Machinery Installations –

Sl. No.	Name & Description of Machines	Quantity (Indicative)
0l.	Lathe S.S. & S.C. (All geared head stock) with minimum specifications: Machine to be motorized and supplied with coolant installation, 4-jaw Independent chuck, 3-jaw self-centering chuck, fixed steady, traveling steady, face plate, driving plate, 4-way tool post, quick change gear box for Metric or British threads, live and dead centers with taper attachments.	5 Nos. (Out of 5 lathes one should be High Speed.)
02.	Lathe Gap bed S.S & S.C.(all geared type).	1 No.
03.	Lathe tool room S.S. & S.C. (all geared type)	1 No.
04.	Grinding machine pedestal	1 No.
05.	Drill machine pillar type sensitive 0-20 mm cap with swivel table motorized	1 No.
06.	Power saw machine	1 No.
07	CNC lathe/CNC turn Centre with minimum specification as: Chuck size:l35mm Between centre distance: 250mm Travel in X: l00mm Travel in Z: 200mm No. of tool stations: 8 station turret Spindle power: 3.7kW (continuous rating) preferably with popular control system like Fanuc / Siemens or equivalent along with motorized coolant system.	1 No.
08	Tool holders to suit the CNC machine for turning, threading, grooving (external & internal), parting off operation, boring, under-cutting with 20 inserts of each operation.	2 each
09	Software capable of teaching CNC Technology, Practicing programming and CNC machine operation, comprising – Multimedia techware, manual programme syntax checking & Tool path simulation software integrated with multimedia machine simulator with Fanuc, Simens, fagor and Mitsubishi CNC system emulators. Perpetual network license : 16 = 1 = 17 users	1 Set
10.	Computer system having minimum configuration : Quad core Intel / Core 13, 2 GB RAM, 10 GB space, Display 1024 X 768 VGA with open GL, Windows OS 7 or higher	16 nos.

INFRASTRUCTURE FOR WORKSHOP CALCULATION & SCIENCE AND ENGINEERING DRAWING

TRADE: TURNER

LIST OF TOOLS & EQUIPMENTS FOR 16 APPRENTICES

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	16 sets
2.	Set square celluloid 45° (250 X 1.5 mm)	16 sets
3.	Set square celluloid 30°-60° (250 X 1.5 mm)	16 sets
4.	Mini drafter	16 sets
5.	Drawing board (700mm x500 mm) IS: 1444	16 sets

B : Instruments & Furniture required

Sl. No.	Name of the items	Quantity (Indicative)
01	Models : Solid & Cut Section	As required
02	Table for Trainees	16 nos.
03	Stool for Trainees	16 nos.
04	Cup Board (Big)	01 no
05	White Board (size : 8ft. X 4 ft.)	01 no
06	Trainer's Table	01 no
07	Trainer's Chair	01 no

ANNEXURE – II

TOOLS & EQUIPMENT FOR ON-JOB TRAINING

INFRASTRUCTURE FOR PROFESSIONAL SKILLS & PROFESSIONAL KNOWLEDGE

TRADE: TURNER

For Batch of 16 APPRENTICES

General Machinery Installations –

Sl. No.	Name & Description of Machines	Quantity (Indicative)
0l.	Lathe S.S. & S.C. All geared head stock	As required
02.	Grinding machine	As required
03.	Drill machine	As required
04.	Power hack saw machine	As required
05	CNC lathe/CNC turn Centre with minimum specification as: Chuck size:l35mm Between centre distance: 250mm Travel in X: l00mm Travel in Z: 200mm No. of tool stations: 8 station turret Spindle power: 3.7kW (continuous rating) preferably with popular control system like Fanuc/Siemens or equivalent along with motorized coolant system.	As required
06	Tool holders to suit the CNC machine for turning, threading, grooving (external & internal), parting off operation, boring, under-cutting with 20 inserts of each operation.	As required
07	Measuring Instruments	As required
08	Software capable of teaching CNC Technology, Practicing programming and CNC machine operation, comprising – Multimedia techware, manual programme syntax checking & Tool path simulation software integrated with multimedia machine simulator with Fanuc, Simens, fagor and Mitsubishi CNC system emulators. Perpetual network license : 16 users	As required
09	Computer system having minimum configuration : Quad core Intel / Core 13, 2 GB RAM, 10 GB space, Display 1024 X 768 VGA with open GL, Windows OS 7 or higher	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.