TURNER

COMPETENCY BASED CURRICULUM

(Duration: 2 Yrs.)

APPRENTICESHIP TRAINING SCHEME (ATS)

NSQF LEVEL- 5

SECTOR – PRODUCTION & MANUFACTURING

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

TURNER

(Revised in 2018)

APPRENTICESHIP TRAINING SCHEME (ATS)

NSQF LEVEL - 5

Developed By

Ministry of Skill Development and Entrepreneurship
Directorate General of Training
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1. .....
2. .....

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

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CONTENT

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.

2.1 GENERAL

Directorate General of Training (DGT) under Ministry of Skill Development & Entrepreneurship offers range of vocational training courses catering to the need of different sectors of economy/ Labour market. The vocational training programmes are delivered under aegis of National Council of Vocational Training (NCVT). Craftsman Training Scheme (CTS) and Apprenticeship Training Scheme (ATS) are two pioneer programmes of NCVT for propagating vocational training.

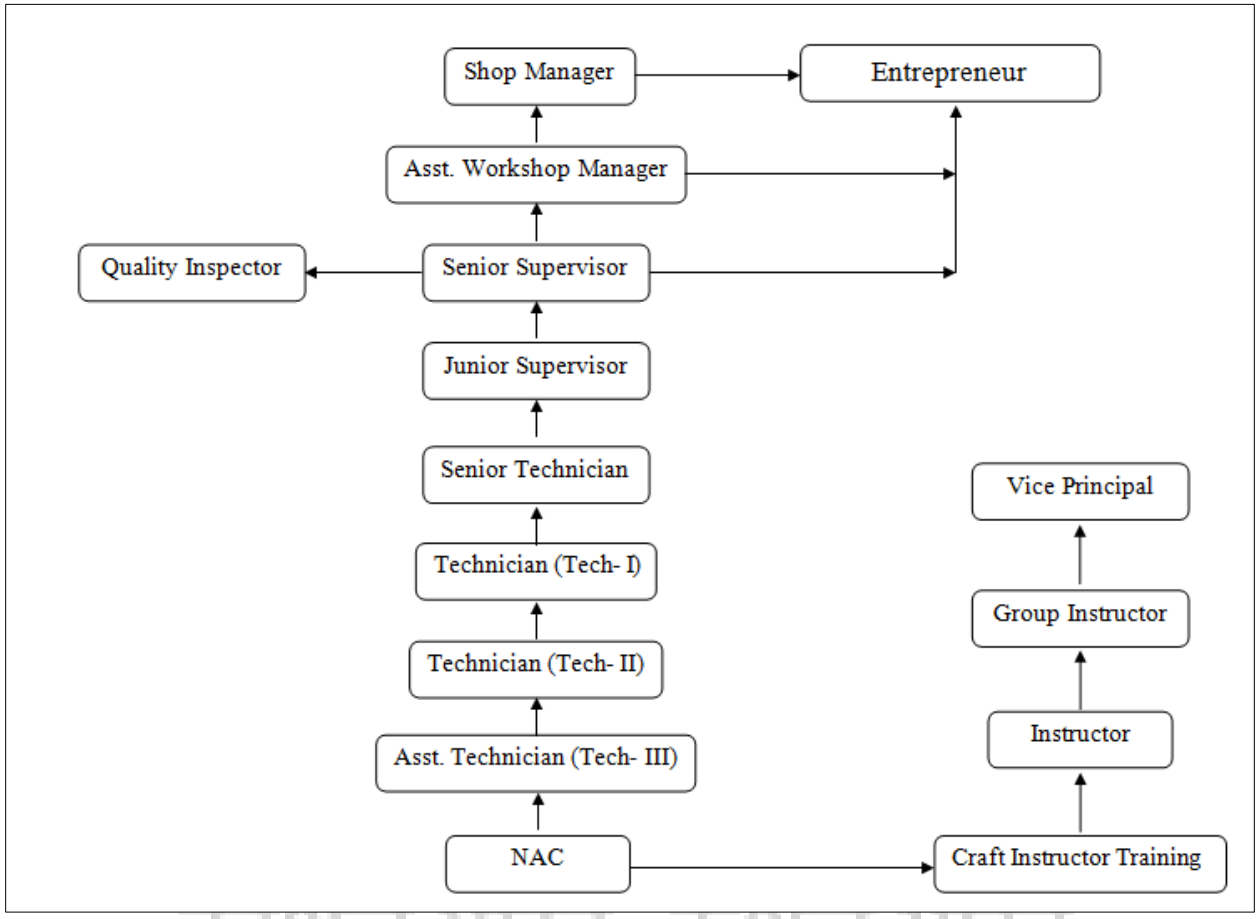
Turner trade under ATS is one of the most popular courses delivered nationwide through different industries. The course is of two years (02 Blocks) duration. It mainly consists of Domain area and Core area. In the Domain area Trade Theory & Practical impart professional - skills and knowledge, while Core area - Workshop Calculation and science, Engineering Drawing and Employability Skills imparts requisite core skills & knowledge and life skills. After passing out the training programme, the trainee is being awarded National Apprenticeship Certificate (NAC) by NCVT having worldwide recognition.

Broadly candidates need to demonstrate that they are able to:

- Read & interpret technical parameters/document, plan and organize work processes, identify necessary materials and tools;
- Perform task with due consideration to safety rules, accident prevention regulations and environmental protection stipulations;
- Apply professional skill, knowledge, core skills & employability skills while performing jobs and solve problem during execution.
- Check the job/assembly as per drawing for functioning, identify and rectify errors in job/assembly.
- Document the technical parameters related to the task undertaken.

2.2 CAREER PROGRESSION PATHWAYS:

- Can join Crafts Instructor Training Scheme (CITS) in the trade for becoming instructor in ITIs.
- Indicative pathways for vertical mobility.



2.3 COURSE STRUCTURE:

Table below depicts the distribution of training hours across various course elements during a period of two years (*Basic Training and On-Job Training*) : -

Total training duration details: -

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

A. Basic Training

For 02 yrs. course (Engg.) :-(**Total 06 months:** 03 months in 1st yr. + 03 months in 2nd yr.)
For 01 yr. course (Engg.) :-(**Total 03 months:** 03 months in 1st yr.)

Sl. No.	Course Element	Total Notional Training Hours	
		For 02 Yrs. course	**For 01 Yr. course**
1.	Professional Skill (Trade Practical)	550	275
2.	Professional Knowledge (Trade Theory)	240	120
3.	Workshop Calculation & Science	40	20
4.	Engineering Drawing	60	30
5.	Employability Skills	110	55
	Total (Including internal assessment)	**1000**	**500**

B. On-Job Training:-

For 02 yrs. Course (Engg.):- (**Total 18 months:** 09 months in 1st yr. + 09 months in 2nd yr.)

Notional Training Hours for On-Job Training: 3120 Hrs.

For 01 yr. course (Engg.):- (**Total 12 months**)

Notional Training Hours for On-Job Training: 2080 Hrs.

C. Total training hours:-

Duration	Basic Training	On-Job Training	Total
For 02 yrs. course (Engg.)	1000 hrs.	3120 hrs.	4120 hrs.
For 01 yr. course (Engg.)	500 hrs.	2080 hrs.	2580 hrs.

2.4 ASSESSMENT & CERTIFICATION:

The trainee will be tested for his skill, knowledge and attitude during the period of course and at the end of the training programme as notified by Govt of India from time to time. The Employability skills will be tested in first two semesters only.

a) The **Internal assessment** during the period of training will be done by **Formative assessment method** by testing for assessment criteria listed against learning outcomes. The training institute have to maintain individual *trainee portfolio* as detailed in assessment guideline. The marks of internal assessment will be as per the template (Annexure – II).

b) The final assessment will be in the form of summative assessment method. The All India Trade Test for awarding NAC will be conducted by NCVT on completion of course as per guideline of Govt of India. The pattern and marking structure is being notified by govt of India from time to time. **The learning outcome and assessment criteria will be basis for setting question papers for final assessment. The examiner during final examination will also check** individual trainee's profile as detailed in assessment guideline before giving marks for practical examination.

2.4.1 PASS REGULATION

The minimum pass percent for Practical is 60% & minimum pass percent for Theory subjects 40%. The candidate pass in each subject conducted under all India trade test.

2.4.2 ASSESSMENT GUIDELINE

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

Assessment will be evidence based comprising the following:

- Job carried out in labs/workshop
- Record book/ daily diary
- Answer sheet of assessment
- Viva-voce
- Progress chart
- Attendance and punctuality
- Assignment
- Project work

Evidences of internal assessments are to be preserved until forthcoming semester examination for audit and verification by examination body. The following marking pattern to be adopted while assessing:

Performance Level	Evidence
(a) Weight age in the range of 60 -75% to be allotted during assessment	
For performance in this grade, the candidate with occasional guidance and showing due regard for safety procedures and practices, has produced work which demonstrates attainment of an acceptable standard of craftsmanship.	• Demonstration of good skill in the use of hand tools, machine tools and workshop equipment • Below 70% tolerance dimension/accuracy achieved while undertaking different work with those demanded by the component/job/set standards. • A fairly good level of neatness and consistency in the finish • Occasional support in completing the project/job.
(b) Weight age in the range of above75% - 90% to be allotted during assessment	
For this grade, the candidate, with little guidance and showing due regard for safety procedures and practices, has produced work which demonstrates attainment of a reasonable standard of craftsmanship.	• Good skill levels in the use of hand tools, machine tools and workshop equipment • 70-80% tolerance dimension/accuracy achieved while undertaking different work with those demanded by the component/job/set standards. • A good level of neatness and consistency in the finish • Little support in completing the project/job
(c) Weight age in the range of above 90% to be allotted during assessment	
For performance in this grade, the candidate, with minimal or no support in organization and execution and with due regard for safety procedures and practices, has produced work which demonstrates attainment of a high standard of craftsmanship.	• High skill levels in the use of hand tools, machine tools and workshop equipment • Above 80% tolerance dimension/accuracy achieved while undertaking different work with those demanded by the component/job/set standards. • A high level of neatness and consistency in the finish. • Minimal or no support in completing the project.

3. JOB ROLE

Brief description of Job roles:

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:- 7223.0601

4. NSQF LEVEL COMPLIANCE

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 problem by selecting and applying basic methods, tools, materials and information.	Desired mathematical skill, understanding of social, political and some skill of collecting and organizing information, communication.	Responsibility for own work and Learning and some responsibility for other's works and learning.

5. GENERAL INFORMATION

Name of the Trade	TURNER
NCO - 2015	7223.0601
NSQF Level	Level – 5
Duration of Apprenticeship Training (Basic Training + On-Job Training)	Two years (02 Blocks each of one year duration).
Duration of Basic Training	a) Block –I : 3 months b) Block – II : 3 months **Total duration of Basic Training: 6 months**
Duration of On-Job Training	a) Block–I: 9 months b) Block–II : 9 months **Total duration of Practical Training: 18 months**
Entry Qualification	Passed 10th Class with Science and Mathematics under 10+2 system of Education or its equivalent
Selection of Apprenticeship	The apprentices will be selected as per Apprenticeship Act amended time to time.
Instructors Qualification for Basic Training	As per ITI instructors qualifications as amended time to time for the specific trade.
Infrastructure for Basic Training	As per related trades of ITI.
Examination	The internal examination/ assessment will be held on completion of each block. Final examination for all subjects will be held at the end of course and same will be conducted by NCVT.
Rebate to Ex-ITI Trainees	01 year
CTS trades eligible for Turner Apprenticeship	1. Turner

Note:

- *Industry may impart training as per above time schedule for different block, however this is not fixed. The industry may adjust the duration of training considering the fact that all the components under the syllabus must be covered. However the flexibility should be given keeping in view that no safety aspects is compromised.*
- *For imparting Basic Training the industry to tie-up with ITIs having such specific trade and affiliated to NCVT.*

6. LEARNING OUTCOME

6.1 GENERIC LEARNING OUTCOME

The following are minimum broad Common Occupational Skills/ Generic Learning Outcome after completion of the Turner course of 02 years duration under ATS.

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.

6.2 SPECIFIC LEARNING OUTCOME

Block – I

1. Perform basic fitting operations that requires well developed skills in industrial workshop practices and inspect dimensions with standard procedures
2. Execute preventive maintenance of lathe machine maintaining proper procedures and test for functionality by appropriate maintenance method.
3. 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.
4. Produce taper (external & internal) components with well developed skills and proper procedures using different methods of taper turning and match with male / female part.

5. Manufacture components having eccentric turning with well developed skills and proper procedures.
6. Produce components with Trepanning operation with desired mathematical skills and with proper procedures.
7. Bore soft jaws for holding components with well developed skills.
8. Produce components with different thread forms viz. BSW, Metric, Square with well developed skills and maintaining proper procedures.

Block – II

9. Produce components with Scroll operation applying desired mathematical skills and with proper procedures.
10. Produce components with Acme, Buttress and Worm thread with well developed skills and maintaining proper procedures.
11. Manufacture components with specific Form with well developed skills and maintaining proper procedures.
12. Turn job having center/axial offset (castings/forgings) with well developed skills and maintaining proper procedures.
13. Turn Crank Shaft as per drawing applying desired mathematical skills and with proper procedures.
14. Make job having eccentric boring applying desired mathematical skills and with proper procedures.
15. Produce job having helical grooves /multi start thread form with well developed skills and maintaining proper procedures.
16. Produce components on CNC Lathe involving different operations applying desired mathematical skills and with proper procedures.
17. 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 and assessment will be carried out as per assessment criteria.*

7. LEARNING OUTCOME WITH ASSESSMENT CRITERIA

GENERIC LEARNING OUTCOME	
LEARNING OUTCOMES	**ASSESSMENT CRITERIA**
1. Recognize & comply safe working practices, environment regulation and housekeeping.	1. 1. Follow and maintain procedures to achieve a safe working environment in line with occupational health and safety regulations and requirements.
	1. 2. Recognize and report all unsafe situations according to site policy.
	1. 3. Identify and take necessary precautions on fire and safety hazards and report according to site policy and procedures.
	1. 4. Identify, handle and store / dispose off dangerous/unsalvageable goods and substances according to site policy and procedures following safety regulations and requirements.
	1. 5. Identify and observe site policies and procedures in regard to illness or accident.
	1. 6. Identify safety alarms accurately.
	1. 7. Report supervisor/ Competent of authority in the event of accident or sickness of any staff and record accident details correctly according to site accident/injury procedures.
	1. 8. Identify and observe site evacuation procedures according to site policy.
	1. 9. Identify Personal Productive Equipment (PPE) and use the same as per related working environment.
	1. 10. Identify basic first aid and use them under different circumstances.
	1. 11. Identify different fire extinguisher and use the same as per requirement.
	1. 12. Identify environmental pollution & contribute to avoidance of same.
	1. 13. Take opportunities to use energy and materials in an environmentally friendly manner
	1. 14. Avoid waste and dispose waste as per procedure
	1. 15. Recognize different components of 5S and apply the same in the working environment.

2. Understand, explain different mathematical calculation & science in the field of study including basic electrical and apply in day to day work.*[Different mathematical calculation & science -Work, Power & Energy, Algebra, Geometry & Mensuration, Trigonometry, Heat & Temperature, Levers & Simple machine, graph, Statistics, Centre of gravity, Power transmission, Pressure]*	2.1 Explain concept of basic science related to the field such as Material science, Mass, weight, density, speed, velocity, heat & temperature, force, motion, pressure, heat treatment, centre of gravity, friction.
	2.2 Measure dimensions as per drawing
	2.3 Use scale/ tapes to measure for fitting to specification.
	2.4 Comply given tolerance.
	2.5 Prepare list of appropriate materials by interpreting detail drawings and determine quantities of such materials.
	2.6 Ensure dimensional accuracy of assembly by using different instruments/gauges.
	2.7 Explain basic electricity, insulation & earthing.
3. Interpret specifications, different engineering drawing and apply for different application in the field of work. *[Different engineering drawing-Geometrical construction, Dimensioning, Layout, Method of representation, Symbol, scales, Different Projections, Machined components & different thread forms, Assembly drawing, Sectional views, Estimation of material, Electrical & electronic symbol]*	3. 1. Read & interpret the information on drawings and apply in executing practical work.
	3. 2. Read & analyse the specification to ascertain the material requirement, tools, and machining /assembly /maintenance parameters.
	3. 3. Encounter drawings with missing/unspecified key information and make own calculations to fill in missing dimension/parameters to carry out the work.
4. Select and ascertain measuring instrument and measure dimension of components and record data.	4.1 Select appropriate measuring instruments such as micrometers, vernier calipers, dial gauge, bevel protector and height gauge (as per tool list).
	4.2 Ascertain the functionality & correctness of the instrument.
	4.3 Measure dimension of the components & record data to analyse the with given drawing/measurement.
5. Explain the concept in productivity, quality tools, and labour welfare legislation and apply such in day to day work	5.1 Explain the concept of productivity and quality tools and apply during execution of job.
	5.2 Understand the basic concept of labour welfare legislation and adhere to responsibilities and remain

to improve productivity & quality.	sensitive towards such laws.
	5.3 Knows benefits guaranteed under various acts
6. Explain energy conservation, global warming and pollution and contribute in day to day work by optimally using available resources.	6.1 Explain the concept of energy conservation, global warming, pollution and utilize the available recourses optimally & remain sensitive to avoid environment pollution.
	6.2 Dispose waste following standard procedure.
7. Explain personnel finance, entrepreneurship and manage/organize related task in day to day work for personal & societal growth.	7. 1. Explain personnel finance and entrepreneurship.
	7. 2. Explain role of Various Schemes and Institutes for self-employment i.e. DIC, SIDA, SISI, NSIC, SIDO, Idea for financing/ non financing support agencies to familiarizes with the Policies /Programmes & procedure & the available scheme.
	7. 3. Prepare Project report to become an entrepreneur for submission to financial institutions.
8. Plan and organize the work related to the occupation.	8. 1. Use documents, drawings and recognize hazards in the work site.
	8. 2. Plan workplace/ assembly location with due consideration to operational stipulation
	8. 3. Communicate effectively with others and plan project tasks
	8. 4. Assign roles and responsibilities of the co-trainees for execution of the task effectively and monitor the same.
SPECIFIC OUTCOME	
Block-I & II	
*Assessment Criteria i.e. the standard of performance, for each specific learning outcome mentioned under **block – I & block – II**(section: 10) must ensure that the trainee achieves well developed skill with clear choice of procedure in familiar context. Assessment criteria should broadly cover the aspect of **Planning** (Identify, ascertain, estimate etc.); **Execution** (perform, illustration, demonstration etc. by applying 1) a range of cognitive and practical skills required to accomplish tasks and solve problems by selecting and applying basic methods, tools, materials and information 2) Knowledge of facts, principles, processes, and general concepts, in a field of work or study 3)Desired Mathematical Skills and some skill of collecting and organizing information, communication) and **Checking/ Testing** to ensure functionality during the assessment of each outcome. The assessments parameters must also ascertain that the candidate is responsible for own work and learning and some responsibility for other's work and learning.*	

8. SYLLABUS

BASIC TRAINING (Block – I)

Duration: (03) Three Months

Week No.	Professional Skills (Trade Practical)	Professional Knowledge (Trade Theory)
1.	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.	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 &

	Threading with the help of Taps (Hand). Threading with the help Dies(Hand).	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.	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.

	Measurement with scale and inside caliper. Measurement with inside micrometer	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).	Side 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.	Turning and boring practice on CI and cast steel. Soft jaw boring. Trepanning operation.
10.	Screw thread cutting (B.S.W) external	Screw thread-definition, purpose & its

	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)	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	

NOTE: - *More emphasis to be given on video/real-life pictures during theoretical classes. Some real-life pictures/videos of related industry operations may be shown to the trainees to give a feel of Industry and their future assignment.*

BASIC TRAINING (Block – II)

Duration: (03) Three Months

Week No.	Professional Skills (Trade Practical)	Professional Knowledge (Trade Theory)
1	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. Whole 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)	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

	Use of Dial test indicator.	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,	About CNC machine – History, Introduction, Elements and applications.

	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. CNC mode functions.	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 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)	Address characteristics A to Z, G-codes and M- codes (familiarization) Reason for referencing and homing (safe working mode)

	Initial practice on CNC machine simulator followed by practice on machine Use of Digital Varnier Caliper, Digital Micrometer, Digital Height Gauge.	
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	

NOTE: - *More emphasis to be given on video/real-life pictures during theoretical classes. Some real-life pictures/videos of related industry operations may be shown to the trainees to give a feel of Industry and their future assignment.*

9. SYLLABUS - CORE SKILLS

9.1 WORKSHOP CALCULATION SCIENCE & ENGINEERING DRAWING

Block – I		
Sl. No.	**Workshop Calculation and Science (Duration: - 20 hrs.)**	**Engineering Drawing (Duration : - 30 hrs.)**
1.	**Unit**: Systems of unit- FPS, CGS, MKS/SI unit, unit of length, Mass and time, Conversion of units	**Engineering Drawing: Introduction and its importance** - Viewing of engineering drawing sheets. - Method of Folding of printed Drawing Sheet as per BIS SP:46-2003
2.	**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.	**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.
3.	**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.	**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
4.	**Average :** Problems of Average. **Ratio &Proportion** : Simple calculation on related problems.	**Drawing of Geometrical Figures:** Drawing practice on: - Angle: Measurement and its types, method of bisecting. - Triangle -different types - Rectangle, Square, Rhombus, Parallelogram.

		- Circle and its elements.
5.	**Mass, Weight and Density**: Mass, Unit of Mass, Weight, difference between mass and weight, Density, unit of density.	**Dimensioning:** - Definition, types and methods of dimensioning (functional, non-functional and auxiliary) - Types of arrowhead - Leader Line with text
6.	**Percentage**: Introduction, Simple calculation. Changing percentage to decimal and fraction and vice-versa.	**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.	- 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.	**Method of presentation of Engineering Drawing** - Pictorial View - Orthogonal View - Isometric view
8.	**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.	**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
9.	**Algebra** : Addition, Subtraction, Multiplication, Division, Algebraic	**Dimensioning practice:** - Position of dimensioning (unidirectional,

	formula, Linear equations (with two variables). - Circular Motion: Relation between circular motion and Linear motion, Centrifugal force, Centripetal force.	aligned, oblique as per BIS SP:46-2003) - Symbols preceding the value of dimension and dimensional tolerance.
10.	**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.	**Construction of Geometrical Drawing Figures:** - Polygons and their values of included angles. - Conic Sections (Ellipse)
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

Block – II		
Sl. No.	**Workshop Calculation and Science (Duration: - 20 hrs.)**	**Engineering Drawing (Duration : - 30 hrs.)**
1.	**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.	- Machined components; concept of fillet & chamfer; surface finish symbols.
2.	**Friction** and its application in Workshop practice.	- Screw thread, their standard forms as per BIS, external and internal thread, conventions on the features for drawing as per BIS.
3.	**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.	- Reading & interpretation of assembly drawing and detailing.
4.	**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.	- Reading of drawing. Simple exercises related to missing lines, dimensions and views. How to make queries.
5.	**Heat treatment** – Necessity, different common types of Heat treatment.	- Simple exercises related to trade related symbols. - Solution of NCVT test papers.
6.	**Graph:** - Read images, graphs, diagrams – Bar chart, pie chart. - Graphs: abscissa and ordinates, graphs of straight line, related to two sets of varying quantities.	
7.	**Transmission of power:** By belt, pulleys & gear drive.	
8.	**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	

9.2 EMPLOYABILITY SKILLS

(DURATION: - 110 HRS.)

Block – I **(Duration – 55 hrs.)**	
1. English Literacy Duration: 20 Hrs.	Marks : 09
Pronunciation	Accentuation (mode of pronunciation) on simple words, Diction (use of word and speech
Functional Grammar	Transformation of sentences, Voice change, Change of tense, Spellings.
Reading	Reading and understanding simple sentences about self, work and environment
Writing	Construction of simple sentences Writing simple English
Speaking / Spoken English	Speaking with preparation on self, on family, on friends/ classmates, on know, picture reading gain confidence through role-playing and discussions on current happening job description, asking about someone's job habitual actions. Cardinal (fundamental) numbers ordinal numbers. Taking messages, passing messages on and filling in message forms Greeting and introductions office hospitality, Resumes or curriculum vita essential parts, letters of application reference to previous communication.
2. I.T. Literacy Duration: 20 Hrs.	Marks : 09
Basics of Computer	Introduction, Computer and its applications, Hardware and peripherals, Switching on-Starting and shutting down of computer.
Computer Operating System	Basics of Operating System, WINDOWS, The user interface of Windows OS, Create, Copy, Move and delete Files and Folders, Use of External memory like pen drive, CD, DVD etc, Use of Common applications.
Word processing and Worksheet	Basic operating of Word Processing, Creating, opening and closing Documents, use of shortcuts, Creating and Editing of Text, Formatting the Text, Insertion & creation of Tables. Printing document. Basics of Excel worksheet, understanding basic commands, creating simple worksheets, understanding sample worksheets, use of simple formulas and functions, Printing of simple excel sheets.
Computer Networking and Internet	Basic of computer Networks (using real life examples), Definitions of Local Area Network (LAN), Wide Area Network (WAN), Internet, Concept of Internet (Network of Networks), Meaning of World Wide Web (WWW), Web Browser, Web Site, Web page and Search Engines. Accessing the Internet using Web Browser, Downloading and Printing Web Pages, Opening an email account and use of email. Social media sites and its implication. Information Security and antivirus tools, Do's and Don'ts in Information Security, Awareness of IT - ACT, types of cyber crimes.
3. Communication Skills	

Duration: 15 Hrs.	Marks : 07
Introduction to Communication Skills	Communication and its importance Principles of Effective communication Types of communication - verbal, non verbal, written, email, talking on phone. Non verbal communication -characteristics, components-Para-language Body language Barriers to communication and dealing with barriers. Handling nervousness/ discomfort.
Listening Skills	Listening-hearing and listening, effective listening, barriers to effective listening guidelines for effective listening. Triple- A Listening - Attitude, Attention & Adjustment. Active Listening Skills.
Motivational Training	Characteristics Essential to Achieving Success. The Power of Positive Attitude. Self awareness Importance of Commitment Ethics and Values Ways to Motivate Oneself Personal Goal setting and Employability Planning.
Facing Interviews	Manners, Etiquettes, Dress code for an interview Do's & Don'ts for an interview.
Behavioral Skills	Problem Solving Confidence Building Attitude
Block – II **(Duration – 55 hrs.)**	
4. Entrepreneurship Skills Duration : 15 Hrs.	Marks : 06
Concept of Entrepreneurship	Entrepreneur - Entrepreneurship - Enterprises:-Conceptual issue Entrepreneurship vs. management, Entrepreneurial motivation. Performance & Record, Role & Function of entrepreneurs in relation to the enterprise & relation to the economy, Source of business ideas, Entrepreneurial opportunities, The process of setting up a busines
Project Preparation & Marketing analysis	Qualities of a good Entrepreneur, SWOT and Risk Analysis. Concept & application of PLC, Sales & distribution Management. Different Between Small Scale & Large Scale Business, Market Survey, Method of marketing, Publicity and advertisement, Marketing Mix.
Institutions Support	Preparation of Project. Role of Various Schemes and Institutes for self-employment i.e. DIC, SIDA, SISI, NSIC, SIDO, Idea for financing/ non financing support agencies to familiarizes with the Policies /Programmes & procedure & the available scheme.
Investment Procurement	Project formation, Feasibility, Legal formalities i.e., Shop Act, Estimation & Costing, Investment procedure - Loan procurement - Banking Processes.

5. Productivity Duration: 10 Hrs.	Marks : 05
Benefits	Personal / Workman - Incentive, Production linked Bonus, Improvement in living standard.
Affecting Factors	Skills, Working Aids, Automation, Environment, Motivation - How improves or slows down.
Comparison with developed countries	Comparative productivity in developed countries (viz. Germany, Japan and Australia) in selected industries e.g. Manufacturing, Steel, Mining, Construction etc. Living standards of those countries, wages.
Personal Finance Management	Banking processes, Handling ATM, KYC registration, safe cash handling, Personal risk and Insurance.
6. Occupational Safety, Health and Environment Education Duration: 15 Hrs.	Marks : 06
Safety & Health	Introduction to Occupational Safety and Health importance of safety and health at workplace.
Occupational Hazards	Basic Hazards, Chemical Hazards, Vibroacoustic Hazards, Mechanical Hazards, Electrical Hazards, Thermal Hazards. Occupational health, Occupational hygienic, Occupational Diseases/ Disorders & its prevention.
Accident & safety	Basic principles for protective equipment. Accident Prevention techniques - control of accidents and safety measures.
First Aid	Care of injured & Sick at the workplaces, First-Aid & Transportation of sick person.
Basic Provisions	Idea of basic provision legislation of India. safety, health, welfare under legislative of India.
Ecosystem	Introduction to Environment. Relationship between Society and Environment, Ecosystem and Factors causing imbalance.
Pollution	Pollution and pollutants including liquid, gaseous, solid and hazardous waste.
Energy Conservation	Conservation of Energy, re-use and recycle.
Global warming	Global warming, climate change and Ozone layer depletion.
Ground Water	Hydrological cycle, ground and surface water, Conservation and Harvesting of water.
Environment	Right attitude towards environment, Maintenance of in -house environment.
7. Labour Welfare Legislation Duration: 05 Hrs.	Marks : 03
Welfare Acts	Benefits guaranteed under various acts- Factories Act, Apprenticeship Act, Employees State Insurance Act (ESI), Payment Wages Act, Employees Provident Fund Act, The Workmen's compensation Act.
8. Quality Tools Duration : 10 Hrs.	Marks : 05
Quality	Meaning of quality, Quality characteristic.

Consciousness	
Quality Circles	Definition, Advantage of small group activity, objectives of quality Circle, Roles and function of Quality Circles in Organization, Operation of Quality circle. Approaches to starting Quality Circles, Steps for continuation Quality Circles.
Quality Management System	Idea of ISO 9000 and BIS systems and its importance in maintaining qualities.
House Keeping	Purpose of House-keeping, Practice of good Housekeeping.
Quality Tools	Basic quality tools with a few examples.

10. DETAILS OF COMPETENCIES (ON-JOB TRAINING)

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

Block -I

1. Perform basic fitting operations that requires well developed skills in industrial workshop practices and inspect dimensions with standard procedures
2. Execute preventive maintenance of lathe machine maintaining proper procedures and test for functionality by appropriate maintenance method.
3. 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.
4. Produce taper (external & internal) components with well developed skills and proper procedures using different methods of taper turning and match with male / female part.
5. Manufacture components having eccentric turning with well developed skills and proper procedures.
6. Produce components with Trepanning operation with desired mathematical skills and with proper procedures.
7. Bore soft jaws for holding components with well developed skills.
8. Produce components with different thread forms viz. BSW, Metric, Square with well developed skills and maintaining proper procedures.

Block – II

9. Produce components with Scroll operation applying desired mathematical skills and with proper procedures.
10. Produce components with Acme, Buttress and Worm thread with well developed skills and maintaining proper procedures.
11. Manufacture components with specific Form with well developed skills and maintaining proper procedures.
12. Turn job having center/axial offset (castings/forgings) with well developed skills and maintaining proper procedures.
13. Turn Crank Shaft as per drawing applying desired mathematical skills and with proper procedures.
14. Make job having eccentric boring applying desired mathematical skills and with proper procedures.
15. Produce job having helical grooves /multi start thread form with well developed skills and maintaining proper procedures.

16. Produce components on CNC Lathe involving different operations applying desired mathematical skills and with proper procedures.
17. 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: -

1. Industry must ensure that above mentioned competencies are achieved by the trainees during their on job training.
2. In addition to above competencies/ outcomes industry may impart additional training relevant to the specific industry.

ANNEXURE – I

INFRASTRUCTURE FOR PROFESSIONAL SKILL & PROFESSIONAL KNOWLEDGE

TURNER			
LIST OF TOOLS AND EQUIPMENT for Basic Training (For 16 Apprentices)			
A. TRAINEES TOOL KIT (For each additional unit trainees tool kit Sl. 1-10 is required additionally)			
Sl. No.	**Name of the items**	**Specification**	**Quantity (Indicative)**
1	Caliper out side (15 cm spring)	15 cm spring	05 nos.
2	Caliper inside (15 cm spring)	15 cm spring	05 nos.
3	Caliper odd-leg 15 cm	15 cm	05 nos.
4	Steel Rule l50 mm & 300 mm	l50 mm & 300 mm	05 nos.
5	Scriber 15 cm	15 cm	05 nos.
6.	Hammer ball peen 0.45 kg with handle	ball peen 0.45 kg with handle	05 nos.
7	Centre punch 10 cm	10 cm 90 degree	05 nos.
8	Prick punch 10 cm	10 cm 30 degree	05 nos.
9	Divider (15 cm spring)	15 cm spring	05 nos.
10	Safety goggles clear glass (Good quality)	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	45 X 45 cm CI/Granite	0l no.
l2	Work bench 240 X 120 X 90 cm	240 X 120 X 90 cm	01 no.
l3	Marking table 91 X 91 X 122 cm	91 X 91 X 122 cm	01 No.
l4	Bench vice 12 cm jaws	12 cm jaws	04 nos.
l5	V-Block with clamp 7 cm and 15 cm	V-Block with clamp 7 cm and 15 cm	02 pair
16	Chisel cold 19 mm flat	19 mm flat	02 nos.
17	Hacksaw Frame Fixed 30 cm	Hacksaw Frame Fixed 30 cm	04 nos.
18	File flat rough 20 cm	File flat rough 20 cm	05 nos.
19	File flat 2nd cut 25 cm	File flat 2nd cut 25 cm	05 nos.
20	File flat smooth 25 cm	File flat smooth 25 cm	05 nos.
21	Knurling tool revolving head (Rough, med, fine) diamond and	Knurling tool revolving head (Rough, med, fine) diamond and	02 Sets

TURNER

	Straight	Straight	
22	Combination set 30 cm blade	Combination set 30 cm blade	02 Nos.
23	Caliper transfer inside l50mm	Caliper transfer inside l50mm	02 nos.
24	Micrometer Outside 0 to l inch Reading 0.0001inch	Micrometer Outside 0 to l inch Reading 0.0001inch	02 set
25	Micrometer Outside 0 to 25 mm Reading 0.01 mm	Micrometer Outside 0 to 25 mm Reading 0.01 mm	02 sets
26	Micrometer Outside above 25mm	Micrometer Outside above 25mm	02 sets
27	Angle Gauge for tool grinding	Angle Gauge for tool grinding	04 Nos
28	Micrometer Inside 25-50 mm with extension rods	Micrometer Inside 25-50 mm with extension rods	02 sets
29	Vernier Caliper with metric & inch scale 15 cm	Vernier Caliper with metric & inch scale 15 cm	05 nos.
30	Dial Vernier Caliper 15 cm	15 cm	02 nos.
31	Vernier Bevel Protractor 15 cm	Vernier Bevel Protractor 15 cm	02 nos.
32	Vernier Micrometer 0 - 25 mm o/s LC 0.001mm	Vernier Micrometer 0 - 25 mm o/s LC 0.001mm	02 nos.
33	Feeler Gauge l00 mm blade metric set	Feeler Gauge l00 mm blade metric set	02 sets
34	Radius Gauge l to 7 mm	Radius Gauge l to 7 mm	02 Sets
35	Radius Gauge 7.5 to l5 mm	Radius Gauge 7.5 to l5 mm	02 Sets
36	Centre Gauge com. 60°, 55° and 29°	Centre Gauge com. 60°, 55° and 29°	02 sets
37	Screw Pitch Gauge Whitworth & Metric each	Screw Pitch Gauge Whitworth & Metric each	02 sets
38	Drill Angle Gauge	Drill Angle Gauge	02 sets
39	Dial Test Indicator 0.01 mm with magnetic base	Dial Test Indicator 0.01 mm with magnetic base	02 sets
40	Vernier Height Gauge 30cm	Vernier Height Gauge 30cm	01 set
41	Try Square 15 cm blade	Try Square 15 cm blade	04 nos.
42	Magnifying Glass	Magnifying Glass	02 nos.
43	Plain Ring and Plug Gauge	Plain Ring and Plug Gauge	02set each
44	Wheel Dresser Huntingon-type with star cutter	Wheel Dresser Huntingon-type with star cutter	01 no.
45	Wheel Dresser Diamond	Wheel Dresser Diamond	02 Nos.
46	Screw Driver 15 cm	Screw Driver 15 cm	02 nos.
47	Spanners Double Ended 6-26 mm set of 10 pcs.	Spanners Double Ended 6-26 mm set of 10 pcs.	02 sets
48	Adjustable Spanner 15 cm	Adjustable Spanner 15 cm	02 nos.
49	Screw Thread micrometer interchangeable	Screw Thread micrometer interchangeable	01 no
50	Morse Taper Plug & Ring Gauge no. 0	Morse Taper Plug & Ring Gauge	01 set

	to 7 MT	no. 0 to 7 MT	
51	Sin Bar with centers 10 cm	Sin Bar with centers 10 cm	01 no
52	Slip Gauge metric set (Workshop grade)	Slip Gauge metric set (Workshop grade)	01 set
53	Morse Taper Sleeves 1-2, 2-3, 3-4	Morse Taper Sleeves 1-2, 2-3, 3-4	01 set
54	Taps & Dies 3-18 mm set of 10	Taps & Dies 3-18 mm set of 10	02 nos.
55	Reamer machine straight flute 9, 12 and 18 mm	Reamer machine straight flute 9, 12 and 18 mm	01 set
56	Reamer Adjustable	Reamer Adjustable	01 set.
57	Tool Holder RH, LH & straight for 6, 8 and 10 mm square tool bit	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	Parting Tool Holder with H.S.S. blade	05 nos.
59	Tool Bits 6 mm, 8mm and 10 mm	Tool Bits 6 mm, 8mm and 10 mm	05nos.each
60	Boring Tool holder	As required	04 nos.
61	Dog Carrier 5cm and 10 cm	Dog Carrier 5cm and 10 cm	04 nos each
62	Angle Plate with slots 10X20cm	Angle Plate with slots 10X20cm	02 nos.
64	Combination Drill	Combination Drill	01 set
65	Telescopic Gauge 15 cm	Telescopic Gauge 15 cm	02 nos
66	Revolving Center (to suit Lathe tailstock)	Revolving Center (to suit Lathe tailstock)	04 nos
67	Tool Cemented carbide	Tool Cemented carbide	0lno.
68	Thread Plug Gauge	As required	01 set
69	Thread Ring Gauge	As required	01 no.
70	Gauge Drill Grinding	Gauge Drill Grinding	01 no
71	Magnetic Chuck	Magnetic Chuck	01 set
72	Lathe Mandrels (Diff. Types)	Lathe Mandrels (Diff. Types)	01 set.
73	Fire Extinguisher and buckets	Fire Extinguisher and buckets	02 nos. each
74	Digital Varnier Caliper 15 cm	Digital Varnier Caliper 15 cm	01 no
75	Digital Micrometer 0-25 mm	0-25 mm	01 no
76	Digital Height Gauge 150 cm	150 cm	01 no
77	Digital Bore Gauge 10-25 cm	10-25 cm	01 no

C : General Machinery Installations –

Sl. No.	Name & Description of Machines		Quantity (Indicative)
01.	Lathe S.S. & S.C.	(All geared head stock) with minimum specifications: Machine to be motorized and supplied with coolant	5 Nos. (Out of 5 lathes one should be High

		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	Speed.)
02.	Lathe Gap bed S.S & S.C.(all geared type).	Lathe Gap bed S.S & S.C.(all geared type).	1 No.
03.	Lathe tool room S.S. & S.C. (all geared type)	Lathe tool room S.S. & S.C. (all geared type)	1 No.
04.	Grinding machine pedestal	Grinding machine pedestal	1 No.
05.	Drill machine pillar type sensitive 0-20 mm cap with swivel table motorized	Drill machine pillar type sensitive 0-20 mm cap with swivel table motorized	1 No.
06.	Power saw machine	Power saw machine	1 No.
07	CNC lathe/CNC turn Centre with minimum specification as:	Chuck size:l35mm Between centre distance: 250 mm Travel in X: l00 mm Travel in Z: 200 mm 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.	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	Software capable of teaching CNC Technology, Practicing programming and CNC machine operation, comprising – Multimedia techware, manual programme syntax checking &	1 Set

	integrated with multimedia machine simulator with Fanuc, Simens, fagor and Mitsubishi CNC system emulators. Perpetual network license : 16 = 1 = 17 users	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	
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	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 -16APPRENTICES

1) **Space Norms** : 45 Sq. m.(For Engineering Drawing)

2) Infrastructure:

A : TRAINEES TOOL KIT:-			
Sl. No.	**Name of the items**	**Specification**	**Quantity**
1.	Draughtsman drawing instrument box		16 sets
2.	Set square celluloid 45^o (250 X 1.5 mm)		16 sets
3.	Set square celluloid 30^o-60^o (250 X 1.5 mm)		16 sets
4.	Mini drafter		16 sets
5.	Drawing board (700mm x500 mm) IS: 1444		16 sets
B : Furniture Required			
Sl. No.	**Name of the items**	**Specification**	**Quantity**
1	Models : Solid & cut section		As required
2	Drawing Table for trainees		16 nos.
3	Stool for trainees		16 nos.
4	Cupboard (big)		01 no
5	White Board (size: 8ft. x 4ft.)		01 no
6	Trainer's Table		01 no
7	Trainer's Chair		01 no

TOOLS & EQUIPMENTS FOR EMPLOYABILITY SKILLS		
Sl. No.	**Name of the Equipment**	**Quantity**
1.	Computer (PC) with latest configurations and Internet connection with standard operating system and standard word processor and worksheet software	10 Nos.
2.	UPS - 500VA	10 Nos.
3.	Scanner cum Printer	1 No.
4.	Computer Tables	10 Nos.
5.	Computer Chairs	20 Nos.
6.	LCD Projector	1 No.
7.	White Board 1200mm x 900mm	1 No.
Note: - Above Tools & Equipments not required, if Computer LAB is available in the institute.		

ANNEXURE-II

FORMAT FOR INTERNAL ASSESSMENT

Name & Address of the Assessor :			**Year of Enrollment :**
Name & Address of ITI (Govt./Pvt.) :			**Date of Assessment :**
Name & Address of the Industry :			**Assessment location: Industry / ITI**
Trade Name :	**Semester:**		**Duration of the Trade/course:**
Learning Outcome:			

Sl. No	**Candidate Name**	**Father's/Mother's Name**	Safety consciousness (15)	Workplace hygiene (5)	Attendance/ Punctuality (10)	Ability to follow Manuals/ Written instructions (5)	Application of Knowledge (10)	Skills to handle tools & equipment (10)	Economical use of materials (5)	Speed in doing work (10)	Quality in workmanship (15)	VIVA (15)	**Total internal assessment Marks**	**Result (Y/N)**
1														
2														