CNC Programmer cum Operator

COMPETENCY BASED CURRICULUM

(Duration: 1 Yr. 3 Months)

APPRENTICESHIP TRAINING SCHEME (ATS)

NSQF LEVEL- 4

SECTOR – PRODUCTION & MANUFACTURING

सत्यमेव जयते

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

CNC Programmer cum Operator

(Revised in 2018)

APPRENTICESHIP TRAINING SCHEME (ATS)

NSQF LEVEL - 4

Developed By

Ministry of Skill Development and Entrepreneurship
Directorate General of Training
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2. Mahindra & Mahindra Ltd. , Mumbai

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CONTENTS

1. BACKGROUND

1.1 Apprenticeship Training Scheme under Apprentice Act 1961

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

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

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

1.2 Changes in Industrial Scenario

Recently we have seen huge changes in the Indian industry. The Indian Industry registered an impressive growth during the last decade and half. The number of industries in India have increased manifold in the last fifteen years especially in services and manufacturing sectors. It has been realized that India would become a prosperous and a modern state by raising skill levels, including by engaging a larger proportion of apprentices, will be critical to success; as will stronger collaboration between industry and the trainees to ensure the supply of skilled workforce and drive development through employment. Various initiatives to build up an adequate infrastructure for rapid industrialization and improve the industrial scenario in India have been taken.

1.3 Reformation

The Apprentices Act, 1961 has been amended and brought into effect from 22nd December, 2014 to make it more responsive to industry and youth. Key amendments are as given below:

- Prescription of number of apprentices to be engaged at establishment level instead of trade-wise.
- Establishment can also engage apprentices in optional trades which are not designated, with the discretion of entry level qualification and syllabus.
- Scope has been extended also to non-engineering occupations.
- Establishments have been permitted to outsource basic training in an institute of their choice.
- The burden of compliance on industry has been reduced significantly.

2. TRAINING SYSTEM

2.1 GENERAL

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

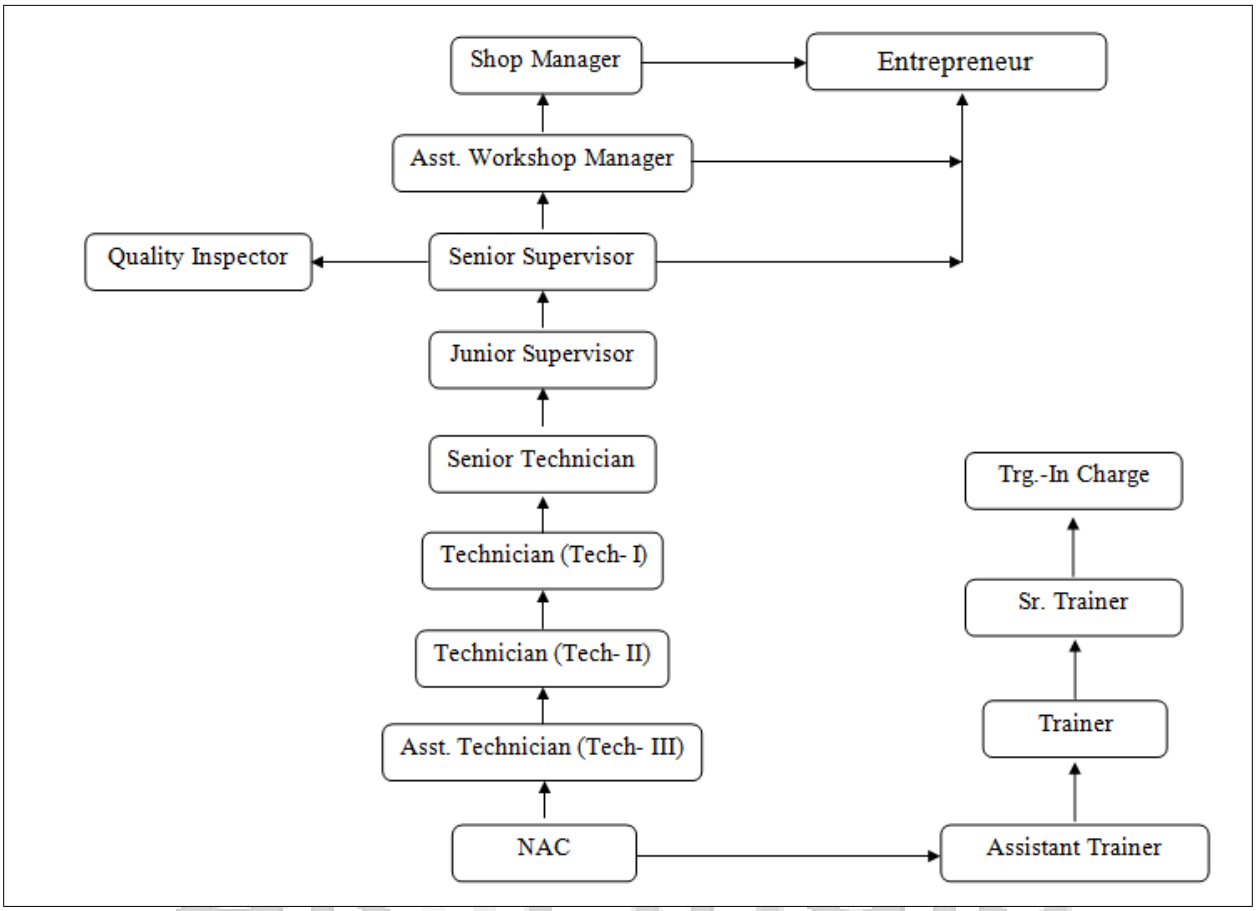
CNC Programmer cum Operator trade under ATS is one of the most popular courses delivered nationwide through different industries. The course is of one year (01 Block) duration. It mainly consists of Domain area and Core area. In the Domain area Trade Theory & Practical impart professional - skills and 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:

- 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 one year (*Basic Training and On-Job Training*): -

Total training duration details: -

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

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.)

S 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)Weightage 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) Weightage 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:

CNC Programmer cum Operator; Sets up and operates Computer Numerical Control (CNC) machines and machining centers to fabricate metallic and nonmetallic parts, and fits and assembles machined parts into complete units, applying knowledge of machine shop theory and procedures, shop mathematics, machinability of materials, and layout techniques: Studies blueprints, sketches, drawings, manuals, specifications, or sample part to determine dimensions and tolerances of finished work piece, sequence of operations, and setup requirements. Measures, marks, and scribes dimensions and reference points on material or workpiece as guides for subsequent machining. Selects, aligns, and secures cutting tools, attachments, accessories, and materials on machines, such as VMC & Turn Centre. Calculates and sets controls to regulate machining factors, such as speed, feed, coolant flow, and depth and angle of cut, or enters commands to retrieve, input, or edit computerized machine control media. Starts and observes machine operation to detect malfunctions or out-of-tolerance machining, and adjusts machine controls or control media as required. Verifies conformance of finished workpiece to specifications, using precision measuring instruments. Sets up and operates machine on trial run to verify accuracy of machine settings or programmed control data.

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

Perform TPM (Total Production Management), TQM (Total Quality Management) and record keeping system.

Reference NCO:

1. 7223.6001 CNC Setter cum Operator Turning
2. 7223.6002 CNC Operator Turning
3. 7223.6003 CNC Programmer
4. 7223.5002 CNC Operator Machining Technician
5. 7223.5003 CNC Operator Machinist
6. 7223.5004 CNC Operator VMC
7. 7223.5005 CNC Setter cum Operator VMC

4. NSQF LEVEL COMPLIANCE

NSQF level for Programmer cum Operator trade under ATS: **Level 4**

As per notification issued by Govt. of India dated- 27.12.2013 on National Skill Qualification Framework total 10 (Ten) Levels are defined.

Each level of the NSQF is associated with a set of descriptors made up of five outcome statements, which describe in general terms, the minimum knowledge, skills and attributes that a learner needs to acquire in order to be certified for that level.

Each level of the NSQF is described by a statement of learning outcomes in five domains, known as level descriptors. These five domains are:

a. Process
b. Professional knowledge,
c. Professional skill,
d. Core skill and
e. Responsibility.

The Broad Learning outcome of CNC Programmer cum Operator trade under ATS mostly matches with the Level descriptor at Level- 4.

The NSQF level-4 descriptor is given below:

LEVEL	Process required	Professional knowledge	Professional skill	Core skill	Responsibility
Level 4	Work in familiar, predictable, routine, situation of clear choice.	Factual knowledge of field of knowledge or study	Recall and demonstrate practical skill, routine and repetitive in narrow range of application, using appropriate rule and tool, using quality concepts	Language to communicate written or oral, with required clarity, skill to basic Arithmetic and algebraic principles, basic understanding of social political and natural environment.	Responsibility for own work and learning.

5. GENERAL INFORMATION

Name of the Trade	CNC PROGRAMMER CUM OPERATOR
NCO Code 2015	7223.6001, 7223.6002, 7223.6003,7223. 5002, 7223.5003, 7223. 5004, 7223. 5005
NSQF Level	Level – 4
Duration of Apprenticeship Training (Basic Training + On-Job Training)	3 months + One year (01 Block of 15 month duration).
Duration of Basic Training	a) Block –I : 3 months **Total duration of Basic Training: 3 months**
Duration of On-Job Training	a) Block–I: 12 months **Total duration of Practical Training: 12 months**
Entry Qualification	Passed 10th class examination 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 trade of ITI
Examination	The internal examination/ assessment will be held on completion of each block. Final examination for all subjects will be held at the end of course and same will be conducted by NCVT.
Rebate to Ex-ITI Trainees	03 months **(**Basic training) in the trade of CNC PROGRAMMER CUM OPERATOR
CTS trades eligible for CNC Programmer cum Operator **Apprenticeship**	1. Broad Based Basic Training in Production and Manufacturing Sector under Centre of Excellence Scheme and Advanced module of Centre of Excellence Scheme in CNC Machining. 2. Machinist 3. 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 CNC Programmer cum Operator course of 01 years duration under ATS.

Block I:-

1. Recognize & comply safe working practices, environment regulation and housekeeping.

2. Understand and explain different mathematical calculation & science in the field of study including basic electrical. *[Different mathematical calculation & science* – Units, Basic Mathematics, Percentage, Material Science, Elasticity, Mass, Weight and Density, Mensuration, Heat & Temperature, Pressure &Basic Electricity,]

3. Interpret specifications, different engineering drawing and apply for different application in the field of work. *[Different engineering drawing-Geometrical construction, , Layout, Method of representation, Symbol, scales, Different Projections etc.]*

4. Select and ascertain measuring instrument and measure dimension of components and record data.

5. Explain the concept in productivity, quality tools, and labour welfare legislation and apply such in day to day work to improve productivity & quality.

6. Explain energy conservation, global warming and pollution and contribute in day to day work by optimally using available resources.

7. Explain personnel finance, entrepreneurship and manage/organize related task in day to day work for personal & societal growth.

8. Plan and organize the work related to the occupation.

6.2 SPECIFIC LEARNING OUTCOME

Block – I

1. Introduction of lathe. Its types etc.
2. Introduction of Taper, its types, uses calculations of tapers & its Measurement by sine bar and slip gauges.
3. Introduction of Milling machine, its types & specification, driving and feed mechanism of milling machine. Classification & different types of milling cutters & their uses.
4. CNC technology- Difference between CNC and conventional lathes. Advantages and disadvantages of CNC machines over conventional machines. Schematic diagram of CNC system. Axes convention. Working of parts explained using multimedia CNC teachware. Parts shown on machine.
5. Programming - Sequence, formats, different codes, canned cycles. Absolute and incremental programming system. Tool nose radius compensation (G41/42). Cutting tool materials, cutting tool geometry - insert types, holder types, insert cutting edge geometry, ISO nomenclature for turning tools, boring tools, inserts.
6. Cutting parameters - cutting speed, feed rate, depth of cut, constant surface speed, limiting spindle speed. Process planning, tool selection and cutting parameters selection. Explained using multimedia CNC teach ware and CNC machine simulator.
7. Program execution in different modes like single block, manual and auto. Tool and work offsets setting. Prepare various programs as per drawing etc.
8. Surface finish- Surface roughness related BIS symbols etc.
9. Identification of machines over travel limits & emergency stop, machine parts, mode practice (Jog, MDI, Edit, Auto, Single Block, MPG) Work & Tool setting CNC m/c part program preparation
10. Linear interpolation, assignments & simulations on software on old program. Circular interpolation, assignment & simulation on old program. Work offset & tool offset measurement & entry in CNC control. Part program preparation by absolute & incremental programming.
11. Chuck removing & its assembly. Cutting tool setting Work setting Program editing & simulation
12. Cycle 95-Stock removal cycle OD/ID Drilling/boring cycles in CNC turning
13. Grooving/Threading on OD/ID in CNC turning Offset correction practice Size control on CNC machine Sub program with repetition
14. CNC turning exercise: Multistate threading Programming
15. FANUC CNC Control – Turning Study of CNC machine, keyboard & specifications, Machine starting & operating in reference point, jog & incremental modes, coordinate system points, assignments absolute & incremental co-ordinate. Identification of machines over travel limits & emergency stop, machine parts, mode practice (Jog, MDI, Edit, Auto, Single Block, MPG) Work & Tool setting CNC m/c part program preparation

16. Linear interpolation, assignments & simulations on software on old program. Circular interpolation, assignment & simulation on old program.
17. Work offset & tool offset measurement & entry in CNC control. Part program preparation by absolute & incremental programming. CNC m/c turning with radius/Chamfer with TNRC editing practice & simulation.
18. Linear & Circular interpolation simulation & assignment Chuck removal & mounting on CNC Lathe Tool changes in CNC turning & MPG Mode operation. Linear interpolation & circular interpolation. Manual Data Input (MDI) mode operations & zero offsets & tool offsets, measurement on tool presenter Automatic Mode Execution.
19. Part program preparation, simulation & auto mode execution of CNC m/c exercises-stock removal cycle OD drilling/boring cycles stock removal cycle ID etc. Review, assignment/practice/test
20. Geometry & wear offset correction Part program preparation, simulation & auto mode execution of CNC m/c exercises-stock removal cycle OD drilling/boring cycles stock removal cycle ID etc. Review, assignment/ practice/ test.
21. Threading cycle OD Sub program with repetition,
22. FANUC CNC Control –Milling Study of CNC machine, keyboard & specifications, Machine starting & operating in reference point, jog & incremental modes, coordinate system points, assignments absolute & incremental co-ordinate. Identification of machines over travel limits & emergency stop, machine parts, mode practice (Jog, MDI, Edit, Auto, Single Block, MPG) Work & Tool setting CNC m/c part program preparation
23. Linear interpolation, assignments & simulations on software on old program. Circular interpolation, assignment & simulation on software on old program. Work offset & tool offset measurement & entry in CNC control. Part program preparation by absolute & incremental programming. CNC m/c practical milling examples, chamfering & end milling with CRC etc. Editing practice & simulation. Review, assignment, practice, test.
24. Linear & Circular interpolation simulation & assignment milling Tool changes in CNC milling with ATC & Tool Magazine & MPG mode operation. Manual Data Input (MDI) mode operations & zero offsets & tool offsets, measurement on tool preseter Automatic Mode Execution. CNC machine exercise end milling with polar co-ordinates. Drilling-G81 etc.
25. Geometry & wear offset correction Part program preparation, simulation on CNC milling & auto mode execution of CNC m/c exercises. Chamfer & counter-sink drilling. Deep hole drilling G83 Threading & tapping G84
26. Boring cycles G85-G89.
27. Preparation of part programme for auto mode execution of CNC machine exercises sub program. Circular & rectangular pockets. Drilling, Milling patterns etc.
28. CNC machining programming & DNC operations introduction.

29. SIEMENS CNC Control - Milling (Sinumeric 802D-M or latest) Study of CNC machine, keyboard & specifications, Machine starting & operating in reference point, jog & incremental modes, coordinate system points, assignments absolute & incremental co-ordinate. Identification of machines over travel limits & emergency stop, machine parts, mode practice (Jog, MDI, Edit, R.P. Auto, Single Block, MPG) Work & Tool setting CNC m/c part program preparation
30. Linear interpolation & circular interpolation, assignments & simulations on software on old program Milling. Work offset & tool offset measurement & entry in CNC control. Part program preparation by absolute & incremental programming. CNC m/c practical milling examples chamfering & end milling with CRC etc. Editing practice & simulation.
31. Linear & Circular interpolation simulation & assignment milling Tool changes in CNC milling with ATC & Tool Magazine & MPG mode operation. Manual Data Input(MDI) mode operations & zero offsets & tool offsets, measurement on tool presenter Automatic Mode Execution. CNC machine exercise end milling with polar co-ordinates. Drilling-Cycle 81 etc. Chamfer & counter-sink drilling. Deep hole drilling Cycle 83 Threading & tapping Cycle 84, Boring cycles 85-89
32. Geometry & wear offset correction Part program preparation, simulation on CNC milling & auto mode execution of CNC m/c exercises. Boring cycles G85-G89 Review, assignment/practice/test
33. Preparation of part programme for CNC milling center. Simulation on CNC mill computers. Auto mode execution of CNC machine exercises sub program Circular& rectangular pockets. Drilling, Milling patterns etc.
34. Row of holes (Drilling pattern cycle) HOLES 1 Circle of poles (Drilling pattern cycle) HOLES 2
35. Slot on circle practice circumferential slot practice.

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	2.1 Explain concept of basic science related to the field such as Material science, Mass, weight, density&Pressure.
	2.2 Measure dimensions as per drawing

including basic electrical and apply in day to day work. *[Different mathematical calculation & science – Units, Basic Mathematics, Percentage, Material Science, Elasticity, Mass, Weight and Density, Mensuration, Heat & Temperature, Pressure &Basic Electricity,]*	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, , Layout, Method of representation, Symbol, scales, Different Projections]*	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, verniercalipers, dial gauge, bevel protector and height gauge (as per tool list). 4.2 Ascertain the functionality & correctness of the instrument. 4.3 Measure dimension of the components & record data to analyse the with given drawing/measurement.
5. Explain the concept in productivity, quality tools, and labour welfare legislation and apply such in day to day work to improve productivity & quality.	5.1 Explain the concept of productivity and quality tools and apply during execution of job. 5.2 Understand the basic concept of labour welfare legislation and adhere to responsibilities and remain sensitive towards such laws. 5.3 Knows benefits guaranteed under various acts
6. Explain energy conservation, global	6.1 Explain the concept of energy conservation, global warming, pollution and utilize the available recourses

warming and pollution and contribute in day to day work by optimally using available resources.	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	
*Assessment Criteria i.e. the standard of performance, for each specific learning outcome mentioned under **Block – I**(section: 10) must ensure that the trainee works in familiar, predictable, routine, situation of clear choice. Assessment criteria should broadly cover the aspect of **Planning** (Identify, ascertain, etc.); **Execution** apply factual knowledge of field of knowledge, recall and demonstrate practical skill during performing the work in routine and repetitive in narrow range of application, using appropriate rule and tool, complying with basic arithmetic and algebraic principles and language to communicate in written or oral with required clarity; **Checking/ Testing** to ensure functionality during the assessment of each outcome. The assessments parameters must also ascertain that the candidate is responsible for his/her own work and learning.*	

8. SYLLABUS

BASIC TRAINING (Block – I)

Duration: (03) Three Months

Week No.	Professional Skills (Trade Practical)	Professional Knowledge (Trade Theory)
1.	Safety: - its importance, classification, personal, general, workshop and job safety. Occupational health and safety. 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 housekeeping & good shop floor practices. Disposal procedure of waste materials like cotton waste, metal chips/burrs etc. Fire& safety: Use of Fire extinguishers. Safety regarding working with different types of steam and its First-Aid.	Importance of safety and general precautions observed in the in the industry/shop floor. All necessary guidance to be provided to the new comers to become familiar with the working of Institute system including stores procedures. Introduction of First aid. Safety attitude development of the trainee by educating him to use Personal Protective Equipment (PPE). Response to emergencies e.g.; power failure, fire, and system failure. Accidents- Definition types and causes. First-Aid, nature and causes of injury and utilization of first-aid. Introduction to 5S concept & its application. Fire: - Types, causes and prevention methods. Fire Extinguisher, its types. Define environment, environment Pollution, Pollutants, type of Pollution (Air pollution, water pollution, soil pollution noise pollution, thermal pollution, radiation. Global warming its causes and remedies. Industrial Waste its types, sources and waste Management.
2.	**Precision Instruments reading and handling**, Holding of round job in an independent chuck and truing it. Holding the tool in a tool post, centering the job with the tool. Facing & drilling. Parallel turning between centers, parting off, chamfering using roughing, finishing and parting off tools.	**Precision Instruments reading** Introduction to lathe. Its types, engine lathe construction, detail function of parts size and specification. Safety points to be observed while working on a lathe. Lathe tools their angles & uses. Driving mechanism, speed and feed mechanism & lathe accessories.
3.	Holding the job in three jaw chuck truing, centering facing. Step turning undercutting, knurling drilling and	Chucks-different types of job holding devices on lathe and advantages of each type. Mounting and dismounting of chucks.

	boring. Taper turning by swiveling compound rest, setting the compound rest to correct degree, checking the tool height, clamping the saddle for no longitudinal movement, checking up with precision instruments.	Taper introduction, types and uses. Calculations of tapers. Measurement of taper by sine bar and slip gauges.
4.	Introduction to milling machine, demonstration on working principle, setting of job, setting of cutter in arbor, setting of vice on table. Safety points to be observed while working on a milling machine. Sequence of milling six faces of a solid block. Checking the accuracy with the help of try-square scribing block and vernier height gauge. Step milling using side and face cutter checking with micrometer.	Milling machine importance of milling machine, types and specification of milling machine, driving and feed mechanism of milling machine. Classification & different types of milling cutters & their use. Parts and nomenclature. Vernier height gauge construction, graduations vernier setting & reading, vernier bevel protractor, construction graduation setting and reading. Care and maintenance of vernier height gauge and bevel protractor.
5.	Straddle operations including up-milling and down milling. Introduction to indexing head types, setting and aligning of indexing head with reference to job on milling machine. Milling square / hexagonal job by simple indexing method.	Different milling operations plain-face, angular, form, slot, gang and straddle milling etc. Up and down milling. Different types of milling attachments and their uses. Indexing-introduction & types. Indexing head-constructional details, function of indexing plates and the sector arms. Calculation for various types of indexing.
6.	Demo of parts of CNC machine -control switches, console buttons and machines specifications Demonstration of CNC lathe parts -bed, spindle motor and drive, chuck, tailstock, tool changer, axes motor and balls crews, guide ways, LM guides, console, electrical, coolant system, hydraulic system, chip conveyor. Working of parts explained using multimedia CNC teach ware. Parts shown on machine.	CNC technology basics: Difference between CNC and conventional lathes. Advantages and disadvantages of CNC machines over conventional machines. Schematic diagram of CNC system. Axes convention. Working of parts explained using multimedia CNC teachware. Parts shown on machine.
7.	CNC part programming with simple exercises and various programming codes. Practice on CNC machine simulator.	Programming - sequence, formats, different codes, canned cycles. Absolute and incremental programming. Tool nose radius compensation (G41/42). Cutting tool materials, cutting tool geometry - insert

		types, holder types, insert cutting edge geometry, ISO nomenclature for turning tools, boring tools, inserts. Cutting parameters - cutting speed, feed rate, depth of cut, constant surface speed, limiting spindle speed. Process planning, tool selection and cutting parameters selection. Explained using multimedia CNC teach ware and CNC machine simulator.
8.	CNC turning center operation in various modes : jog, single block, auto, MDI, edit, etc. Program entry. Setting of tool offsets, entry of tool nose radius and orientation.	Program execution in different modes like single block, manual and auto. Tool and work offsets setting. Prepare various programs as per drawing. Concepts taught using multimedia CNC teach ware.
9.	Machining parts on CNC lathe with parallel, taper, step, radius turning, grooving and threading of different pitches. First 60 % of the practice is on CNC machine simulator, followed by 40 % on machine.	Prepare various programs as per drawing. Concepts taught using multimedia CNC teach ware.
10.	Demo of parts of CNC machining center -control switches, console buttons and machines specifications (spindle power, axes traverse, etc.).Demonstration of machine parts - bed, spindle motor and drive, tool changer, axes motors and ball screws, guideways, LM guides, console, electrical, coolant system, hydraulic system, chip conveyor. Working of parts explained using multimedia CNC teach ware. Parts shown on machine.	Axes convention. Working of parts explained using multimedia CNC teach ware. Parts shown on machine.
11-12.	CNC part programming with simple exercises and various programming codes. Practice on CNC machine simulator. CNC machining center operation in various modes: jog, single block, auto, MDI, edit, etc. Program entry. Setting of tool offsets, entry of tool radius. Practice on CNC machine simulator.	Program execution in different modes like single block, manual and auto. Tool and work offsets setting. Prepare various programs as per drawing. Concepts taught using multimedia CNC teach ware.

13.	Program and cut parts on CNC machining center with face milling, contour milling with tool radius compensation, pocket milling, drilling, peck drilling, countersinking, tapping operations using canned cycles for hole operations. First 80 % of the practice is on CNC machine simulator, followed by 20 % on machine.	Surface finish. Surface roughness related BIS symbols
	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	Introduction to Engineering Drawing and Drawing Instruments : - Conventions - Viewing of engineering drawing sheets. - Method of Folding of printed Drawing Sheet as per BIS SP:46-2003 - 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.
2.	**Basic Mathematics** - BODMAS rule Fraction-Addition, Subtraction, multiplication and Division-Problem solving, Decimal-Addition. Simple calculation using Scientific Calculator.	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
3.	Conversion of Fraction to Decimal and vice-versa.	Free hand drawing of - Lines, polygons, ellipse, etc. - geometrical figures and blocks withdimension

		Transferring measurement from the given object to the free hand sketches.
4.	**Percentage**: Introduction, Simple calculation. Changing percentage to fraction and decimal & vice-versa.	Drawing of Geometrical Figures: Definition, nomenclature and practice of - Angle: Measurement and its types, method of bisecting. - Triangle -different types - Rectangle, Square, Rhombus, Parallelogram. - Circle and its elements.
5.	**Material Science** : Definition, properties (physical & mechanical) and uses of Metal, Non-metal, Alloy &Insulator. Types of ferrous and Non-ferrous metals. Difference between Ferrous and Non-Ferrous metals.	Sizes and Layout of Drawing Sheets - Selection of sizes - Title Block, its position and content - Item Reference on Drawing Sheet (Item List)
6.	**Mass, Weight and Density**: Mass, Unit of Mass, Weight, difference between mass and weight. Density, unit of density. Relation between mass, weight & density. Simple problems related to mass, weight, and density.	Method of presentation of Engineering Drawing - Pictorial View - Orthographic View - Isometric view
7.	**Mensuration :** Area and perimeter of square, rectangle, parallelogram, triangle, circle, semi circle, Volume of solids – cube, cuboid, cylinder and Sphere. Surface area of solids – cube, cuboid, cylinder and Sphere.	- Drawing of Solid figures (Cube, Cuboids, Cone) with dimensions.

8.	**Elasticity:** Elastic & Plastic material. Stress & strain and their units. Young's modules. Ultimate stress and breaking stress.	Free hand Drawing of Solid figures (Prism, Pyramid, Frustum of Cone and Pyramid.) with dimensions.
9.	**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.	Free Hand sketch of hand tools and measuring tools used in respective trades.
10.	**Basic Electricity:** Introduction and use of Electricity. AC, DC & their comparisons. Current, Voltage, Resistance& their units. Power, Energy & their units. Insulator and conductors & their uses.	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.
11.	-----	Drawing of Orthographic projection in 3rd angle.

9.2 EMPLOYABILITY SKILLS

(DURATION: - 110 HRS.)

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.		

10. DETAILS OF COMPETENCIES (ON-JOBTRAINING)

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

Block – I

1. Importance of safety and general precautions observed in the in the industry/shop floor.
2. Introduction to 5S concept & its application.
3. Prepare different types of documentation as per industrial need by different methods of recording information.
4. Introduction to lathe. Its types etc.
5. Introduction of Taper, its types, uses calculations of tapers & its Measurement by sine bar and slip gauges.
6. Introduction of Milling machine, its types &specification, driving and feed mechanism of milling machine. Classification & different types of milling cutters & their uses.
7. CNC technology- Difference between CNC and conventional lathes. Advantages and disadvantages of CNC machines over conventional machines. Schematic diagram of CNC system. Axes convention. Working of parts explained using multimedia CNC teachware. Parts shown on machine.
8. Programming - Sequence, formats, different codes, canned cycles. Absolute and incremental programming system. Tool nose radius compensation (G41/42). Cutting tool materials, cutting tool geometry - insert types, holder types, insert cutting edge geometry, ISO nomenclature for turning tools, boring tools, inserts.
9. Cutting parameters - cutting speed, feed rate, depth of cut, constant surface speed, limiting spindle speed. Process planning, tool selection and cutting parameters selection. Explained using multimedia CNC teachware and CNC machine simulator.
10. Program execution in different modes like single block, manual and auto. Tool and work offsets setting. Prepare various programs as per drawing etc.
11. Surface finish. Surface roughness related BIS symbols etc.
12. Identification of machines over travel limits & emergency stop, machine parts, mode practice (Jog, MDI, Edit, Auto, Single Block, MPG) Work & Tool setting CNC m/c part program preparation
13. Linear interpolation, assignments & simulations on software on old program. Circular interpolation, assignment & simulation on old program. Work offset & tool offset measurement & entry in CNC control. Part program preparation by absolute & incremental programming.
14. Chuck removing & its assembly. Cutting tool setting Work setting Program editing & simulation
15. Cycle 95-Stock removal cycle OD/ID Drilling/boring cycles in CNC turning
16. Grooving/Threading on OD/ID in CNC turning Offset correction practice Size control on CNC machine Sub program with repetition

17. CNC turning exercise: Mutlistart threading Programming
18. FANUC CNC Control – Turning Study of CNC machine, keyboard & specifications, Machine starting & operating in reference point, jog & incremental modes, coordinate system points, assignments absolute & incremental co-ordinate. Identification of machines over travel limits & emergency stop, machine parts, mode practice (Jog, MDI, Edit, Auto, Single Block, MPG) Work & Tool setting CNC m/c part program preparation
19. Linear interpolation, assignments & simulations on software on old program. Circular interpolation, assignment & simulation on old program.
20. Work offset & tool offset measurement & entry in CNC control. Part program preparation by absolute & incremental programming. CNC m/c turning with radius/Chamfer with TNRC editing practice & simulation.
21. Linear & Circular interpolation simulation & assignment Chuck removal & mounting on CNC Lathe Tool changes in CNC turning & MPG Mode operation. Linear interpolation & circular interpolation. Manual Data Input(MDI) mode operations & zero offsets & tool offsets, measurement on tool presenter Automatic Mode Execution.
22. Part program preparation, simulation & auto mode execution of CNC m/c exercises-stock removal cycle OD drilling/boring cycles stock removal cycle ID etc. Review, assignment/practice/test
23. Geometry & wear offset correction Part program preparation, simulation & auto mode execution of CNC m/c exercises-stock removal cycle OD drilling/boring cycles stock removal cycle ID etc. Review, assignment/ practice/ test
24. Threading cycle OD Sub program with repetition,
25. FANUC CNC Control –Milling Study of CNC machine, keyboard & specifications, Machine starting & operating in reference point, jog & incremental modes, coordinate system points, assignments absolute & incremental co-ordinate. Identification of machines over travel limits & emergency stop, machine parts, mode practice (Jog, MDI, Edit, Auto, Single Block, MPG) Work & Tool setting CNC m/c part program preparation
26. Linear interpolation, assignments & simulations on software on old program. Circular interpolation, assignment & simulation on software on old program. Work offset & tool offset measurement & entry in CNC control. Part program preparation by absolute & incremental programming. CNC m/c practical milling examples, chamfering & end milling with CRC etc. Editing practice & simulation. Review, assignment, practice, test.
27. Linear & Circular interpolation simulation & assignment milling Tool changes in CNC milling with ATC & Tool Magazine & MPG mode operation. Manual Data Input (MDI) mode operations & zero offsets & tool offsets, measurement on tool preseter

Automatic Mode Execution. CNC machine exercise end milling with polar co-ordinates. Drilling-G81 etc.

28. Geometry & wear offset correction Part program preparation, simulation on CNC milling & auto mode execution of CNC m/c exercises. Chamfer & counter-sink drilling. Deep hole drilling G83 Threading & tapping G84
29. Boring cycles G85-G89 Review, assignment/practice/test
30. Preparation of part programme for auto mode execution of CNC machine exercises sub program. Circular & rectangular pockets. Drilling, Milling patterns etc.
31. CNC machining programming & DNC operations introduction.
32. SIEMENS CNC Control - Milling (Sinumeric 802D-M or latest) Study of CNC machine, keyboard & specifications, Machine starting & operating in reference point, jog & incremental modes, coordinate system points, assignments absolute & incremental co-ordinate. Identification of machines over travel limits & emergency stop, machine parts, mode practice (Jog, MDI, Edit, R.P. Auto, Single Block, MPG) Work & Tool setting CNC m/c part program preparation
33. Linear interpolation & circular interpolation, assignments & simulations on software on old program Milling. Work offset & tool offset measurement & entry in CNC control. Part program preparation by absolute & incremental programming. CNC m/c practical milling examples chamfering & end milling with CRC etc. Editing practice & simulation. Review, assignment/practice test.
34. Linear & Circular interpolation simulation & assignment milling Tool changes in CNC milling with ATC & Tool Magazine & MPG mode operation. Manual Data Input(MDI) mode operations & zero offsets & tool offsets, measurement on tool presenter Automatic Mode Execution. CNC machine exercise end milling with polar co-ordinates. Drilling-Cycle 81 etc. Chamfer & counter-sink drilling. Deep hole drilling Cycle 83 Threading & tapping Cycle 84, Boring cycles 85-89
35. Geometry & wear offset correction Part program preparation, simulation on CNC milling & auto mode execution of CNC m/c exercises. Boring cycles G85-G89 Review, assignment/practice/test
36. Preparation of part programme for CNC milling center. Simulation on CNC mill computers. Auto mode execution of CNC machine exercises sub programCircular& rectangular pockets. Drilling, Milling patterns etc.
37. Row of holes (Drilling pattern cycle) HOLES 1 Circle of poles (Drilling pattern cycle) HOLES 2
38. Slot on circle practice circumferential slot practice.

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.

INFRASTRUCTURE FOR PROFESSIONAL SKILL & PROFESSIONAL KNOWLEDGE

CNC PROGRAMMER CUM OPERATOR			
LIST OF TOOLS AND EQUIPMENT for Basic Training (For 20 Apprentices)			
A. TRAINEES TOOL KIT			
Sl. no.	**Name of the Tool &Equipments**	**Specification**	**Quantity**
1	Steel rule	30 cm graduated both in English & Metric units	20 Nos
2	Outside caliper (Spring Type)	150 mm	20 Nos
3	Inside caliper (Spring Type)	150 mm	20 Nos
4	Hermaphrodite caliper	150 mm	20 Nos
5	Divider (Spring Type)	150 mm	20 Nos
6	Centre punch	100 mm	20 Nos
7	Hammer B P	0.5 Kg	20 Nos
8	Combination plier	150 mm	20 Nos
9	Safety goggle	Clear	20 Nos
10	File Flat smooth	200 mm	20 Nos
B : TOOLS, INSTRUMENTS AND GENERAL SHOP OUT FITS			
1.	Surface plate with Table	900 x 900 x 1200 mm	1 No.
2.	Marking off table	1200 x 1200 x 900mm	1 No.
3.	Scribing block universal	300 mm	2 Nos.
4.	" V " block	100/7-80-A	2 Nos.
5.	Try Square	150 mm	2 Nos.
6.	Outside spring caliper	200 mm	2 Nos.
7.	Divider spring	200 mm	2 Nos.
8.	Steel rule	60 cm graduated both in English and Metric units	2 Nos.
9.	Spirit level	2V 250, 05 metre	1 No
10.	Hammer B P	800 gms with handle	12 Nos.
11.	Screw Driver, heavy duty	300 mm with handle	4 Nos.
12.	Combination set	300 mm	1 No
13.	Reduction sleeve	MT (to suit the machine)	1 set
14.	Angle plate	size 200 x 100 x 200 mm	2 Nos.
15.	Solid parallels in pairs	(Different sizes) in Metric	4 pairs

16.	Oil can	pressure feed 500 mg	6 Nos.
17.	Oil stone	150 x 50 x 25 mm	2 Nos.
18.	Twist Drill Taper shank	set 12 to 20 mm in step of 1 mm	2 sets
19.	Twist drills& Drill chucks including keyless drill chuck		1 set
20.	Grinding wheel dresser	(diamond)	1
21.	C-Clamps	as required	2 Nos.
22.	Clamps C	200 mm	1 set.
23.	Assorted carbide lathe tools with holder different shapes and sizes		As Reqd.
24.	Hacksaw frame adjustable with blades	250 - 300mm	2 Nos.
25.	Universal table angle plate		1 No
26.	Plier cutting	200 mm	2 Nos.
27.	Magnifying glass	75 mm	2 Nos.
28.	Hand hammer with handle	1 Kg	2 Nos.
29.	Centre drill	2, 3 & 4	4 Sets
Measuring Instrument			
30.	Micrometer outside	0-25 mm	4 Nos.
31.	Micrometer outside	25 - 50 mm	2 Nos.
32.	Micrometer depth gauge	0 – 200 mm	1 No.
33.	Direct reading Vernier caliper	B 300	1 No.
34.	Vernier height gauge	300 mm	1 No.
35.	Vernier bevel protractor	with150 mm blade	1 No.
36.	Bevel gauge	200 mm	1 No.
37.	Telescopic gauge	13 mm to 300 mm	1 set
38.	Compound dial gauge with stand	(Metric)	1 No.
39.	Dial test indicator with magnetic gauge type 1 grade A with magnetic base		1 No.
40.	Screw pitch gauge for metric pitches	(0.5 to 6mm)	2 sets
41.	Radius gauge	metric set	
42.	Taper gauge	M T No. 1,2,3,4, & 5	1 set
43.	3 pin micrometer	10 – 25 mm	2 Nos.
C : GENERAL MACHINERY INSTALLATIONS			
1.	Lathe General purpose all geared (gap bed), height of centres 150 mm, bedlength 1500 mm with 3 jaw & 4 jawchuck, face plate, taper turning attachment steadies etc., andset of lathe tool holders.		2 Nos.

2.	Pedestal grinder, double ended with 170mm wheels (one fineand one rough)	1No.
3.	Milling machine universal, with standard accessories and the following attachments: i. Universal dividing head with set of change gears - 1 No ii. Long arbors dia 16, 22, 27 and 32 mm - 1each iii. Machine vice swivel base 150mm - 1 No	2 Nos.
4.	CNC Trainer Lathe with Siemens Sinumerik 802D / Latest version, ANUC 0i / Latest version CNC system , Servo stabilizer and with necessary Turning cutting tools & Tooling package Installation and commissioning	1 No each
5.	CNC Trainer Mill with Siemens Sinumerik 802D - M / Latest version, Fanuc 0i – MB / Latest version CNC system, Servo stabilizer and with necessary Milling cutters & Tooling Package Installation and commissioning	1 No each
6.	Multimedia based simulator for CNC technology and interactive CNC part programming software for turning & milling with virtual machine operation and simulation using popular operation control system such as Fanuc, Siemens, etc. (Web-based or licensed based) (10 trainess + 1 faculty)	10 users
7.	CNC part program – Simulation softwares for Siemens Sinumerik 802 D / FANUC - 0i MB Turning module - 2 axes -8 Licenses & Milling Modules - 3 axes - 8 Licenses	1 set
8.	Desk Top Personnel Computers – Intel Pentium IV – CPU, 17" CRT Monitor, Multimedia key board, 1.44 Floppy drive, 52 x CD Rom drive and windows x P Professional operating system	10 Nos
9.	Uninterrupted power supply UPS - 600 VA	10 Nos

NOTE: Either Sl. No. 6 or Sl. No. (4 & 5) to be procured under General Machinery Installation.

INFRASTRUCTURE FOR WORKSHOP CALCULATION & SCIENCE AND ENGINEERING DRAWING

TRADE: CNC PROGRAMMER CUM OPERATOR

LIST OF TOOLS& EQUIPMENTS FOR -20APPRENTICES

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

2) Infrastructure:

A : TRAINEES TOOL KIT:-		
Sl. No.	**Name of the items**	**Quantity**
1.	Draughtsman drawing instrument box	20 Nos.
2.	Set square celluloid 45^o (250 X 1.5 mm)	20 Nos.
3.	Set square celluloid 30^o-60^o (250 X 1.5 mm)	20 Nos.
4.	Mini drafter	20 Nos.
5.	Drawing board (700mm x500 mm) IS: 1444	20 Nos.
B : Furniture Required		
Sl. No.	**Name of the items**	**Quantity**
1	Drawing Board	20
2	Models : Solid & cut section	as required
3	Drawing Table for trainees	as required
4	Stool for trainees	as required
5	Cupboard (big)	01
6	White Board (size: 8ft. x 4ft.)	01
7	Trainer's Table	01
8	Trainer's Chair	01

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