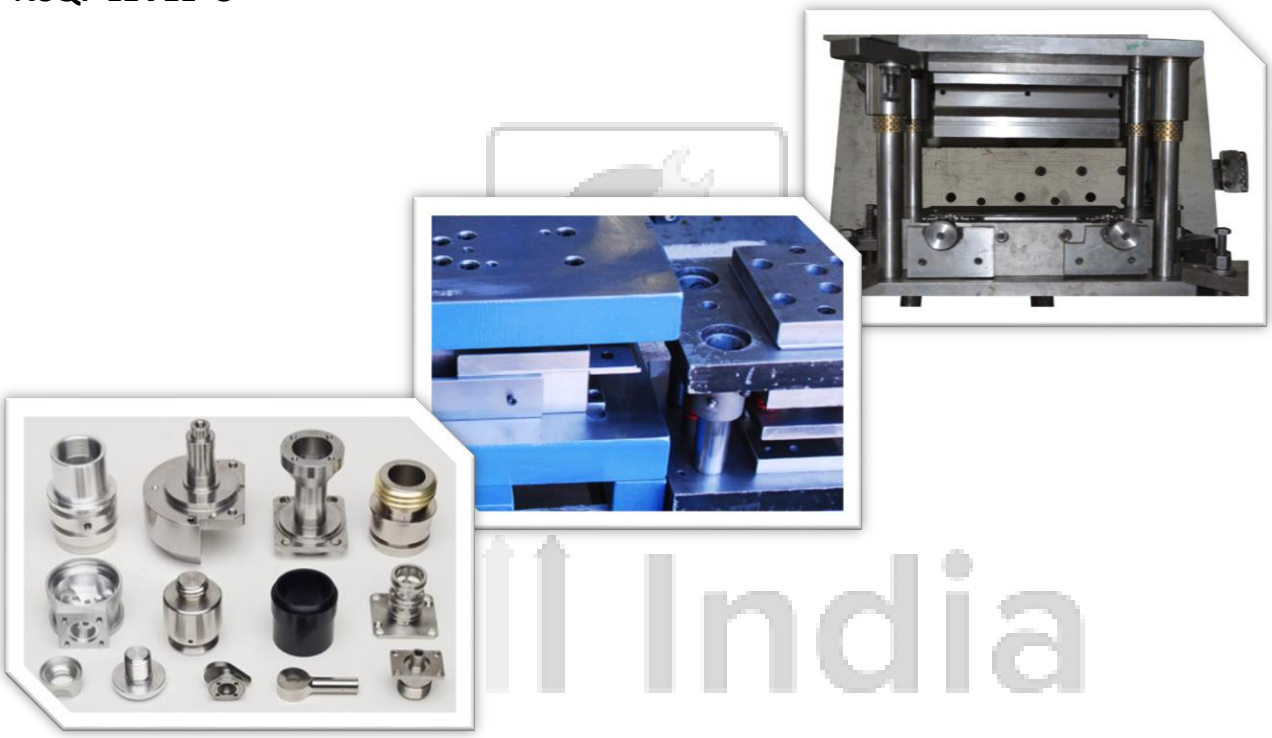
TOOL AND DIE MAKER
(PRESS TOOLS, JIGS & FIXTURES)

COMPETENCY BASED CURRICULUM

(Duration: 2 Yrs.)

APPRENTICESHIP TRAINING SCHEME (ATS)

NSQF LEVEL- 5



SECTOR – PRODUCTION & MANUFACTURING

सत्यमेव जयते

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

TOOL AND DIE MAKER
(PRESS TOOLS, JIGS & FIXTURES)

(Revised in 2018)

APPRENTICESHIP TRAINING SCHEME (ATS)

NSQF LEVEL - 5

Developed By

Ministry of Skill Development and Entrepreneurship
Directorate General of Training
CENTRAL STAFF TRAINING AND RESEARCH INSTITUTE
EN-81, Sector-V, Salt Lake City,
Kolkata – 700 091

ACKNOWLEDGEMENT

The DGT sincerely expresses appreciation for the contribution of the Industry, State Directorate, Trade Experts and all others who contributed in revising the curriculum. Special acknowledgement is extended by DGT to the following expert members who had contributed immensely in this curriculum.

Co-ordinator for the course: Sh. Nirmalya Nath, ADT, CSTARI- Kolkata

Sl. No.	Name & Designation Shri/Mr./Ms.	Organization	Mentor Council Designation
Expert group on restructuring of Apprenticeship Training Modules			
1.	Shri Madhusudan Karmakar, Vocational Instructor	ATI KOLKATA	Expert

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:

Tool and Die Maker (Press Tool, Jigs & Fixtures)

- 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.

TDM (Press tools, Jig & Fixtures) 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.

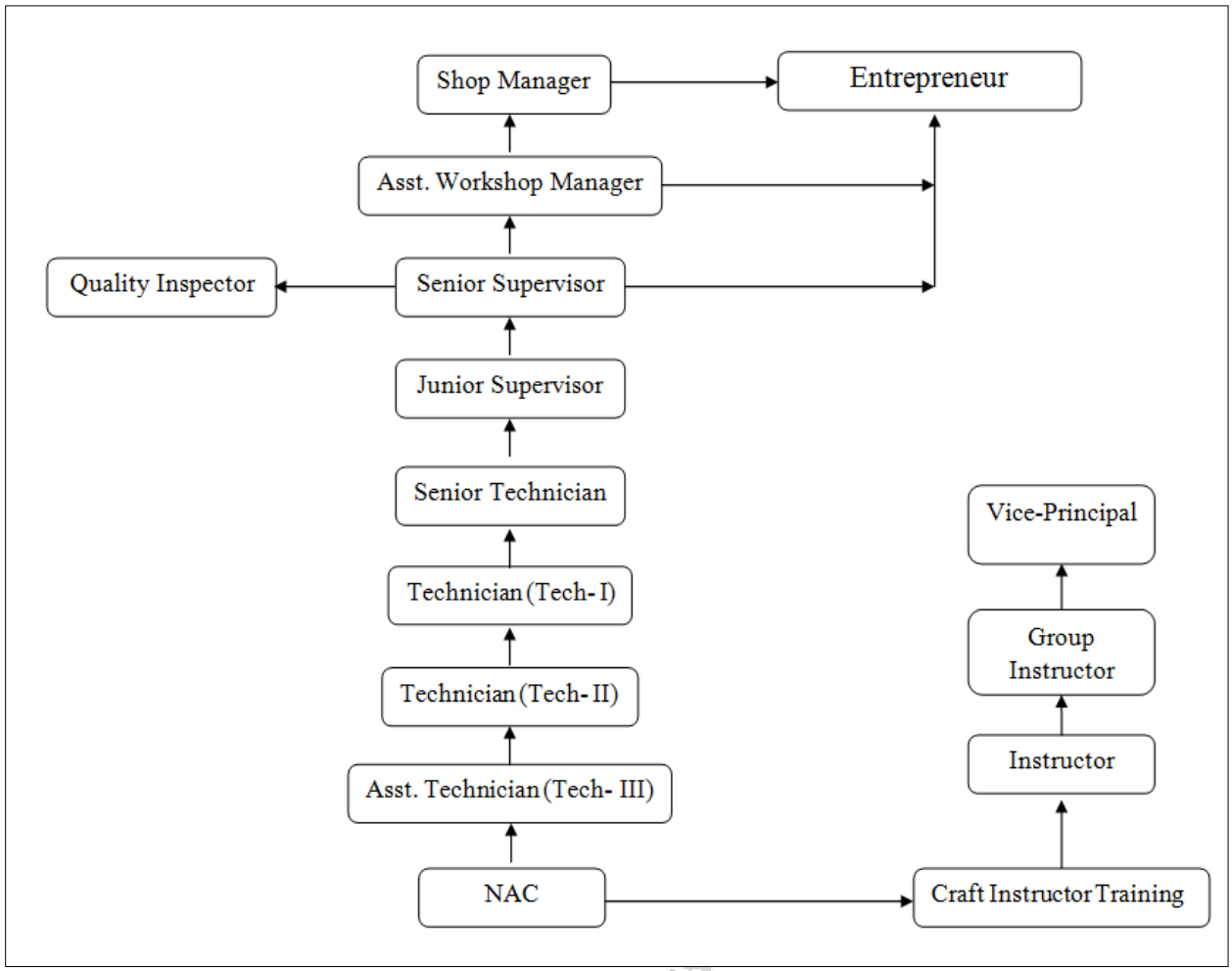
Broadly candidates need to demonstrate that they are able to:

- 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/finishing and assembly as per drawing for functioning, identify and rectify errors in job/assembly.
- Document the technical parameters related to the task undertaken.

Tool and Die Maker (Press Tool, Jigs & Fixtures)

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**

Tool and Die Maker (Press Tool, Jigs & Fixtures)

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 (section-2.4.2). 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 (section-2.4.2) 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:

Tool and Die Maker (Press Tool, Jigs & Fixtures)

Performance Level	Evidence
(a) Weightage 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:

Tool Maker makes cutting and press tools, gauges, simple jigs, fixtures, etc. mainly for use in machines. Studies drawings, samples and other specifications of tool or gauge to be made. Selects required type of metal or alloy and marks it for various operations, using vernier height gauges, sine plate, Vee blocks, etc. Cuts, files, grinds, scrapes or otherwise shapes metal to specified dimensions frequently checking it while working with measuring instruments such as micrometer, vernier, gauges, face plate etc. as necessary. Anneals, shapes, hardens and tempers cutting tools ensuring correct cutting angles, clearances, etc. according to standard or prescribed specifications. Assembles part, finishes object. Checks accuracy with precision measuring instruments and shadow graph if necessary to ensure desired performance. Calibrates and adjusts tools and gauges where required and maintains them in good working order. Guides brazing of tips to stalks and finishes them to make tip tools. Is designated as GAUGE MAKER if engaged in making or reconditioning gauges. May repair and recondition tools for further use. May design tools, jigs and fixtures and braze and weld metal parts.

Jig and Fixture Maker makes and repairs jigs and fixtures (device for holding metal and guiding cutting tools) for mass production work. Studies drawing and checks dimensions and other specifications of sample to calculate working details. Collects material, gets surfaces finished by filing or machining and marks them off. Makes different parts of required jig or fixture by cutting, filing, machining, grinding, scraping, drilling, screwing, etc. and finishes them to required dimensions. Hardens and tempers necessary parts or gets them done ensuring that they do not get demoted. Assembles parts in proper sequence, fits hardened bushes or parts where specified to guide cutting tools and checks easy fixing and removing of part to be machined to ensure operational efficiency of jig or fixture made. Checks fitting of jig and fixture at each stage while assembling to conform to specifications. Tests completed jig or fixture by trial operations to ensure operational efficiency and accuracy in production work. May make adaptors, pullers etc. for specific purposes. May machine and grind jig and fixture parts himself.

Tool Setter, Press sets press tools (die and punch) in power and hand press for manufacture of sheet metal products. Examines sample or studies drawings and specifications of item for production. Selects appropriate pair of die and punch and examines them for sharpness, cutting angle, clearance, etc. Fits punch in punch holder of machine and securely screws it in position. Places die on machine table and lowers punch to fit in die. Adjusts position of die in relation to punch. Clamps die securely on machine table with holders, plates, bolts and nuts and manually operate punch few times to ensure that it passes clearly through die set. Starts machine and feeds metal to cut or form trial pieces. Examines them for correctness in all respects, resets die if necessary, and hands press over to operator for production work. May grind press tools on

surface grinder. May fit guide pin in die to avoid wastage of material. May fit die in bolster (holding device) before setting. May supervise operators.

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:

i) **NCO-2015:**7222.0200 Tool Maker
ii) **NCO-2015:**7222.0300 Jigs and Fixture Marker
iii) **NCO-2015:**7223.0200 Tool Setter, Press
iv) **NCO-2015:**7222.0500 Die Maker
v) **NCO-2015:**7223.0500 Mechanist, General/Machinist
vi) **NCO-2015:**7223.0601 Turner/Conventional Turning
vii) **NCO-2015:**7223.0800 Shaper
viii) **NCO-2015:**7223.1201 Miller/Operator – Conventional Milling
ix) **NCO-2015:**7223.1600 Radial Driller
x) **NCO-2015:**7223.2200 Grinder, Tool and Cutter
xi) **NCO-2015:**7223.2800 Die Copying Machine Operator/Die Sinking Electric Discharge Machine Operator
xii) **NCO-2015:**7222.0400 Jig Borer
xiii) **NCO-2015:**7222.9900 Tool Makers and Related Workers, Other

4. NSQF LEVEL COMPLIANCE

NSQF level for TDM (Press Tool, Jig & Fixture) 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 TDM (Press Tool, Jig & Fixture) 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	TDM (PRESS TOOL, JIG & FIXTURE)
NCO-2015	7222.0200, 7222.0300, 7223.0200, 7222.0500, 7223.0500, 7223.0601, 7223.0800, 7223.1201, 7223.1600, 7223.2200, 7223.2800, 7222.0400, 7222.9900
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 Apprentices	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 TDM (Jig & Fixture) Apprenticeship	1. TDM (Press tools, Jig & Fixtures) 2. Machinist 3. TDM (Dies & Moulds)

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

6.1GENERIC LEARNING OUTCOME

The following are minimum broad Common Occupational Skills/ Generic Learning Outcome after completion of the TDM (Press Tool, Jig & Fixture) course of 02 years duration under ATS.

Block I & II:-

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 -Work, Power & Energy, Algebra, Geometry & Mensuration, Trigonometry, Heat & Temperature, Levers & Simple machine, graph, Statistics, Centre of gravity, Power transmission, Pressure]*
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]*
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. Safety and best practices/Basic Industrial Culture (5S, KAIZEN, etc.)
2. Prepare different types of documentation as per industrial need by different methods of recording information.
3. Produce finished components on a lathe & milling machine and check for accuracy. (Conventional/CNC machine)

4. Produce finished components on a surface and cylindrical grinding machines and check for accuracy.
5. Reading & understanding of Jigs & fixtures, drawing etc. Use of limits fits & tolerances.
6. Grind/ re-sharpen of single point and multipoint cutting tools. (different types of milling cutters) using Tool and cutter grinding machine
7. Material selection for the manufacture of different elements of Press Tool - Jigs and Fixtures and Gauges. Heat treatment - It's effects on functioning of different parts - different methods of heat treatment etc. Material Testing - hardness - tensile and compressive strength - crack - X-ray etc.
8. Manufacture different components using wire cut EDM.
9. Tool length measurement training with different types of tool holders like HSK63, BT40, BT30, BT50, HSK40 etc. automatic machine or with height gauge with dial indicator.
10. Practical exposure to working on Engraving machine.
11. Manufacture of forming tools like coining, embossing, hole flanging, planishing.

Block – II

12. Manufacture of different types of jigs and fixtures.
13. Manufacture and assembly of different press tools viz., Blanking die, piercing die and progressive die.
14. Manufacture and assemble different press tools viz., compound die, V bending die, and drawing die.
15. Identify and explain the function of cylinder, valve , actuator and filters in the machines available in work shop like hydraulic press, surface and cylindrical grinder
16. Process planning - machining sequence, cutting tools selection, cutting parameters, work holding devices.
17. Develop different elements of punches and dies using CAD/CAM software.
18. Measurement of surface finish. Measuring straightness, flatness circularity & roundness, cylindricity, profile of any line or surface, parallelism, perpendicular & squareness, angularity, position concentricity & coaxially symmetry.
19. Factors infusing surface quality. Grinding allowance, hardness requirement. Working on surface finishing processes like broaching, honing & lapping.
20. Hydraulic clamping, pneumatic clamping, vacuum clamping & magnetic clamping Indexing devices - linear indexing devices & rotary indexing devices. Template jigs & pot jigs-description of parts & function.
21. Accuracy & repeatability concept for jigs & fixtures. Automated jigs & fixture by use of pneumatics & hydraulics

Tool and Die Maker (Press Tool, Jigs & Fixtures)

22. Identify potential causes for non-conformities to quality assurance standards for different press tools, jigs and fixtures, ISO standards – Trouble shooting – Rectification of tools – Maintenance of tools – Simple hydraulic/ pneumatic circuits
23. Material selection for the manufacture of different elements of press tools, jigs and fixtures. Factors to be considered for the selection of material like Load, Heat Resistance, Machinability etc. Selection of material on the basis of manufacture aspects and processing aspects. Application of non-ferrous materials for the manufacture of press tools, jigs and fixtures. Fundamental designing of small tools. Heat treatment its effect on functioning of different parts – different methods of heat treatment etc.
24. Quality and Inspection of Tools - Stage inspection - Inspection of additional tooling like electrodes, templates, masters etc..Use of profile projectors, tool maker's microscope, comparators - Three co-ordinate measuring machine - surface measuring equipment etc. and documentation.
25. CNC machine operations and setting of CNC machines verification and simulation of CNC part programs. Work offsets and tool offsets used in the CNC machines.
26. Prepare part programme using G codes and M codes and machine simulation and manufacture different components on CNC machines.
27. Preventive maintenance of CNC machines.
28. Perform TPM (Total Productive Maintenance), TQM (Total Quality Management) and record keeping system.

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	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,

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]*		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 to improve	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.

productivity & quality.	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 (Section:10)	
*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.*	

BASIC TRAINING (Block – I)

Duration: (03) Three Months

Week No.	Professional Skills (Trade Practical)	Professional Knowledge (Trade Theory)
1	1. Safety: - its importance, classification, personal, general, workshop and job safety. 2. Occupational health and safety. 3. Basic injury prevention, Basic first aid, Hazard identification and avoidance, safety signs for Danger, Warning, caution & personal safety message. 4. Preventive measures for electrical accidents & steps to be taken in such accidents. 5. Importance of housekeeping & good shop floor practices. 6. Disposal procedure of waste materials like cotton waste, metal chips/burrs etc. 7. Fire& safety: Use of Fire extinguishers.	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. Global warming its causes and remedies. Industrial Waste its types, sources and waste Management.
2	8. Identification of tools &equipments as per desired specifications for marking & sawing(Hand tools , Fitting tools & Measuring tools) 9. Uses of marking tools, Punch, Try square & basic measuring tools, caliper, steel rule. Marking out lines, gripping suitably in vice jaws, hacksawing to given dimensions, sawing different types of metals of different sections. 10. Filing, Chipping & scraping flat surfaces and measure using different measuring instruments.	Introduction hacksaw cutting, marking, filling operation, need and application, types of files and their construction and usage Perpendicularity, parallelism. Hand tools and its importance, steel rule, Try square, chisel, surface gauge and care & maintenance, Hacksaw frame, blades. Classification and types of chisels, files & uses, vices - its constructions and uses. Hammers and its types. Related safety. Marking block, Steel rule, and calipers- different types and uses. Hacksaw blade, Hacksaw frame and its types. Drill bits- parts, Types & uses.

		Different measuring instruments and gauges used in shop floor, their construction and usage. Selection of Cutting parameters and work holding devices. General measuring tools (used in grinding shop) their description, use care and maintenance
3	11. Mounting and dismantling of different dills on machines and different practical exercises. 12. Marking and Drilling holes on flat pieces. Tapping as per simple drawing. 13. Exercise on use of pillar drill in drilling, counter sinking, counter boring. Spot facing and use of spot facing tools. 14. Further practice of drilling of Radial drills. Practice of reaming on drilled holes.	Identification of different parts, accessories, attachments', operations and tools used in drilling machines. Introduction to Hand Taps & Dies and their types, applications, care and maintenance. Familiar with tap and drill size, Thread Terminology
4	15. Lathe: 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. 16. Parallel turning between centers, parting off, chamfering using roughing, finishing and parting off tools. 17. Holding the job in three jaw chuck truing, centering facing. Step turning undercutting, knurling drilling and boring.	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.
5	18. 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. 19. Cutting V thread external and internal in a lathe. Checking up with screw pitch gauge. Cutting square thread external & internal on a lathe. 20. Cutting square threads (right hand only) on a lathe-checking with thread gauge-grinding of tool and setting in correct position.	Chucks-different types of job holding devices on lathe and advantages of each type. Mounting and dismounting of chucks. Taper introduction, types and uses. Calculations of tapers. Measurement of taper by sine bar and slip gauges. Different thread forms their related dimensions and calculations screw cutting in a lathe.

6	21. 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. 22. Sequence of milling six faces of a solid block. Checking the accuracy with the help of try-square scribing block and vernier height gauge. 23. 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.
7	24. Straddle and gang milling operations including up-milling and down milling. 25. Milling concave and convex surfaces. 26. Introduction to indexing head types, setting and aligning of indexing head with reference to job on milling machine. 27. Milling square and 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.
8	28. Milling dovetail and 'T'slots both male & female matching each other. 29. Milling of spur gear. 30. Introduction to grinding machine surface grinder, cylindrical grinder. Driving and feed mechanism, job holding devices mounting of wheels. 31. Different practical exercises with different accuracy levels. 32. Wheel balancing & truing. Grinding of parallel and stepped jobs. Dressing of grinding wheels.	Introduction surface and cylindrical grinding machine, identification of different parts, accessories, attachments', operations and tools used in grinding machines. Selection of grinding wheels, balancing and mounting of grinding wheels. Types of Abrasives and their uses, Glazing and loading of wheels. Explain the importance and necessity of quality.
9-10	**Tool & Cutter Grinder:** 33. Grinding of single point cutting tool blank. 34. Grinding of plain and face milling cutter.	**Tool & Cutter Grinder:** Description of tool and cutter grinding machine. Work (cutting tool) holding devices for tool & cutter grinder machine. Setting process of cutting tools and grinding wheel on tool & cutter grinding machine.
11-12	**Wire Cut** 35. Machining practice / observation on Wire cut Machine.	**Wire Cut** Electrical discharge machining (EDM) - Introduction, principle of operation, advantages & disadvantages and its applications.

		Wire cut machine - introduction, principle of operation, advantages & disadvantages and its applications.
13	**Revision & Internal Assessment**	

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)
1-3	**JIGS & FIXTURES:** Identify different elements of jigs and fixture. Manufacture simple parts as per drawing with different machining operations	**JIGS & FIXTURES:** Definition and application of jigs and fixtures. Explain the constructional features, different elements and working principles of jigs and fixture.
4-8	**PRESS TOOL:** Identify different parts of press and different elements of different press tools. Demonstrate about safety precautions followed during working on press machine. Manufacture and assembly of different press tools viz., Blanking die, piercing die and progressive die.	**PRESS TOOL:** Introduction of press machine, its types and application of press and press tools. Explain the constructional features and working principles of different types of press and press tools Extrusion process – Process overview, type of extrusion dies with sketches, advantages of different extrusion processes, manufacturing and Inspection of extrusion dies. Concept of Unitized tooling – advantages and limitations. Fine Blanking Technology – Tool Construction, type of Fine Blanking tools.
9	**Hydraulics & Pneumatics** Identification and familiarization of various types of hydraulic & pneumatic elements such as cylinder, valves, actuators and filters. Study of simple hydraulic & pneumatic circuits.	**Hydraulics & Pneumatics** Basic principles of hydraulic & pneumatic system. Advantages & disadvantages of hydraulic and pneumatic system. Theory of Pascal's law, Brahma's press, pressure & flow. Type of valves used in hydraulic and pneumatic system.
10-12	Program generation & Simulation (Turning, Milling and Machining of punch & dies) with CAD/CAMsoftware. Inspection of machined punch and dies with measuring instruments.	Basic concept of CNC Machine and its different code (G and m code) for programming. Practice of simple programming. CAD (Theory)/ CAM Basic concepts of inspection of 3D surfaces

		(Finishing of punch and Die). Importance of Technical English terms used in industry –(in simple definition only)Technical forms, process charts, activity logs, in required formats of industry, estimation, cycle time, productivity reports, job cards. Concept of TPM & TQM.
13	**Revision & Internal Assessment**	

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.*

9.1 WORKSHOP CALCULATION SCIENCE & ENGINEERING DRAWING

Block – I		
Sl. No.	**Workshop Calculation and Science (Duration: - 20 hrs.)**	**Engineering Drawing (Duration: - 30 hrs.)**
1.	**Units & Measurements-** FPS, CGS, MKS/SI unit, unit of length, Mass and time. Fundamentals and derived units Conversion of units and applied problems.	**Engineering Drawing:** Introduction and its importance Different types of standards used in engineering drawing. 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.
2.	**Material Science** : properties -Physical & Mechanical, Types -Ferrous & Non-Ferrous, difference between Ferrous and Non-Ferrous metals	Lines : types and applications in Drawing as per BIS SP:46-2003 Drawing geometrical object using all types of lines. **Drawing of Geometrical Figures:** Angle, Triangle, Square, Rectangle and Circle. **Letters: -** Lettering styles, Single stroke letters and numbers as per IS standard. Lettering practice
3.	**Mass .Weight and Density** : Mass, Unit of Mass, Weight, difference between mass and weight, Density, unit of density	**Dimensioning**- Types of dimension, elements of dimensions, Methods of indicating Values, Arrangement, Alignment and indication of dimensions. **Scales**:-Types use and construction. Representative factor of scale.
4.	**Speed and Velocity:** Rest and motion, speed, velocity, difference between speed and velocity, acceleration, retardation. Average Velocity, Acceleration & Retardation. Related problems. Circular Motion: Relation between circular motion and Linear motion, Centrifugal force, Centripetal force	Method of presentation of Engineering Drawing - Pictorial View - Orthogonal View - Isometric view

Tool and Die Maker (Press Tool, Jigs & Fixtures)

5.	**Ratio & Proportion** : Simple calculation on related problems. **Percentage:** Introduction, Simple calculation	**Constructions: -** Draw proportionate free hand sketches of plane figures. Sketch horizontal, vertical and inclined line by free hand, Draw circles by free hand using square and radial line method, Draw arcs and ellipse by free hand
6.	**Work, Power and Energy:** work, unit of work, power, unit of power, Horse power of engines, mechanical efficiency, energy, use of energy, potential and kinetic energy, examples of potential energy and kinetic energy. Meaning of H.P., I.H.P., B.H.P., and F.H.P. and CC and Torque.	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. Free hand Drawing of Orthographic projection from isometric/3D view of geometrical blocks

Tool and Die Maker (Press Tool, Jigs & Fixtures)

Block – II		
Sl. No.	**Workshop Calculation and Science (Duration: - 20 hrs.)**	**Engineering Drawing (Duration: - 30 hrs.)**
1.	**Algebra:** Addition, Subtraction, Multiplication, Division, Algebraic formula, Linear equations (with two variables).	**Screw :-** Its Types and Sizes, Screw thread, their standard forms as per BIS, external and internal thread.
2.	**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.	**Rivets and Joints:-** Prepare a drawing sheet on rivets nomenclature and Joints.
3.	**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. Volume of cut-out solids: hollow cylinders, frustum of cone, block section. Volume of simple solid blocks.	Free hand Sketches for simple pipe line with general fittings.
4.	**Basic Electricity:** Introduction, use of electricity, how electricity is produced, 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 earthling.	Reading of drawing. Simple exercises related to missing lines, dimensions. How to make queries.
5.	**Simple machines Transmission of power:** - Transmission of power by belt, pulleys & gear drive. **Heat treatment process: -** Heat treatment and advantages. Annealing, Normalizing, Hardening, Tempering.	Simple exercises related to trade related symbols. Basic electrical and electronic symbols
6.	**Trigonometry:** Trigonometrical ratios, measurement of angles. Trigonometric tables. Finding the value of unknown sides and angles of a triangle by Trigonometrical method. Finding height and distance by trigonometry. Application of trigonometry in shop problems. (viz. taper angle calculation).	Free hand sketch of trade related components/ parts /cutting tool indicating angles.

	Calculate the area of triangle by using trigonometry and application of Pythagoras theorem	
7.	**Concept of pressure** - **Definition**:-Force, Pressure, and their units, atmospheric pressure, gauges used for measuring pressure, problems. Introduction to pneumatics & hydraulics systems.	
8.	**Simple exercises related to trade related Test Papers. 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

Tool and Die Maker (Press Tool, Jigs & Fixtures)

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 business.
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 : 10
Quality Consciousness	Meaning of quality, Quality characteristic.
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-JOBTRAINING)

BROAD LEARNING TO BE COVERED IN INDUSTRY FOR TDM (PRESS TOOL, JIG & FIXTURE) TRADE:

1. Safety and best practices /Basic Industrial Culture (5S, KAIZEN, etc.)
2. Record keeping and documentation
3. Making components observing different metal removing procedure and perform different fitting job.
4. Assembling of different components as per requirement and check functionality.
5. Carryout maintenance of different machines including hydraulics & pneumatics system.

Note: Actual training will depend on the existing facilities available in the establishments.

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

Block – I

1. Safety and best practices/Basic Industrial Culture (5S, KAIZEN, etc.)
2. Prepare different types of documentation as per industrial need by different methods of recording information.
3. Produce finished components on a lathe & milling machine and check for accuracy. (Conventional/CNC machine)
4. Produce finished components on a surface and cylindrical grinding machines and check for accuracy.
5. Reading & understanding of Jigs & fixtures, drawing etc. Use of limits fits & tolerances.
6. Grind/ re-sharpen of single point and multipoint cutting tools. (different types of milling cutters) using Tool and cutter grinding machine
7. Material selection for the manufacture of different elements of Press Tool - Jigs and Fixtures and Gauges. Heat treatment - It's effects on functioning of different parts - different methods of heat treatment etc. Material Testing - hardness - tensile and compressive strength - crack - X-ray etc.
8. Manufacture different components using wire cut EDM.
9. Tool length measurement training with different types of tool holders like HSK63, BT40, BT30, BT50, HSK40 etc. automatic machine or with height gauge with dial indicator.
10. Practical exposure to working on Engraving machine.
11. Manufacture of forming tools like coining, embossing, hole flanging, planishing.

Block – II

13. Manufacture of different types of jigs and fixtures.
14. Manufacture and assembly of different press tools viz., Blanking die, piercing die and progressive die.
15. Manufacture and assemble different press tools viz., compound die, V bending die, and drawing die.
16. Identify and explain the function of cylinder, valve , actuator and filters in the machines available in work shop like hydraulic press, surface and cylindrical grinder
17. Process planning - machining sequence, cutting tools selection, cutting parameters, work holding devices.
18. Develop different elements of punches and dies using CAD/CAM software.
19. Measurement of surface finish. Measuring straightness, flatness circularity & roundness, cylindricity, profile of any line or surface, parallelism, perpendicular & squareness, angularity, position concentricity & coaxially symmetry.
20. Factors infusing surface quality. Grinding allowance, hardness requirement. Working on surface finishing processes like broaching, honing & lapping.
21. Hydraulic clamping, pneumatic clamping, vacuum clamping & magnetic clamping Indexing devices - linear indexing devices & rotary indexing devices. Template jigs & pot jigs-description of parts & function.
22. Accuracy & repeatability concept for jigs & fixtures. Automated jigs & fixture by use of pneumatics & hydraulics
23. Identify potential causes for non-conformities to quality assurance standards for different press tools, jigs and fixtures, ISO standards – Trouble shooting – Rectification of tools – Maintenance of tools – Simple hydraulic/ pneumatic circuits
24. Material selection for the manufacture of different elements of press tools, jigs and fixtures. Factors to be considered for the selection of material like Load, Heat Resistance, Machinability etc. Selection of material on the basis of manufacture aspects and processing aspects. Application of non-ferrous materials for the manufacture of press tools, jigs and fixtures. Fundamental designing of small tools. Heat treatment its effect on functioning of different parts – different methods of heat treatment etc.
25. Quality and Inspection of Tools - Stage inspection - Inspection of additional tooling like electrodes, templates, masters etc. Use of profile projectors, tool maker's microscope, comparators - Three co-ordinate measuring machine - surface measuring equipment etc. and documentation.
26. CNC machine operations and setting of CNC machines verification and simulation of CNC part programs. Work offsets and tool offsets used in the CNC machines.
27. Prepare part programme using G codes and M codes and machine simulation and manufacture different components on CNC machines.

Tool and Die Maker (Press Tool, Jigs & Fixtures)

28. Preventive maintenance of CNC machines.
29. Perform TPM (Total Productive Maintenance), TQM (Total Quality Management) and record keeping system.

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

TDM (PRESS TOOL, JIG & FIXTURE)			
LIST OF TOOLS AND EQUIPMENT for Basic Training (For 20 Apprentices)			
Sl. no.	**Name of the Tool & Equipments**	**Specification**	**Quantity**
A. TRAINEES TOOL KIT			
1.	Steel Rule	150 mm English and Metric combined	20 nos.
2.	Engineer's Square	150 mm with knife edge	20 nos.
3.	Hacksaw frame	adjustable with pistol grip for 200-300 mm blade	20 nos.
4.	Centre punch	100 mm	20 nos.
5.	Prick punch	150 mm	20 nos.
6.	File	flat bastard 300 mm	20 nos.
7.	File	flat 2nd cut 250 mm	20 nos.
8.	File	flat safe edge 200 mm	20 nos.
9.	File	triangular smooth 200 mm	20 nos.
B : INSTRUMENTS & GENERAL SHOP OUTFIT			
10.	Caliper	inside spring type-150 mm	4 nos.
11.	Caliper	outside spring type-150 mm	4 nos
12.	Divider	spring type – 150 mm	4 nos.
13.	Odd leg caliper	firm joint 0- 150 mm	2 nos.
14.	Screw driver –	150 mm	1 no.
15.	Screw driver –	200 mm	1 no.
16.	Centre gauge	55^0 and 60^0	2 nos.
17.	Oil can	250 ml	1 no.
18.	File	flat smooth 200 mm	4 nos.
19.	File	flat smooth with safe edge 200 mm	4 nos.
20.	File	half round bastard 300 mm	4 nos.
21.	File	half round smooth 250 mm	4 nos.
22.	File	triangular bastard 250 mm	4 nos.
23.	File	triangular smooth 200 mm	4 nos.
24.	File	round bastard 250 mm	4 nos.
25.	File	square bastard 300 mm	4 nos.
26.	File	square smooth 250 mm	4 nos.

27.	Knife edge file	150 mm	4 nos.
28.	Needle file	assorted (12 nos.) 150 mm	4 sets
29.	File card		4 nos.
30.	Scraper	flat 250 mm	4 nos.
31.	Hammer	Ball Peen 0.5 kg with handle	4 nos.
32.	Hammer	Cross Peen 0.75 kg with handle	4 nos.
33.	Chisel	cold flat 18 x 150 mm	4 nos.
34.	Chisel	Cross Cut 10 x 3 x 200 mm	4 nos.
35.	Chisel	Half Round 10 x 250 mm	4 nos.
36.	Chisel	diamond point 10 x 200 mm	4 nos.
37.	Scribing block	universal 300 mm	2 nos.
38.	Cast Iron Surface plate	300 x 300 mm	1 no.
39.	Granite Surface plate	600 x 600 x 80 mm	1 no
40.	Tap extractor	3 mm to 12 mm x 1.5 mm (ezzy out)	1 set
41.	Screw extractor	sizes 1 to 8	1 set
42.	Taps and dies	metric 5 mm to 12 mm complete set in a box	2 sets
43.	Twist Drill	with St. Shank Ø 5 to Ø 12 mm in steps of 0.5 mm	1 set
44.	Twist Drill	St. Shank Ø 8 mm to Ø 12 mm in steps of 2 mm	1 set
45.	Taper shank drills	Ø 6 mm to Ø 20 mm in steps of 1 mm	1 set
46.	D.E spanners	3-4 , 6-8, 10-12, 13-14, 15-16, 18-19, 20-22, 24-26 (8 spanners)	2 sets
47.	Letter punch	5 mm set	1 set
48.	Number punch	5 mm set	1 set
49.	Drill chuck	12 mm capacity with key	1 no.
50.	Allen key	metric 3 to 12 mm set	2 sets
51.	Centre drills	3, 4,5 mm	2 each
52.	Parallel hand reamer	6 mm to 12 mm in steps of 1 mm	1 set
53.	Star dresser		2 nos.
54.	Diamond dresser	with holder	2 nos.
55.	Safety goggles	(Personal Protective Equipments)	4 nos.
56.	Demagnetizer		1 no.
57.	Snips	200 mm blade	1 no.
58.	Workbench	240 cm x 120 cm x 75 cm with 150 mm vice	4 nos.

		(Each bench fitted with 4 vices)	
59.	Bench Vice	150 mm	16 nos.
60.	Steel lockers	for 16 trainees (Pigeon Cup Board)	2 nos.
61.	Steel cupboard	180 cm x 60 cm x 45 cm	6 nos.
62.	Metal rack	180 cm x 60 cm x 45 cm	1 nos.
63.	Fire extinguisher		2 nos.
64.	Fire buckets with stand		4 nos.
65.	Feeler gauge	0.05 mm to 0.3 mm by 0.05 and 0.4 mm to 1 mm by 0.1 mm (13 leaves)	1 set
66.	Metric Screw pitch gauge-Range	0.4 -6 mm pitch 60^0 (21 leaves)	1 set
67.	Radius gauge	1 - 3 mm by 0. 25 mm and 3.5-7mm by 0.5 mm (34 leaves)	1 no.
68.	Vernier height gauge -	Range 300 mm, with 0.02 mm least count	1 no.
69.	Universal vernier caliper-	Range 200 mm, with 0.02 mm least count	2 nos.
70.	Dial vernier caliper	0-200 mm, with 0.02 mm least count	1 no.
71.	Vernier caliper-	Range 300 mm Vernier scale 0.02 mm	2 nos.
72.	Vernier bevel protractor-	Blade range 150 and 300 mm, dial 1^0 , least count 5' (min.) with head, Acute Angle attachment	1 no.
73.	Outside micrometer	0-25 mm, with 0.01 mm least count	2 nos.
74.	Outside micrometer	25-50 mm, with 0.01 mm least count	1 no.
75.	Outside micrometer	50-75mm, with 0.01 mm least count	1 no.
76.	Combination square sets-	300 mm blade with square head, centre head, protractor head	1 set
77.	Telescopic gauge	range 8 -150 mm (6 pcs/set)	1 set
78.	Sine bar	150 mm with stopper plate	1 no.
79.	Sine table	200 mm length with magnetic bed	1 no.
80.	Slip Gauge	Box (workshop grade) -87 pieces per set	1 set
81.	Gauge block	accessories consisting holders, half round jaws, scriber point, centre point , triangular straight edge (14 pcs/set)	1 set
82.	Central square –	Size 400 x 250 mm blade	1 no.
83.	V-Block-	Approx. 32 x 32 x 41 mm with clamping capacity of 25 mm with	2 pairs

		clamps	
84.	V-Block-	Approx 65x65x80 mm with clamping capacity of 50 mm with clamps	1 pairs
85.	Magnetic V-Block	100x100x125 mm	2 pairs
86.	Angle plate	150 x 150 x 200 mm	1 no.
87.	Angle plate-	adjustable 250x250x300 mm	1no.
88.	Inside micrometer –	Range 50-63 mm with std extension rods upto 200mm.	1 set
89.	Depth micrometer –	Range 0-25 mm, accuracy 0.01 mm with std set of extension rod s.	1set.
90.	Magnetic stand with magnetic	base 60 x 47.5 mm and with universal swivel clamp, dial holding rod (150 mm) scriber	2 nos.
91.	Dial test indicator-	Lever type- Range 0-0.8 mm – Graduation 0.01mm, reading 0-50-0 with accessories	1 nos.
92.	Dial test indicator –	Plunger type-Range 0-10 mm , Graduation 0.01 mm, Reading 0-100 with revolution counter	1 nos.
93.	Bore gauge	with dial indicator (1 mm range, 0-0.01 mm graduation)-Range of bore gauge 18-150 mm	1 set
94.	Straight edge-	Single beveled-Size 150 mm and 250 mm	1 each
95.	Tool makers clamp	50 mm & 75 mm	2 nos. each
96.	C – clamp-	50 mm & 75 mm	2 nos. each
Cutting Tools:			
97.	Side and face milling cutter	Ø 100 x 10 X Ø 25 mm	2 nos.
98.	Side and face cutter	Ø 80 x 10 X Ø 27 mm	2 nos.
99.	Cylindrical milling cutter	Ø 63 x 70 x Ø 27 mm	2 nos.
100.	Slitting Saw cutter	Ø 75 x 3 X Ø 27 mm	2 nos.
101.	Slitting Saw cutter	Ø 100 x 6 X Ø 27 mm	2 nos.
102.	Single angle cutter	Ø 75 x 16 x Ø 27mm - 60^0	2 nos.
103.	Single angle cutter	Ø 75 x 20 x Ø 27 - 45^0	2 nos
104.	Equal angle cutter	Ø75x 30 x Ø 27 - 90^0	2 nos
105.	Shell End Mill	Ø 50 x 36 x Ø 22 (preferably inserted	2 nos.

		tip type)	
106.	Shell End Mill	Ø 75 mm x 50 x Ø 22 (preferably inserted tip type)	2 nos.
107.	Parallel shank end mills	Ø6, Ø10 and Ø 16 are (double fluted), Ø 20 mm & Ø 25mm (four fluted)	4 nos. each
108.	'T' slot cutter	with parallel shank- Ø 17.5 x 8 mm width x dia. of shank 8 mm	2 nos.
109.	Concave Milling cutter	Ø 63 x 6 radius x Ø 27 mm	1 nos.
110.	Convex Milling cutter	Ø 63 x 6 radius x Ø 27 mm	1 nos.
111.	Disc type form milling cutter	(involutes form -2 module, 20° pressure angle)	1 set
112.	Tool holder (straight)	to suit 6, 8 mm sq. bit size	2 nos. each
113.	Parting tool holders	To suit 3 and 4 mm thick tool blade.	2 nos.
114.	Boring bars	with holders to accommodate 4, 6 and 8 mm HSS tool bits	3 each
115.	Knurling tool	(straight & diamond)	2 nos. each
116.	Tool bits,	inserts, carbide tool bits, reamers, special counter bore, counter sink tools(CNC tooling setup)	As required
C : GENERAL MACHINERY INSTALLATIONS			
117.	Sensitive drilling machine -	capacity 12 mm Motorized –with drill chuck and key etc.	1No.
118.	Pillar/column type Drilling machine –	25 mm capacity-motorized with drill chuck & key etc.	1No.
119.	Radial Drill machine	To drill up to 32 mm diameter.	1No.
120.	Power hacksaw machine	To accommodate 21" or more length blade.	1no.
121.	Double ended Pedestal Grinder	with 178 mm wheels(one fine and one rough wheel)	1 no.
122.	SS and SC centre lathe (all geared)	with centre height 150 mm and centre distance 1000 mm along with 3 jaws, 4 jaw chuck, auto feed system, taper turning attachment, coolant pump, safety guard, dog carriers, face plate and machine light	3 sets.

		arrangement.	
123.	Shearing machine (lever type)	hand operated complete with 300 mm blade length	1 no.
124.	Welding Equipment (**It is not required if Welding Trade is available in the Institute**) Latest welding kits in Die making		2 set.
		(i) Transformer welding set 300 amps-continuous welding current with all accessories and electrode holder	1 set
		(ii) Welding cable to carry 400 amps 50 meter with flexible rubber cover.	12 nos.
		(iii) Lugs for cable	2 nos.
		(iv) Earth clamps	1 set
		(v) Arc welding table (all metal top) 122cm x 12 cm x 60 cm with positioner	1 no.
		(vi) Oxy-acetylene gas welding set-equipment with hoses, regulator and other accessories	1 set
		(vii) Gas welding table with positioner	6 nos.
		(viii) Welding torch tips of different sizes	1 no
		(ix) Gas lighter	2 nos.
		(x) Trolley for gas cylinders	2 pairs
		(xi) Chipping hammer	2 nos.
		(xii) Gloves (Leather)	1 set
		(xiii) Leather apron	2 nos.
		(xiv) Welding torches 5 to 10 nozzles	4 pair
		(xv) Spindle key for cylinder valve	2 nos.
		(xvi) Welding goggles	10 sets
		(xvii) Welding helmets with coloured glass	2 nos.
		(xviii) Tip cleaner	1 no.
125.	Universal Milling Machine -	Longitudinal traverse 700 - 800 mm Cross traverse 300 - 400 mm Vertical traverse	2 no

		200 - 350 mm Swivel of table on either side 45^0 Speed range rpm 30 to 1800 With universal dividing head, circular table, long arbors, slab arbor, slotting attachment, vertical indexing head, etc.	
126.	Horizontal and Vertical milling machine	**Table** Length x width 1350x310 mm Longitudinal traverse 700 - 800 mm Cross traverse 200 - 265 mm Vertical traverse 300 - 400 mm Speed range rpm 20 to 1800	2 Nos. each
127.	Hydraulic Surface Grinding Machine	**Table** Clamping area 600 x 178 mm Grinding area 400 x 200 mm Distance table-centre of spindle 400 - 500 mm Table speed 1-25 m/min. With standard accessories like dust extractor with water separator, balancing device, table-mounted Radius-tangent wheel dresser, wheel flanges, etc.	2 Nos.
128.	Tool and Cutter Grinder	Largest diameter of cutter that can be ground 10-100 mm Max. admit between centers 230 mm	1No.

		Max. length of cutting edges ground 120 mm With standard equipment like adaptor bushes, cutter head holder assembly, adaptors, extension spindle, flanges fro grinding wheel, etc.	
129.	Universal cylindrical Grinding Machine	Max. dia ground (effective) 250 mm Max. grinding length 300 mm Height of centre 130 mm Max. distance between centers 340 mm With special accessories like face plate, steady, radius and face dressers, find hand feed attachment etc.	1No.
130.	Pantograph **/ E**ngraving 3D machine	Working area (rectangle) 320 x 145 mm Max. height of work 380 mm **Work table traverse:** Longitudinal x Transverse 160 x300 mm Work clamping area 360x200 mm With attachment like index head, roll engraving attachment, type template holders, circular table, raised and sunk letters etc.	1set.
131.	Fly press	5 ton capacity	1No.
132.	Muffle furnace –	heating chamber 300 x 300 x 450 mm for 1050^0 C Quenching tank-600 x600 x 600 mm	1No.
133.	Rockwell hardness testing machine	with standard accessories	1No.
134.	Wire EDM	with CAM software	1 No.

Tool and Die Maker (Press Tool, Jigs & Fixtures)

135.	CAD/CAM software	(Standard/latest available in the market)	4 set
136.	Desktop computers	with latest configuration suitable for CAD/CAM software with necessary furniture	5 sets
137.	Spark Erosion	EDM (Optional)	1No.
138.	CNC vertical milling machine (Optional)	(Optional)	1 no
139.	CNC lathe (optional)	(Optional)	1 no
140.	Co-ordinate measuring machine (Optional)	(Optional)	01
141.	Profile projector (Optional)	(Optional)	01
142.	Unit height master (Optional)	(Optional)	01
143.	Polishing kits (Optional)	(Optional)	1 set
144.	Hydraulic press 16T with all safety measures (Optional)	(Optional)	01

INFRASTRUCTURE FOR WORKSHOP CALCULATION & SCIENCE AND ENGINEERING DRAWING

TRADE: TDM (PRESS TOOL, JIG & FIXTURE)

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**	**Specification**	**Quantity**
1.	Draughtsman drawing instrument box		20+1 set
2.	Set square celluloid 45^o	250 X 1.5 mm	20+1 set
3.	Set square celluloid 30^o-60^o	250 X 1.5 mm	20+1 set
4.	Mini drafter		20+1 set
5.	Drawing board IS: 1444	700mm x500 mm	20+1 set
B : Furniture Required			
Sl. No.	**Name of the items**	**Specification**	**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

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	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														