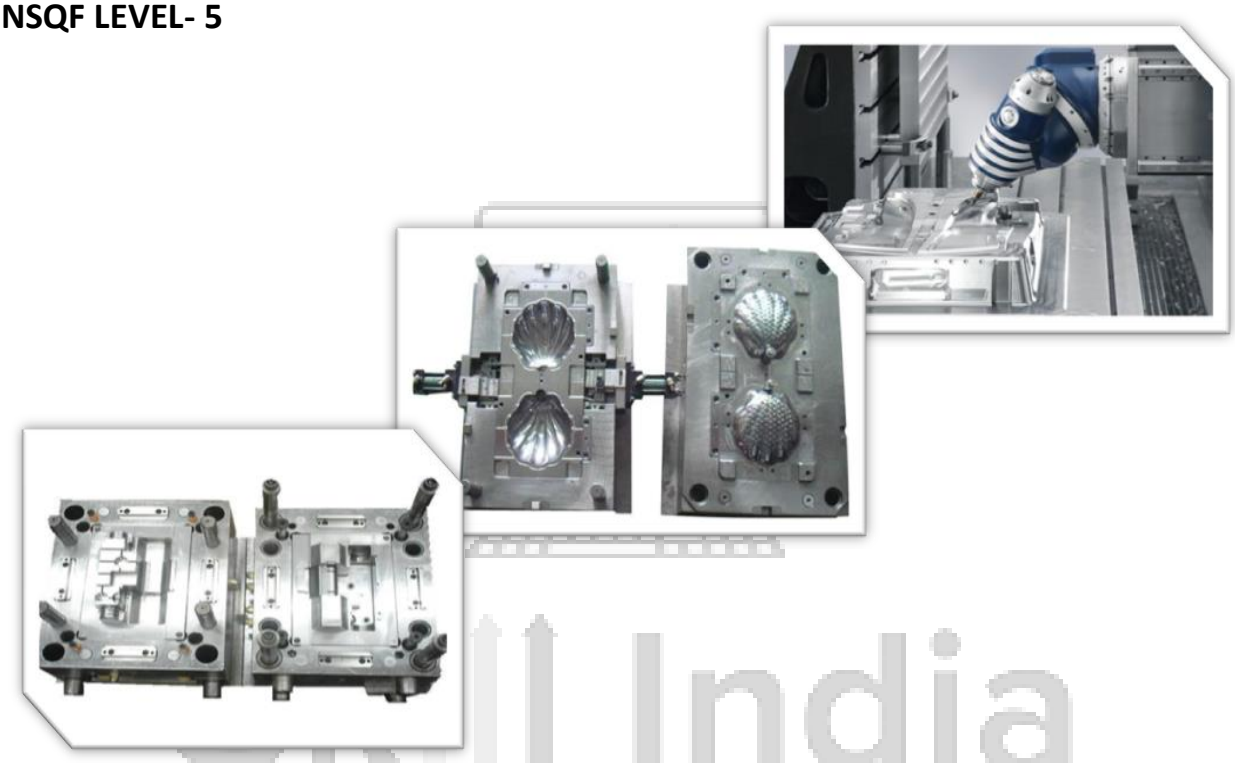
# TOOL AND DIE MAKER (DIES AND MOULDS)

**COMPETENCY BASED CURRICULUM**

**(Duration: 2 Yrs.)**

## APPRENTICESHIP TRAINING SCHEME (ATS)

**NSQF LEVEL- 5**



**SECTOR – PRODUCTION & MANUFACTURING**

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

# TOOL AND DIE MAKER (DIES AND MOULDS)

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

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# 1. BACKGROUND

## 1.1 Apprenticeship Training Scheme under Apprentice Act 1961

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

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

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

## 1.2 Changes in Industrial Scenario

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

- 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 (Dies & Moulds)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.

## 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.

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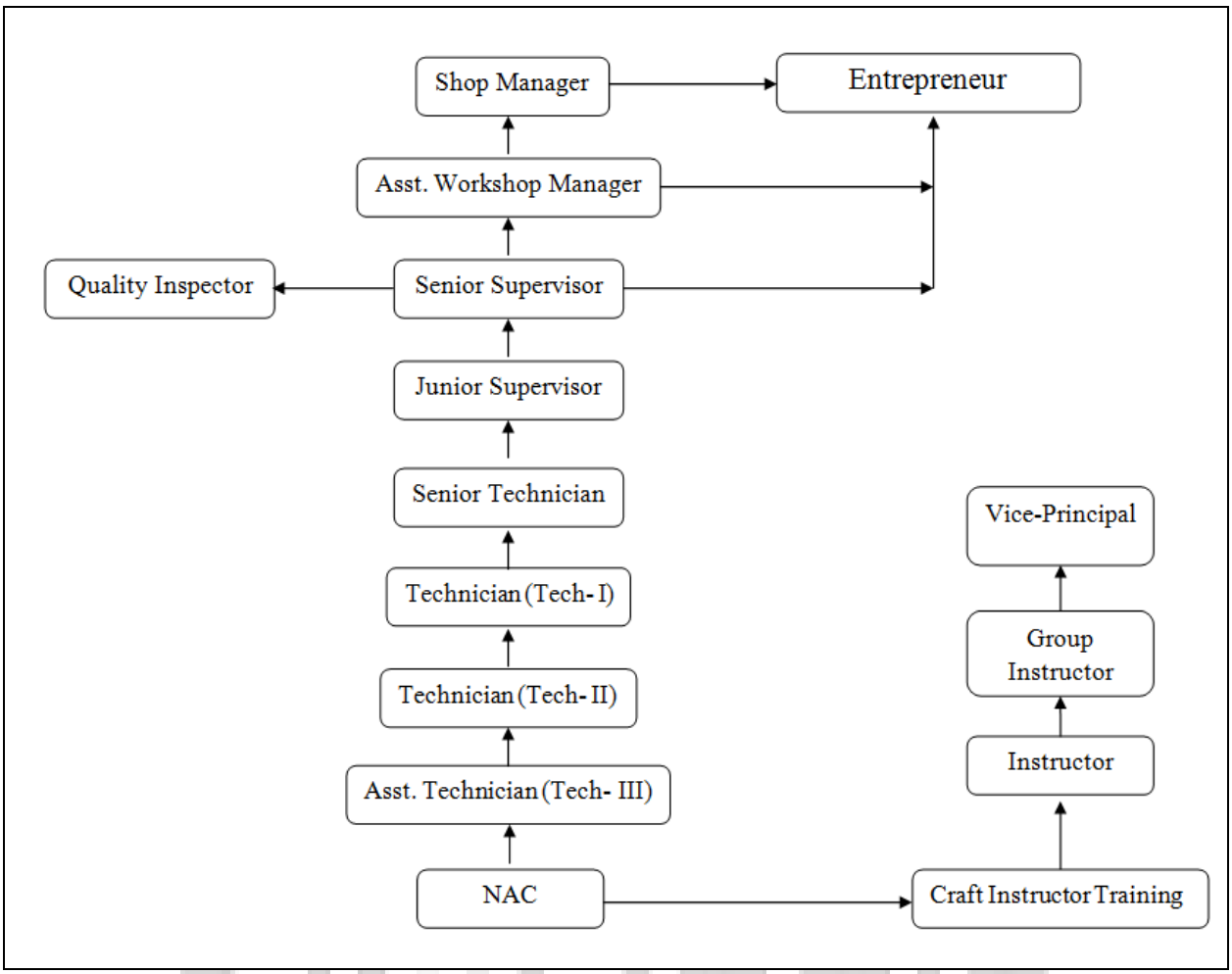


## 2.3 COURSE STRUCTURE:

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 (Dies &Moulds)***

**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 (Dies &Moulds)***

| 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<br>• Below 70% tolerance dimension/accuracy achieved while undertaking different work with those demanded by the component/job/set standards.<br>• A fairly good level of neatness and consistency in the finish<br>• 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<br>• 70-80% tolerance dimension/accuracy achieved while undertaking different work with those demanded by the component/job/set standards.<br>• A good level of neatness and consistency in the finish<br>• 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<br>• Above 80% tolerance dimension/accuracy achieved while undertaking different work with those demanded by the component/job/set standards.<br>• A high level of neatness and consistency in the finish.<br>• Minimal or no support in completing the project. |

## Brief description of Job roles:

**Die Maker; Die Fitter; Press Tool Fitter** makes metal dies to prescribed dimension for punching, cutting, forging and forming of metal or synthetic components for mass production. Studies drawing and specifications of dies to be made. Selects required type of metal or rough cast metal block. Machines or grinds one surface and marks it with template or otherwise to indicate dimensions and other working details. Cuts shapes, drill holes and mills metal according to marking on various machines. Checks dimensions while working with gauges and other measuring tools. Finishes made die(punch) by filing to required dimension and fits female to it. Files cutting angle and clearance accurately in female die and checks for sizes. Drills holes and cuts thread in female die for driving guide pin and fitting guide plates. Gets male and female dies tempered and grinds them to finish ensuring correct shear, cutting angle, clearances, etc. Sets finished dies in press and cuts or forms some trial pieces to ensure accuracy and correct production. May shape female die block to required angle for fitting it in bolster. May repair used dies and grind them to desired finish. May operate lathe, milling and shaping machines and harden and temper dies.

**Die Sinker, Hand** makes metal dies in two halves for manufacture of metal and synthetic components using fine chisels, hand tools, machine, etc. Studies samples or drawings of dies to be made. Selects right type of metal or alloy rough cast blocks. Gets one surface of each block ground finished. Marks one block to indicate position, size and shape of die to be cut. Follows marking and removes metal with different types of chisels, scrapers, etc. to form one half of die to be made. Measures amount of metal removed frequently while working with depth gauge, template, foot rule etc. to ensure correct forming. Transfers markings to other die block and (forms) and shapes it in similar manner to form other half of die. Takes lead casting of complete die formed and measures it (casting) with calipers, micrometre, etc. for dimensions. Makes alternations in die halves if required checks with further lead castings and ensures that product formed conforms to prescribed specifications. Gets die halves tempered and finishes them by grinding. Sets them in machine and stamps or forges some trial pieces to ensure correct formation. May anneal, grind and sink dies again if necessary. May do primary sinking of dies in vertical milling machine.

**Moulder, General** prepares mould from foundry sand using pattern for casting metal parts. Places pattern on mould plate (Wooden plate with arrangements to hold pattern). Makes mould in two halves (top and bottom) by ramming foundry sand around pattern. Removes pattern carefully and mends two halves of mould by trowel and smoothners. Makes vent holes by wire for escape of gas and other holes on top box for pouring metal into mould and for escape of excess molten metal (runners and risers). Fixes dried 'cores' in proper position to

have designed holes in casting. May prepare bottom half of mould in floor instead of in bottom box. May dry moulds by fire in case of heavy castings. May do additions and alternations in mould from drawing, using foot rule, knife and trowel. May be known as PIPE MOULDER if engaged in pipe moulding.

**Core Maker, Moulding (Hand)** prepares cores with core sand (foundry sand mixed with some bonding agent such as molasses) for casting cavities in metal parts. Sprays ash, silica or other non-adhering powder on sides of core box, partially fills box with core sand, and inserts metal strengthening pins, wires (grid bars). Fills in and compacts mores and until core box is full. Makes vent holes in core with wire. Removes core from core box, mends it if necessary and places it in oven for drying. May apply plumbago mixed with molasses and water to obtain smooth finish on finished castings. 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:** 7222.0500 Die Maker
ii) **NCO-2015:** 7222.0600 Die Sinker, Hand
iii) **NCO-2015:** 7211.0100 Moulder, General
iv) **NCO-2015:** 7211.0500 Core Maker, Moulding (Hand)

# 4. NSQF LEVEL COMPLIANCE

NSQF level for TDM (Dies & Moulds) 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 (Dies & Moulds) 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 (DIES & MOULDS) |
| **NCO-2015** | 7222.0500, 7222.0600, 7211.0100, 7211.0500 |
| **NSQF Level** | Level – 5 |
| **Duration of Apprenticeship Training**<br>(Basic Training + On-Job Training) | Two years (02 Blocks each of one year duration). |
| **Duration of Basic Training** | a) Block –I : 3 months<br>b) Block – II : 3 months<br>**Total duration of Basic Training: 6 months** |
| **Duration of On-Job Training** | a) Block–I: 9 months<br>b) Block–II : 9 months<br>**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.<br>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 (Dies & Moulds)Apprenticeship** | 1. TDM (Dies & Moulds)<br>2. TDM (Jigs & Fixtures)<br>3. Machinist |

***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 TDM (Dies & Moulds) 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.) emphasizing more on housekeeping.
2. Prepare different types of documentation as per industrial need by different methods of recording information.
3. Produce different components involving all the types of operations on conventional/CNC machines viz., lathe, milling, drilling & grinding.

4. Process about Die welding.
5. Grind/ re-sharpen cutting tools in Tool and Cutter Grinding machine.
6. Wire Cut- Machining practice / observation on machine.
7. Technique of forming cavities by different methods.
8. Material selection for the manufacture of core and cavity, pillars and other elements of dies and moulds. 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 moulds and dies. Heat treatment its effect on functioning of different parts – different methods of heat treatment etc.
9. Quality check and Inspection of Moulds and Dies – Stage Inspection of Core, Cavity and mould elements. Inspection of additional tooling like Electrodes, Templates, Masters etc. Final inspection of the system incorporated in the moulds in respect of alignment, Matching, Feed System, Ejection System, Cooling System etc. and product inspection.

**Block – II**

10. Reading and understanding of Technical documents
11. Plastic Materials – Properties and its applications
12. Mould Polishing Technique – Purpose, Different methods and care while polishing, Tools and Equipment used for polishing etc.
13. Manufacture of pressure die casting die and/or Hand Injection Mould and/or two cavity injection mould and/or single compression mould, perform stage inspection and also process planning for the manufacture of dies and moulds.
14. Manufacture of plunger type transfer mould.
15. Identify potential causes for non-conformities to quality assurance standards for different dies and moulds – Trouble shooting – Rectification of tools – Maintenance of tools – Simple hydraulic/ pneumatic circuits and function of different elements of hydraulic and pneumatic system.
16. Programming for Simulation with CAD/CAM software for developing different elements of dies & moulds.
17. Cutting tools, work holding devices selection for CNC machine operations and CNC machine operations and machine settings virtually and practically.
18. Prepare part programme using G codes and M codes and manufacture different components on CNC machines.
19. Preventive maintenance of CNC machines.
20. Assignment should be planned so that the apprentices may spend more of the total time of production type of work (using gauges, templates, fixture etc.) for developing their skill and confidence about manufacturing which will help ever in self- employment, if found necessary in the future.

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21. Operate EDM wire cut machine and produce components.
22. Case Studies – Designing of tools for different plastic dies and moulds – Trouble shooting – Rectification of Tool – Maintenance of tools – Simple hydraulic/pneumatic circuits.
23. Technique of forming cavities by electro forming, chemical etching, hobbing process etc.
24. In addition to the above mentioned skills/ operations industry may impart training on any other skills/ operations related to the trade.
25. 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 field of study including | 2.1 Explain concept of basic science related to the field such as Material science, Mass, weight, density, speed, velocity, heat & temperature, force, motion, pressure, heat treatment, centre of gravity, friction. |

| | | |
|---|---|---|
| basic electrical and apply in day to day work.*[Different mathematical calculation & science -Work, Power & Energy, Algebra, Geometry & Mensuration, Trigonometry, Heat & Temperature, Levers & Simple machine, graph, Statistics, Centre of gravity, Power transmission, Pressure]* | 2.2 | 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, 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 | 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. |

| | | |
|---|---|---|
| | improve 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.*

# 8. SYLLABUS

## 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.<br>2. Occupational health and safety.<br>3. Basic injury prevention, Basic first aid, Hazard identification and avoidance, safety signs for Danger, Warning, caution & personal safety message.<br>4. Preventive measures for electrical accidents & steps to be taken in such accidents.<br>5. Importance of housekeeping & good shop floor practices.<br>6. Disposal procedure of waste materials like cotton waste, metal chips/burrs etc.<br>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.<br>Introduction of First aid. Safety attitude development of the trainee by educating him to use Personal Protective Equipment (PPE).<br>Response to emergencies e.g.; power failure, fire, and system failure.<br>Accidents- Definition types and causes.<br>First-Aid, nature and causes of injury and utilization of first-aid.<br>Introduction to 5S concept & its application.<br>Fire: - Types, causes and prevention methods. Fire Extinguisher, its types.<br>Global warming its causes and remedies.<br>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)<br>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. | Introduction hacksaw cutting, marking, filling operation, need and application, types of files and their construction and usage Perpendicularity, parallelism.<br>Hand tools and its importance, steel rule, Try square, chisel, surface gauge and care & maintenance, Hacksaw frame, blades.<br>Classification and types of chisels, files & uses, vices - its constructions and uses. Hammers and its types. Related safety. |

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| | 10. Filing, Chipping & scraping flat surfaces and measure using different measuring instruments | Marking block, Steel rule, and calipers-different types and uses. Hacksaw blade, Hacksaw frame and its types. Drill bits- parts, Types & uses.<br>Different measuring instruments and gauges used in shop floor, their construction and usage. |
| 3 | 11. Mounting and dismantling of different dills on machines and different practical exercises.<br>12. Marking and drilling holes on flat pieces. Tapping as per simple drawing.<br>13. Exercise on use of pillar drill in drilling, counter sinking, counter boring. Spot facing and use of spot facing tools.<br>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.<br>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.<br>16. Parallel turning between centers, parting off, chamfering using roughing, finishing and parting off tools.<br>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.<br>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.<br>19. Cutting V thread external and internal in a lathe. Checking up with screw pitch gauge. Cutting square thread external & internal on a lathe.<br>20. Cutting square threads (right hand only) | Chucks-different types of job holding devices on lathe and advantages of each type. Mounting and dismounting of chucks.<br>Taper introduction, types and uses. Calculations of tapers. Measurement of taper by sine bar and slip gauges.<br>Different thread forms their related dimensions and calculations screw cutting in a lathe. |

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| | on a lathe-checking with thread gauge-grinding of tool and setting in correct position. | |
| 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.<br>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.<br>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.<br>Classification & different types of milling cutters & their use. Parts and nomenclature.<br>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.<br>25. Milling concave and convex surfaces.<br>26. Introduction to indexing head types, setting and aligning of indexing head with reference to job on milling machine.<br>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.<br>Different types of milling attachments and their uses.<br>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.<br>29. Milling of spur gear.<br>30. Introduction to grinding machine surface grinder, cylindrical grinder. Driving and feed mechanism, job holding devices mounting of wheels.<br>31. Different practical exercises with different accuracy levels.<br>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.<br>Types of Abrasives and their uses, Glazing and loading of wheels. Explain the importance and necessity of quality. |
| 9-10 | **Tool & Cutter Grinder:**<br>33. Grinding of single point cutting tool | **Tool & Cutter Grinder:**<br>Description of tool and cutter grinding machine. |

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| | blank.<br>34. Grinding of plain and face milling cutter. | Work (cutting tool) holding devices for tool & cutter grinder machine.<br>Setting process of cutting tools and grinding wheel on tool & cutter grinding machine |
| 11 | **Wire Cut**<br>35. Machining practice / observation on Wire cut Machine. | **Wire Cut**<br>Electrical discharge machining (EDM) - Introduction, principle of operation, advantages & disadvantages and its applications.<br>Wire cut machine - introduction, principle of operation, advantages & disadvantages and its applications. |
| 12 | 36. Introduction to gas welding equipment/arc welding equipment, Simple welding practice. Practice on brazing. | Explanation of gas welding and arc welding techniques. Description of welding equipment, types of welding joints.<br>Knowledge about flux, filler rod material. Die welding techniques. |
| 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) |
|---|---|---|
| 1-2 | **Hand Injection Mould:**<br>37. Identify different elements of hand injection mould. Manufacture simple parts as per drawing with different machining operations. | **Hand Injection Mould:**<br>Constructional details of a basic injection mould (Hand injection mould) and application of hand injection mould. Importance of mould polishing, advantages of chrome plating, method of mould polishing.<br>Introduction to tooling: Brief description of press tools, moulds for plastics, die-casting, jigs and fixtures.<br>Constructional features of a simple injection mould. |
| 3-7 | **Manufacturing Moulds:**<br>38. Practice in Manufacturing different moulds viz., two cavity injection mould, single compression mould and plunger type transfer mould. | Introduction and constructional features of injection moulding machine. Specification of injection moulding machine and application.<br><br>Different types moulds, their features and manufacturing methods.<br><br>Types of parting surface. Different methods used in moulding internal undercuts.<br>Elements of mould cycle. Importance of mould cycle diagram.<br>Construction/design details of injection mould (plate ejection)<br><br>Identification of common moulding defects that occur during injection moulding, reasons for defect in the component.<br>Compression moulding process. Procedure of compression moulding. Identification of common defect that occur during compression moulding<br>Transfer moulding process, advantages of |

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| | | transfer moulding.<br>Identification of common moulding defects. Reasons for the defects in the component.<br>Compression and transfer mould calculations. |
| 8-9 | 39. Practice in manufacturing of pressure die casting die. | Die casting, hot chamber process and cold chamber process. Basic designs of a die casting die.<br>Effect of metal on die casting process. Effect of die casting machine on process. Effect of die in process. |
| 10 | **Hydraulics & Pneumatics**<br><br>40. Identification and familiarization of various types of hydraulic & pneumatic elements such as cylinder, valves, actuators and filters.<br>41. Study of simple hydraulic & pneumatic circuits | **Hydraulics & Pneumatics**<br>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. |
| 11-12 | 42. Program generation & Simulation with CAD/CAM software for dies &moulds.<br><br>43. Inspection of dies with measuring instruments. | Concepts of CAD/CAM<br>Basic concepts of inspection of 3D surfaces.<br>Part program generation and setting up the machine for producing punch/dies.<br>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.<br>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.<br>Drawing Instruments: their uses<br>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 :<br>types and applications in Drawing as per BIS SP:46-2003<br>Drawing geometrical object using all types of lines.<br>**Drawing of Geometrical Figures:** Angle, Triangle, Square, Rectangle and Circle.<br>**Letters: -** Lettering styles, Single stroke letters and numbers as per IS standard. Lettering practice |
| 3. | **Mass .Weight and Density** :<br>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.<br>**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.<br>Average Velocity, Acceleration & Retardation. Related problems.<br>Circular Motion: Relation between circular motion and Linear motion, Centrifugal force, Centripetal force | Method of presentation of Engineering Drawing<br>- Pictorial View<br>- Orthogonal View<br>- Isometric view |
| 5. | **Ratio & Proportion** :<br>Simple calculation on related problems.<br>**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 |

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| | | 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.<br>Meaning of H.P., I.H.P., B.H.P., and F.H.P. and CC and Torque. | Projections:<br>Concept of axes plane and quadrant.<br>Orthographic projections<br>Method of first angle and third angle projections (definition and difference)<br>Symbol of 1st angle and 3rd angle projection as per IS specification.<br>Free hand Drawing of Orthographic projection from isometric/3D view of geometrical blocks |

| 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** |

*Tool and Die Maker (Dies &Moulds)*

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| 6. | **Trigonometry:**<br>Trigonometrical ratios, measurement of angles. Trigonometric tables.<br>Finding the value of unknown sides and angles of a triangle by Trigonometrical method.<br>Finding height and distance by trigonometry.<br>Application of trigonometry in shop problems. (viz. taper angle calculation).<br>Calculate the area of triangle by using trigonometry and application of Pythagoras theorem. | **Free hand sketch of trade related components / parts /cutting tool indicating angles.** |
| 7. | **Concept of pressure** - **Definition**:-Force, Pressure, and their units, atmospheric pressure, gauges used for measuring pressure, problems.<br>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.<br>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** | Basic of computer Networks (using real life examples), Definitions of |

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| **and Internet** | Local Area Network (LAN), Wide Area Network (WAN), Internet, Concept of Internet (Network of Networks),<br>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.<br>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.<br>Marks : 07 |
| **Introduction to Communication Skills** | Communication and its importance<br>Principles of Effective communication<br>Types of communication - verbal, non verbal, written, email, talking on phone.<br>Non verbal communication -characteristics, components-Para-language<br>Body language<br>Barriers to communication and dealing with barriers.<br>Handling nervousness/ discomfort. |
| **Listening Skills** | Listening-hearing and listening, effective listening, barriers to effective listening guidelines for effective listening.<br>Triple- A Listening - Attitude, Attention & Adjustment.<br>Active Listening Skills. |
| **Motivational Training** | Characteristics Essential to Achieving Success.<br>The Power of Positive Attitude.<br>Self awareness<br>Importance of Commitment<br>Ethics and Values<br>Ways to Motivate Oneself<br>Personal Goal setting and Employability Planning. |
| **Facing Interviews** | Manners, Etiquettes, Dress code for an interview<br>Do's & Don'ts for an interview. |
| **Behavioral Skills** | Problem Solving<br>Confidence Building<br>Attitude |
| **Block – II<br>Duration – 55 hrs.** | |
| **4. Entrepreneurship Skills** | Duration: 15 Hrs. |

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| | Marks : 06 |
| **Concept of Entrepreneurship** | Entrepreneur - Entrepreneurship - Enterprises:-Conceptual issue Entrepreneurship vs. Management, Entrepreneurial motivation. Performance & Record, Role & Function of entrepreneurs in relation to the enterprise & relation to the economy, Source of business ideas, Entrepreneurial opportunities, The process of setting up a 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. |

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| | 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.<br>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.<br>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.<br>Marks : 05 |
| **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 (DIES & MOULDS) 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.) emphasizing more on housekeeping.
2. Prepare different types of documentation as per industrial need by different methods of recording information.
3. Produce different components involving all the types of operations on conventional/CNC machines viz., lathe, milling, drilling & grinding.
4. Process about Die welding.
5. Grind/ re-sharpen cutting tools in Tool and Cutter Grinding machine.
6. **Wire Cut-**Machining practice / observation on machine.
7. Technique of forming cavities by different methods.
8. Material selection for the manufacture of core and cavity, pillars and other elements of dies and moulds. 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 moulds and dies. Heat treatment its effect on functioning of different parts – different methods of heat treatment etc.
9. Quality check and Inspection of Moulds and Dies – Stage Inspection of Core, Cavity and mould elements. Inspection of additional tooling like Electrodes, Templates, Masters etc. Final inspection of the system incorporated in the moulds in respect of alignment, Matching, Feed System, Ejection System, Cooling System etc. and product inspection.

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**Block – II**

10. Reading and understanding of Technical documents
11. Plastic Materials – Properties and its applications
12. Mould Polishing Technique – Purpose, Different methods and care while polishing, Tools and Equipment used for polishing etc.
13. Manufacture of pressure die casting die and/or Hand Injection Mould and/or two cavity injection mould and/or single compression mould, perform stage inspection and also process planning for the manufacture of dies and moulds.
14. Manufacture of plunger type transfer mould.
15. Identify potential causes for non-conformities to quality assurance standards for different dies and moulds – Trouble shooting – Rectification of tools – Maintenance of tools – Simple hydraulic/ pneumatic circuits and function of different elements of hydraulic and pneumatic system.
16. Programming for Simulation with CAD/CAM software for developing different elements of dies & moulds.
17. Cutting tools, work holding devices selection for CNC machine operations and CNC machine operations and machine settings virtually and practically.
18. Prepare part programme using G codes and M codes and manufacture different components on CNC machines.
19. Preventive maintenance of CNC machines.
20. Assignment should be planned so that the apprentices may spend more of the total time of production type of work (using gauges, templates, fixture etc.) for developing their skill and confidence about manufacturing which will help ever in self- employment, if found necessary in the future.
21. Operate EDM wire cut machine and produce components.
22. Case Studies – Designing of tools for different plastic dies and moulds – Trouble shooting – Rectification of Tool – Maintenance of tools – Simple hydraulic/pneumatic circuits.
23. Technique of forming cavities by electro forming, chemical etching, hobbing process etc.
24. In addition to the above mentioned skills/ operations industry may impart training on any other skills/ operations related to the trade.
25. 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 (Dies & Moulds) | | | |
|---|---|---|---|
| **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 | 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 | $2^{nd}$ 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** | | | |
| 1. | Caliper | inside spring type-150 mm | 4 nos. |
| 2. | Caliper | outside spring type-150 mm | 4 nos. |
| 3. | Divider | spring type – 150 mm | 4 nos. |
| 4. | Odd leg caliper | firm joint 0- 150 mm | 2 nos. |
| 5. | Screw driver – | 150 mm | 1 no. |
| 6. | Screw driver – | 200 mm | 1 no. |
| 7. | Centre gauge | $55^0$ and $60^0$ | 2 nos. |
| 8. | Oil can | 250 ml | 1 no. |
| 9. | File flat | smooth 200 mm | 4 nos. |
| 10. | File flat | smooth with safe edge 200 mm | 4 nos. |
| 11. | File | half round bastard 300 mm | 4 nos. |
| 12. | File | half round smooth 250 mm | 4 nos. |
| 13. | File | triangular bastard 250 mm | 4 nos. |
| 14. | File | triangular smooth 200 mm | 4 nos. |
| 15. | File | round bastard 250 mm | 4 nos. |
| 16. | File | square bastard 300 mm | 4 nos. |
| 17. | File | square smooth 250 mm | 4 nos. |
| 18. | Knife edge file | 150 mm | 4 nos. |

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|---|---|---|---|
| 19. | Needle file | assorted (12 nos.) 150 mm | 4 sets |
| 20. | File card | | 4 nos. |
| 21. | Scraper flat | 250 mm | 4 nos. |
| 22. | Hammer | Ball Peen 0.5 kg with handle | 4 nos. |
| 23. | Hammer | Cross Peen 0.75 kg with handle | 4 nos. |
| 24. | Chisel | cold flat 18 x 150 mm | 4 nos. |
| 25. | Chisel | Cross Cut 10 x 3 x 200 mm | 4 nos. |
| 26. | Chisel | Half Round 10 x 250 mm | 4 nos. |
| 27. | Chisel | diamond point 10 x 200 mm | 4 nos. |
| 28. | Scribing block | universal 300 mm | 2 nos. |
| 29. | C.I. Surface plate | 300 x 300 mm | 1 no. |
| 30. | Granite Surface plate | 600 x 600x80 mm | 1 no |
| 31. | Tap extractor | 3 mm to 12 mm x 1.5 mm (ezzy out) | 1 set |
| 32. | Screw extractor | sizes 1 to 8 | 1 set |
| 33. | Taps and dies | metric 5 mm to 12 mm complete set in a box | 2 sets |
| 34. | Twist Drill | with St. Shank Ø 5 to Ø 12 mm in steps of 0.5 mm | 1 set |
| 35. | Twist Drill | St. Shank Ø 8 mm to Ø 12 mm in steps of 2 mm | 1 set |
| 36. | Taper shank drills | Ø 6 mm to Ø 20 mm in steps of 1 mm | 1 set |
| 37. | D.E spanners | 3-4 , 6-8, 10-12, 13-14, 15-16, 18-19, 20-22, 24-26 ( 8 spanners) | 2 sets |
| 38. | Letter punch | 5 mm set | 1 set |
| 39. | Number | punch 5 mm set | 1 set |
| 40. | Drill chuck | 12 mm capacity with key | 1 no. |
| 41. | Allen key | metric 3 to 12 mm set | 2 sets |
| 42. | Centre drills | 3, 4,5 mm | 2 each |
| 43. | Parallel hand reamer | 6 mm to 12 mm in steps of 1 mm | 1 set |
| 44. | Star dresser | | 2 nos. |
| 45. | Diamond dresser | with holder | 2 nos. |
| 46. | Safety goggles | (Personal Protective Equipments) | 4 nos. |

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| 47. | Demagnetizer | | 1 no. |
| 48. | Snips | 200 mm blade | 1 no. |
| 49. | Workbench | 240 cm x 120 cm x 75 cm with 150 mm vice (Each bench fitted with 4 vices) | 4 nos. |
| 50. | Bench Vice | 150 mm | 16 nos. |
| 51. | Steel lockers for 16 trainees | (Pigeon Cup Board) | 2 nos. |
| 52. | Steel cupboard | 180 cm x 60 cm x 45 cm | 6 nos. |
| 53. | Metal rack | 180 cm x 60 cm x 45 cm | 1 nos. |
| 54. | Fire extinguisher | | 2 nos. |
| 55. | Fire buckets | with stand | 4 nos. |
| 56. | 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 |
| 57. | Metric Screw pitch gauge- | Range 0.4 -6 mm pitch $60^0$ (21 leaves) | 1 set |
| 58. | Radius gauge | 1 - 3 mm by 0. 25 mm and 3.5-7mm by 0.5 mm (34 leaves) | 1 no. |
| 59. | Vernier height gauge - | Range 300 mm, with 0.02 mm least count | 1 no. |
| 60. | Universal vernier caliper- | Range 200 mm, with 0.02 mm least count | 2 nos. |
| 61. | Dial vernier caliper | 0-200 mm, with 0.02 mm least count | 1 no. |
| 62. | Vernier caliper- | Range 300 mm Vernier scale 0.02 mm | 2 nos. |
| 63. | Vernier bevel protractor- | Blade range 150 and 300 mm, dial $1^0$ , least count 5’ (min.) with head, Acute Angle attachment | 1 no. |
| 64. | Outside micrometer | 0-25 mm, with 0.01 mm least count | 2 nos. |
| 65. | Outside micrometer | 25-50 mm, with 0.01 mm least count | 1 no. |
| 66. | Outside micrometer | 50-75mm, with 0.01 mm least count | 1 no. |
| 67. | Combination square sets- | 300 mm blade with square head, centre head, protractor head | 1 set |

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| 68. | Telescopic gauge | range 8 -150 mm (6 pcs/set) | 1 set |
| 69. | Sine bar | 150 mm with stopper plate | 1 no. |
| 70. | Sine table | 200 mm length with magnetic bed | 1 no. |
| 71. | Slip Gauge Box | (workshop grade) -87 pieces per set | 1 set |
| 72. | Gauge block | accessories consisting holders, half round jaws, scriber point, centre point , triangular straight edge (14 pcs/set) | 1 set |
| 73. | Central square – | Size 400 x 250 mm blade | 1 no. |
| 74. | V-Block- | Approx. 32 x 32 x 41 mm with clamping capacity of 25 mm with clamps | 2 pairs |
| 75. | V-Block- | Approx 65x65x80 mm with clamping capacity of 50 mm with clamps | 1 pairs |
| 76. | Magnetic V-Block | 100x100x125 mm | 2 pairs |
| 77. | Angle plate | 150 x 150 x 200 mm | 1 no. |
| 78. | Angle plate- | adjustable 250x250x300 mm | 1no. |
| 79. | Inside micrometer – | Range 50-63 mm with std extension rods upto 200mm.. | 1 set |
| 80. | Depth micrometer – | Range 0-25 mm, accuracy 0.01 mm with std set of extension rods. | 1set. |
| 81. | Magnetic stand | with magnetic base 60 x 47.5 mm and with universal swivel clamp, dial holding rod (150 mm) scriber | 2 nos. |
| 82. | Dial test indicator- | Lever type- Range 0-0.8 mm – Graduation 0.01mm, reading 0-50-0 with accessories | 1 nos. |
| 83. | Dial test indicator – | Plunger type-Range 0-10 mm , Graduation 0.01 mm, Reading 0-100 with revolution counter | 1 nos. |
| 84. | Bore gauge | with dial indicator (1 mm range, 0-0.01 mm graduation)-Range of bore gauge 18-150 mm | 1 set |

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| 85. | Straight edge- | Single beveled-Size 150 mm and 250 mm | 1 each |
| 86. | Tool makers clamp | 50 mm & 75 mm | 2 nos. each |
| 87. | C – clamp- | 50 mm & 75 mm | 2 nos. each |
| **Cutting Tools :** | | | |
| 88. | Side and face milling cutter | Ø 100 x 10 X Ø 25 mm | 2 nos. |
| 89. | Side and face cutter | Ø 80 x 10 X Ø 27 mm | 2 nos. |
| 90. | Cylindrical milling cutter | Ø 63 x 70 x Ø 27 mm | 2 nos. |
| 91. | Slitting Saw cutter | Ø 75 x 3 X Ø 27 mm | 2 nos. |
| 92. | Slitting Saw cutter | Ø 100 x 6 X Ø 27 mm | 2 nos. |
| 93. | Single angle cutter | Ø 75 x 16 x Ø 27mm - $60^0$ | 2 nos. |
| 94. | Single angle cutter | Ø 75 x 20 x Ø 27 - $45^0$ | 2 nos. |
| 95. | Equal angle cutter | Ø75x 30 x Ø 27 - $90^0$ | 2 nos. |
| 96. | Shell End Mill | Ø 50 x 36 x Ø 22 (preferably inserted tip type) | 2 nos. |
| 97. | Shell End Mill | Ø 75 mm x 50 x Ø 22 (preferably inserted tip type) | 2 nos. |
| 98. | Parallel shank end mills | Ø6, Ø10 and Ø 16 are (double fluted), Ø 20 mm & Ø 25mm (four fluted) | 4 nos. each |
| 99. | 'T' slot cutter with parallel shank- | Ø 17.5 x 8 mm width x dia. of shank 8 mm | 2 nos. |
| 100. | Concave Milling cutter | Ø 63 x 6 radius x Ø 27 mm | 1 nos. |
| 101. | Convex Milling cutter | Ø 63 x 6 radius x Ø 27 mm | 1 nos. |
| 102. | Disc type form milling cutter | (involutes form -2 module, 20° pressure angle) | 1 set |
| 103. | Tool holder (straight) | to suit 6, 8 mm sq. bit size | 2 nos. each |
| 104. | Parting tool holders | to suit 3 and 4 mm thick tool blade. | 2 nos. |
| 105. | Boring bars | with holders to accommodate 4, 6 and 8 mm HSS tool bits | 3 each |
| 106. | Knurling tool | (straight & diamond) | 2 nos. each |
| **C : GENERAL MACHINERY INSTALLATIONS** | | | |

### *Tool and Die Maker (Dies &Moulds)*

| | | | |
|---|---|---|---|
| 1. | Sensitive drilling machine - | capacity 12 mm Motorized – with drill chuck and key etc. | 1No. |
| 2. | Pillar/column type Drilling machine – | 25 mm capacity-motorized with drill chuck, key etc. | 1No. |
| 3. | Radial Drill machine. | to drill up to 32 mm diameter | 1No. |
| 4. | Power hacksaw machine | to accommodate 21" or more length blade. | 1no. |
| 5. | Double ended Pedestal Grinder | with 178 mm wheels(one fine and one rough wheel) | 1 no. |
| 6. | 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 and machine light arrangement. | 3 nos. |
| 7. | Shearing machine | (lever type)hand operated complete with 300 mm blade length | 1 no. |
| 8. | Arc and gas welding and cutting equipment (**Not required if Welding Trade is available in the Institute**) | | 1No. |
| | | (i) Transformer welding set 300 amps-continuous welding current with all<br>accessories and electrode holder<br>(ii) Welding cable to carry 400 amps 50 meter with flexible rubber cover.<br>(iii) Lugs for cable<br>(iv) Earth clamps<br>(v) Arc welding table (all metal top) 122cm x 12 cm x 60 cm with positioner<br>(vi) Oxy-acetylene gas welding set-equipment with hoses, regulator and other accessories<br>(vii) Gas welding table with positioner | 1 set<br>12 nos.<br>2 nos.<br>1 set<br>1 no.<br>1 set<br>6 nos.<br>1 no<br>2 nos.<br>2 pairs<br>2 nos.<br>1 set<br>2 nos.<br>4 pair<br>2 nos.<br>10 sets |

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| | | (viii) Welding torch tips of different sizes<br>(ix) Gas lighter<br>(x) Trolley for gas cylinders<br>(xi) Chipping hammer<br>(xii) Gloves (Leather)<br>(xiii) Leather apron<br>(xiv) Welding torches 5 to 10 nozzles<br>(xv) Spindle key for cylinder valve<br>(xvi) Welding goggles<br>(xvii) Welding helmets with coloured glass<br>(xviii) Tip cleaner | 2 nos.<br>1 no. |
| 9. | Universal Milling Machine - | | 1 no |
| | | Longitudinal traverse<br>700 - 800 mm<br>Cross traverse<br>300 - 400 mm<br>Vertical traverse<br>200 - 350 mm<br>Swivel of table on either side<br>$45^0$<br>Speed range rpm<br>30 to 1800<br>With universal dividing head, circular table, long arbors, slab arbor, slotting attachment, vertical indexing head, etc. | |
| 10. | Horizontal and Vertical milling machine | | 2 Nos. each |
| | | **Table**<br>Length x width<br>1350x310 mm<br>Longitudinal traverse<br>700 - 800 mm | |

| | | | |
|---|---|---|---|
| | | Cross traverse<br>200 - 265 mm<br>Vertical traverse<br>300 - 400 mm<br><br>Speed range rpm<br>20 to 1800 | |
| 11. | Hydraulic Surface Grinding Machine | **Table**<br>Clamping area<br>600 x 178 mm<br>Grinding area<br>400 x 200 mm<br>Distance table-centre of spindle<br>400 - 500 mm<br>Table speed<br>1-25 m/min.<br><br>With standard accessories like dust extractor with<br>water separator, balancing device, table-mounted Radius-tangent wheel dresser, wheel flanges, etc | 2 Nos. |
| 12. | Tool and Cutter Grinder | Largest diameter of cutter that can be ground 10-100 mm<br>Max. admit between centers 230 mm<br>Max. length of cutting edges ground 120 mm<br><br>With standard equipment like adaptor bushes, cutter head holder<br>assembly, adaptors, extension spindle, flanges fro grinding | 1No. |

| | | | |
|---|---|---|---|
| | | wheel, etc. | |
| 13. | Universal cylindrical Grinding Machine | | 1No. |
| | | Max. dia ground (effective)<br>250 mm<br>Max. grinding length<br>300 mm<br>Height of centre<br>130 mm<br>Max. distance between centers<br>340 mm<br>With special accessories like face plate, steady,<br>radius and face dressers, find hand feed attachment etc. | |
| 14. | Pantograph **/ E**ngraving 3D machine | Working area (rectangle)<br>320 x 145 mm<br>Max. height of work<br>380 mm<br>**Work table traverse:**<br>Longitudinal x Transverse<br>160 x300 mm<br>Work clamping area<br>360x200 mm<br>With attachment like index head, roll engraving attachment,<br>type template holders, circular table, raised and sunk letters etc. | 1No. |
| 15. | Muffle Furnace – | Heating Chamber 300 x 300 x 450 mm for $1050^0$ C<br>Quenching tank-600 x600 x 600 mm | 1No. |
| 16. | Rockwell Hardness Testing Machine | with standard accessories | 1No. |
| 17. | Spark erosion EDM | with standard accessories | 1 No. |
| 18. | Polishing kit | | 1 No. |
| 19. | Hand Injection Moulding Machine | ***103 hand injection*** | 1 No. |

***Tool and Die Maker (Dies &Moulds)***

| | | | |
|---|---|---|---|
| 20. | Hand Compression Moulds: | Compression moulding process (Mechanical for 50 gms) Minimum 25 Ton capacity. | 1 No. |
| 21. | Screw Type Injection Moulding Machine | (capacity 50 gms) (Not required if plastic processing operator trade is available in the institute) | 1 No. |
| 22. | Blow Moulding Machine (Not required if plastic processing operator trade is available in the institute) | | 1 No. |
| 23. | CAD/CAM software | (Program generation and simulation software for moulds and dies) | 4 nos. |
| 24. | Desktop computers | with latest configuration suitable for CAD/CAM software with necessary furniture | 5 sets |
| 25. | Vertical machining centre (VMC) (Optional) | (Optional) | 01 |
| 26. | Co-ordinate measuring machine (Optional) | (Optional) | 01 |
| 27. | Profile projector (Optional) | (Optional) | 01 |

## INFRASTRUCTURE FOR WORKSHOP CALCULATION & SCIENCE AND ENGINEERING DRAWING

**TRADE: TDM (Dies & Moulds))**

**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** | **Maximum Marks (Total 100 Marks)** | | **15** | **5** | **10** | **5** | **10** | **10** | **5** | **10** | **15** | **15** | **Total internal assessment Marks** | **Result (Y/N)** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **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 | | |
| **1** | | | | | | | | | | | | | | |
| **2** | | | | | | | | | | | | | | |