

CURRICULUM

FOR THE TRADE OF

TOOL & DIE MAKER

(Dual Mode)

UNDER

DUAL TRAINING SYSTEM

BY



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

PROPOSED TIME DISTRIBUTION FOR TOOL & DIE MAKER TRADE
UNDER INDUSTRY INSTITUTE - TRAINING SCHEME

BLOCK WITH DURATION	THEORY	PRAC.	WSC/ CAL	ENGG. DRG.	EMP. SKILL	ECA, LIB. & OTHERS	REM.
BLOCK – I (12 months/52 Weeks duration) Institute level trg.	510 hrs.	830 hrs.	170 hrs.	250 hrs.	110 hrs.	50 hrs.	160 hrs. Revision & Test
BLOCK – II (09 months /39 weeks duration) Industry level trg.	---	1560 HRS.	---	---	---	---	---
BLOCK – III (3 months/ 13 Weeks duration) Institute level trg.	100 hrs.	210 hrs. (Practical practice and submission of report related to industry training)	50 hrs.	60 hrs.	---	20 hrs.	Last 2 weeks revision & exam.
GRAND TOTAL	610 HRS.	2600 HRS.	220 HRS.	310 HRS.	110 HRS.	70 HRS.	240 HRS.
Total duration of training inclusive of Industry & Institute is 2 years (4160 HRS.)							

GENERAL INFORMATION FOR INSTITUTE (ITI)

- 1. Name of the Trade** : **Tool & Die Maker (Dies & Moulds)**
(Dual mode)
- 2. NCO Code No.** : 833.10, 833.40
- 3. Duration of Craftsmen Training** : Two years (Three Blocks).
- 4. Power norms** : 29.6 kw
- 5. Space norms** : 130 Sq. mt.
- 6. Entry qualification** : Passed 10th Class with Science and Mathematics under 10+2 system of Education or its equivalent
- 7. Trainees per unit** : 16 (Supernumeraries/Ex-Trainee allowed:5)
- 8a. Qualification for Instructor** : Degree in Mechanical Engineering from recognized university with one year post qualification experience in the relevant field.
OR
Diploma in Mechanical Engineering/Tool and Die Making from a recognized Board of Technical Education with two year post qualification experience in the relevant field.
OR
NTC/NAC passed in TDM (Dies & Mould) trade with 3 years post qualification experience.
- 8b. Desirable Qualification** : Preference will be given to a candidate with Craft Instructor Certificate (CIC) in TDM (Dies & Mould)/TDM (Press tool, Jigs & Fixture) Trade.

Distribution of training on Hourly basis:

Total hours /week	Trade practical	Trade theory	Work shop Cal. &Sc.	Engg. Drawing	Employability skills	Extra curricular activity
40 Hours	25 Hours	6 Hours	2 Hours	3 Hours	2 Hours	2 Hours

SYLLABUS CONTENT WITH TIME STRUCTURE FOR TOOL & DIE MAKER TRADE

Block – I

Duration- 12 Months (52 weeks)

Institute Level Training: -

Sl. No.	Practical Duration:- 830 hrs.	Theory Duration:- 510 hrs.
1.	<p>Importance of trade training, List of tools & Machinery used in the trade. Health & Safety: Introduction to safety equipments and their uses. Introduction of first aid, operation of Electrical mains.</p> <p>Occupational Safety & Health Importance of housekeeping & good shop floor practices.</p> <p>Health, Safety and Environment guidelines, legislations & regulations as applicable. Disposal procedure of waste materials like cotton waste, metal chips/burrs etc. Basic safety introduction, Personal protective Equipments(PPE):-Basic injury prevention, Basic first aid, Hazard identification and avoidance, safety signs for Danger, Warning, caution & personal safety message. Preventive measures for electrical accidents & steps to be taken in such accidents. Use of Fire extinguishers.</p>	<p>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 Industrial Training Institute system including stores procedures. Soft Skills: its importance and Job area after completion of training.</p> <p>Introduction of First aid. Operation of electrical mains. Introduction of PPEs. Introduction to 5S concept & its application. Response to emergencies eg; power failure, fire, and system failure.</p>
2.	<p>Bench work: Identification of tools & equipments as per desired specifications for marking & sawing. Holding rectangular piece of material in bench vice -filing flat surfaces and edges by maintain 90⁰ angles between all surfaces and edges -checking the dimensions and angles with steel rule and try square. Marking out of parallel lines using odd leg caliper, punching. Hack sawing to a different length as per marking (for step filing). Marking out of parallel lines using odd leg caliper, punching. Hack sawing to a different length as per marking (for step filing). Identification of tools & equipments as per desired specifications for filing. File steps and finish with smooth file with in the</p>	<p>Bench vice construction -types, uses, care and maintenance. Hacksaw frames - its types, hacksaw blade - description, material, specifications and uses. Method of using hacksaw. Steel rule, calipers-its type, surface plate, surface gauge, scribes, punches - its types, hammer -its types. Metric and FPS system of measurement. Introduction of file, types, materials, classification, filing techniques and operations. Applications of files.</p>

	accuracy of $\pm 0.5\text{mm}$. Filing 45° chamfer at all the edges Filing external radius and check with radius gauge.	
3.	Identification of tools & equipments as per desired specifications for drilling and tapping. Making rectangular parallel block and drilling practice for through holes, blind holes, Counter drilling, Counter sinking, chain drilling and tapping.	Drilling machine description - its types, Selection of cutting speed for different materials. Calculation of rotation per minute (rpm), drilling time for drilling. Description of twist drill, counter boring tool, counter sinking tool. Drill material, type (taper shank, straight shank), parts and size. Description and uses of taps, dies and reamers. Care to be taken while using taps, dies and reamers.
4.	Practice of step fitting having curvature/radius fitting	Vernier caliper, micrometer (inside & outside), height gauge, bevel protector - working principle - construction, graduations, calculation of least count, readings-uses and care Introduction to Limit, Fits, Tolerance, Allowance - its application in interchangeable system. Introduction of chisel and scraper - its material, parts, type and method of chipping and scraping. Study of different types of gauges and templates used in fitting. Study of tools used in chipping and scraping.
5.	Practice of Chipping & scraping Prepare three piece Assembly fitting with Filing flat and radius, drilling, countersinking, counter boring and tapping. Identify potential problems in preparation process and suggest appropriate solutions	Introduction about metals, difference between Metal and Non Metal, properties of metal, Classification of metals and its applications. Heat treatment of metals, process- such as annealing, nitriding, hardening, tempering, case hardening, carburizing, cyaniding, flame hardening, induction hardening, purposes and its effects on the properties of steel. Ferrous metals and its classification, uses of wrought iron, cast iron and steel. Alloying elements of steel and its effects on the properties of steel. Types of steels used in cutting tool and their specifications.
6.	Dressing of grinding wheels. Grinding of chisel, punch in Pedestal Grinder. Practice of twist drill grinding. Practice of single point turning tools grinding.	Description of pedestal grinder, procedure for mounting the grinding wheel and its application. Introduction to dressing and its importance. Description of single point cutting tool. Tool angles and its importance. Effect of tool setting and tool angles.

<p>7.</p>	<p>Lathe: Setting of job in four jaws chuck, truing. Setting of cutting tool on tool post, at centre height and its effect on metal cutting. Practicals on plain turning and facing. Lathe operations - step turning, shouldering, undercut, chamfering, grooving, fillet radius within an accuracy of ± 0.1mm and its checking of squareness, diameter, length, chamfer, fillets radius using micrometer, vernier caliper and gauges. Lathe operations - drilling, boring, counter boring, thread making using die and tap. Practice of eccentric turning. Practice between centre - plain turning, checking the parallelism and aligning/setting of tailstock and head stock centers - using dial test indicator etc. Practice of different taper turning methods on lathe (internal and external).</p>	<p>Lathe: Introduction to lathe machine and its types, specifications, description of main parts - bed, headstock, carriage, tail-stock, feed mechanism and thread cutting mechanisms. Safety precautions while working on lathe. Lathe machine Lathe accessories and attachments. Chuck - its types, face plates, lathe dogs, lathe centers - its types, and lathe steady. Coolants and lubricants-its difference and use. Nomenclature of Lathe cutting tool - its shapes cutting angles for different lathe operations. Influence of cutting tool angles on metal cutting. Recommended cutting tool materials for lathe operations. Different simple lathe operations - parallel/straight turning, step turning, grooving, radius forming, drilling and boring, counter boring. Calculation of cutting speed, feed and turning time. Different taper turning methods and its calculations. Definition of screw thread, types, forms and its applications. Calculation of gear train for screw thread cutting on lathe. Change gear and its calculation.</p>
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8.	<p>Milling: Preparation of rectangular block by milling -selection of cutters for plain milling, mounting of milling cutters. Milling a block within an accuracy of ± 0.2 mm and check the dimensions. Step milling operation within an accuracy of ± 0.2mm Angular milling. Dovetail milling Milling Operation using rotary table. T- Slot Milling. Concave and convex radius milling. Milling key ways or spline. Diagnose common problems in the machine based on visual inspection, sound, temperature etc. Gear Cutting (spur).</p>	<p>Milling: Introduction to milling machine, construction, types. Safety precaution followed during milling operation. Milling machine attachments - vertical milling attachment, universal milling attachment, circular milling attachment, dividing head attachment etc. Different types of milling cutters used in milling operations. Nomenclature of milling cutters, different milling cutter angles, Milling cutter materials. Milling cutter holding devices, work holding devices, milling process - Up milling and Down milling. Calculation of cutting speed, feed, machining time for milling machine. Milling machine operations. Dividing head - Introduction, construction, types. Simple and universal dividing head. G code M code, co-ordinates, basic programming for CNC Indexing methods - direct indexing, simple indexing, angular indexing, differential indexing and its calculations. Gears - types, calculation for spur, helical and bevel gears. Holding of gear blanks. Setting method of cutters and gear blanks.</p>
9.	<p>Grinding: Procedure for holding of job, setting of machine stroke length. Practice of wheel balancing. Grinding of parallel and perpendicular surfaces with in the accuracy of ± 0.02mm Grinding of angular surfaces within an accuracy of ± 5 arc minutes using universal vice. Grinding of angular surfaces of die block using sine table. Setting of machine for internal & external cylindrical grinding surfaces within an accuracy of ± 0.02mm. Grinding internal & external steps on cylindrical surfaces within ± 0.02mm accuracy. Achieving interference fit of guide pillar and bush.</p>	<p>Grinding: Grinding machine - introduction, description, types - surface grinding and cylindrical grinding machines. Safety precautions followed while working on grinding machines. Grinding wheels - abrasives, bond and bonding process, grit, grade, and structure of grinding wheels. Use of sine table and related calculations Grinding wheel shapes and sizes. Standard marking system. Selection of grinding wheel. Procedure for mounting of grinding wheels, balancing of grinding wheels, dressing and truing of grinding wheels, glazing and loading in grinding wheel. Calculation for cutting speed and work speed, feed, depth of cut and machining time.</p>
10.	EDM:	EDM:

	Machining practice / observation on EDM Machine (Spark Erosion m/c) Preparing simple electrodes from Copper, Graphite.	Electrical discharge machining (EDM) -Introduction, principle of operation, advantages & disadvantages and its applications.
11.	Welding: Introduction to gas welding equipment/arc welding equipment, Simple welding practice. Practice on brazing. Practice on die welding. Welding on Hard die block as well as on die casting.	Welding: Explanation of gas welding and arc welding techniques. Description of welding equipment, types of welding joints. Knowledge about flux, filler rod material. Die welding techniques.
12.	Pantograph machine: - Practice for setting of job on machine vice, setting of cutter, setting of stylus, master and template, depth of cut. Practice of removing material from work piece i.e. from - Engraving, sunk and raised letters, die sinking.	Pantograph machine: - Introduction, types, parts, working principle, advantages for using of pantograph milling m/c, its applications. Setting of enlarging and reducing ratios between master/template and work piece for Engraving, sunk and raised letters, die sinking. Wire Cut Electrical wire cut machining - Introduction, principle of operation, advantages & disadvantages and its applications. Hand Injection Mould Constructional details of a basic injection mould (Hand injection mould). Constructional details of a single cavity two plate injection mould. Introduction to tooling: Brief description of press tools, moulds for plastics, die-casting, jigs and fixtures. Constructional features of a simple injection mould Differentiating between thermosetting plastics. Properties and uses of commonly used thermoset plastics, fillers and additives, reinforced plastics mould release agents. Identification of common thermoplastics. Surface treatment of plastics, screen printing, Heat transfer in mould decorating, two colour moulding. Electroplating and vacuum metalizing of plastics. Importance of mould polishing, advantages of chrome plating, method of mould polishing.

13.		<p>Injection Moulding Machine Constructional features of injection moulding machine. Specification of injection moulding machine. Calculation of shot weight. Plasticising capacity, minimum cycle time, Clamping. Description of parts of system Runner functions. Different types of runner cross-sections. Selection of best runner cross section. Functions and types of gates selection of gate. Calculation of runner and gate size. Different parts of ejection system functioning of ejection system ejector return system. Ejection methods. Actuations methods for stripper plates. Ejection from fixed half. Function and type of spruce pullers.</p> <p>Types of parting surface. Selection of parting surface shrink-age factors, governing shrinkage determination of core and cavity dimensions Importance of temperature controlling in moulds. Method for controlling different parts of moulds. Cooling channel and their positions, mould cooling calculations. Constructional details of two cavity injection mould. Necessity of split in a mould, method of operation of split, split locking method, split locking arrangements, side core and side cavity assembly details of side core and side cavity. Methods used in actuating side core and side cavity. Constructional details of an injection mould with side core movement by dog legged cam</p> <p>Different methods used in moulding internal undercuts. Factors to be considered while designing moulds for components with threads. Methods employed in the removal of internally and externally threaded components. Different between single daylight mould and multi day light mould. Under feed moulds, Feed system in multi day light moulds. Triple daylight moulds. Elements of mould cycle. Importance of mould cycle diagram. Construction/design details of injection mould (plate ejection)</p>
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<p>14.</p>	<p>Tool & Cutter Grinder: Grinding of single point cutting tool blank. Grinding of plain and face milling cutter.</p>	<p>Tool & Cutter Grinder: Description of tool and cutter grinding machine. Work (cutting tool) holding device for tool & cutter grinder machine. Setting process of cutting tools and grinding wheel on tool & cutter grinding machine. Identification of common moulding defects that occur during injection moulding, reasons for defect in the component.</p> <p>Compression moulding process. Procedure of compression moulding. Identification of common defect that occur during compression moulding Transfer moulding process, advantages of transfer moulding.</p> <p>Identification of common moulding defects. Reasons for the defects in the component. Compression and transfer mould calculations. Construction - design details of simple compression mould. Construction design details of simple transfer mould. Introduction to blow moulding, thermo forming, rotational moulding, extrusion process</p> <p>Die casting, hot chamber process and cold chamber process. Basic designs of a die casting die. Effect of metal on die casting process. Effect of die casting machine on process. Effect of die in process.</p> <p>Flow system in a die-casting die. Goose neck nozzle, sprue, runner system from sprue to gate, shock absorbers, gating, air vents, over flow. Ejection system in a die-casting die. Moving cores. Actuation of moving cores. Cold type defects, hot types defects, miscellaneous defects.</p> <p>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. Study of simple hydraulic & pneumatic circuit. Concepts of CAD/CAM Basic concepts of inspection of 3D surfaces. Part program generation and setting up the machine for producing punch/dies.</p>
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		<p>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.</p>
REVISION & TEST		

NOTE: - Maximum uses of video demonstration and other IT based teaching aids may be adopted to deliver the theoretical knowledge.

Syllabus for

EMPLOYABILITY SKILLS

GENERAL INFORMATION
(Employability Skill)

1. **Name of the subject:** EMPLOYABILITY SKILLS
2. **Hours of Instruction:** 110 Hrs.
3. **Examination:** The examination will be held at the end of the training.
4. **Instructor Qualification:**

MBA OR BBA with two years experience OR Graduate in Sociology/ Social Welfare/ Economics with Two years experience OR Graduate/ Diploma with Two years experience and trained in Employability Skills from DGET institutes

AND

Must have studied English/ Communication Skills and Basic Computer at 12th / Diploma level and above

OR

Existing Social Studies Instructors duly trained in Employability Skills from DGET institutes

5. **Instructor:**

One full time regular instructor shall be engaged on every 240 numbers of trainees for teaching the subject “Employability Skills”. One additional full time regular instructor would be required on increase in every 240 trainees. Wherever the trainees are less than 240 or part thereof, a part-time instructor may be engaged to teach the subject.

ALLOTMENT OF TIME AND MARKS AMONG THE TOPICS

Sl. No.	Topics	Allotted Hours	Marks Allotted	To be covered in
1.	English Literacy	20 hrs.	9	Block – I
2.	I.T. Literacy	20 hrs.	9	
3.	Communication Skills	15 hrs.	7	
4.	SUB TOTAL:	55	25	
5.	Entrepreneurship Skills	15 hrs.	6	
6.	Productivity	10 hrs.	5	
7.	Occupational safety , health and Environment Education	15 hrs.	6	
8.	Labour Welfare Legislation	05 hrs.	3	
9.	Quality Tools	10 hrs.	5	
	Sub Total:	55	25	
	TOTAL	110 hrs.	50	

Detail of Syllabus

1. English Literacy	
Hours of Instruction: 20 Hrs. Marks Allotted: 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	
Hours of Instruction: 20 Hrs. Marks Allotted: 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 Hour of Instruction: 15 Hrs. Marks Allotted: 07	
Topic	Contents
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
4. Entrepreneurship Skills Hour of Instruction: 15 Hrs. Marks Allotted: 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 Hour of Instruction: 10 Hrs. Marks Allotted: 05	

Benefits	Personal / Workman - Incentive, Production linked Bonus, Improvement in living standard. Industry Nation.
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.
7. Occupational Safety, Health and Environment Education Hour of Instruction: 15 Hrs. Marks Allotted: 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 of 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 Hour of Instruction: 05 Hrs. Marks Allotted: 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.
Hour of Instruction: 10 Hrs.	
8. Quality Tools	Marks Allotted: 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 Housekeeping, Practice of good Housekeeping.
Quality Tools	Basic quality tools with a few examples

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.

Syllabus for

ENGINEERING DRAWING

GENERAL INFORMATION
(Engineering Drawing)

1. **Name of the Subject :** ENGINEERING DRAWING
2. **Hours of Instruction:** 310 hrs.
3. **Instructor Qualification:** Degree in Engineering with one year experience
OR
Diploma in Engineering with two years experience
OR
NCVT / NAC in the Draughtsman (Mechanical / Civil)
with three years experience.
4. **Desirable:** Craft Instructor Certificate in RoD & A course under NCVT.
5. **Instructor:**
 - One full time instructor is required for 144Engineering seats sanctioned in the institute. Additional instructor will be required on increase in every 144 students.
 - For seats less than 144, the instructor may be out sourced/ hired on contract basis.

Details of syllabus

Sl. No.	Topics (Total duration – 310 hrs.)
1.	Engineering Drawing: Introduction and its importance <ul style="list-style-type: none"> - Relationship to other technical drawing types - Conventions - Viewing of engineering drawing sheets. - Method of Folding of printed Drawing Sheet as per BIS SP:46-2003
2.	Drawing Instruments : their Standard and uses <ul style="list-style-type: none"> - Drawing board, T-Square, Drafter (Drafting M/c), Set Squares, Protractor, Drawing Instrument Box (Compass, Dividers, Scale, Diagonal Scales etc.), Pencils of different Grades, Drawing pins / Clips.
3.	Lines : <ul style="list-style-type: none"> - Definition, types and applications in Drawing as per BIS SP:46-2003 - Classification of lines (Hidden, centre, construction, Extension, Dimension, Section) - Drawing lines of given length (Straight, curved) - Drawing of parallel lines, perpendicular line - Methods of Division of line segment
4.	Drawing of Geometrical Figures: Definition, nomenclature and practice of - Angle: Measurement and its types, method of bisecting. <ul style="list-style-type: none"> - Triangle -different types - Rectangle, Square, Rhombus, Parallelogram. - Circle and its elements.
5.	Lettering and Numbering as per BIS SP46-2003: - Single Stroke, Double Stroke, inclined, Upper case and Lower case.
6.	Dimensioning: <ul style="list-style-type: none"> - Definition, types and methods of dimensioning (functional, nonfunctional and auxiliary) - Types of arrowhead - Leader Line with text
7.	Free hand drawing of <ul style="list-style-type: none"> - Lines, polygons, ellipse, etc. - geometrical figures and blocks with dimension - Transferring measurement from the given object to the free hand sketches.
8.	Sizes and Layout of Drawing Sheets <ul style="list-style-type: none"> - Basic principle of Sheet Size - Designation of sizes - Selection of sizes - Title Block, its position and content - Borders and Frames (Orientation marks and graduations) - Grid Reference - Item Reference on Drawing Sheet (Item List)
9.	Method of presentation of Engineering Drawing <ul style="list-style-type: none"> - Pictorial View - Orthogonal View - Isometric view
10.	Symbolic Representation (as per BIS SP:46-2003) of : <ul style="list-style-type: none"> Fastener (Rivets, Bolts and Nuts) - Bars and profile sections - Weld, brazed and soldered joints. - Electrical and electronics element

	- Piping joints and fittings
11.	Construction of Scales and diagonal scale
12.	Practice of Lettering and Title Block
13.	Dimensioning practice: - Position of dimensioning (unidirectional, aligned, oblique as per BIS SP:46-2003) - Symbols preceding the value of dimension and dimensional tolerance. - Text of dimension of repeated features, equidistance elements, circumferential objects.
14.	Construction of Geometrical Drawing Figures: - Different Polygons and their values of included angles. Inscribed and Circumscribed polygons. - Conic Sections (Ellipse & Parabola)
15.	Drawing of Solid figures (Cube, Cuboids, Cone, Prism, Pyramid, Frustum of Cone and Pyramid.) with dimensions.
16.	Free Hand sketch of hand tools and measuring tools used in respective trades.
17.	Projections: - Concept of axes plane and quadrant. - Orthographic projections - Method of first angle and third angle projections (definition and difference) - Symbol of 1 st angle and 3 rd angle projection as per IS specification.
18.	Drawing of Orthographic projection from isometric/3D view of blocks
19.	Orthographic Drawing of simple fastener (Rivet, Bolts, Nuts & Screw)
20.	Drawing details of two simple mating blocks and assembled view.
21.	- Machined components; concept of fillet & chamfer; surface finish symbols.
22.	- Screw thread, their standard forms as per BIS, external and internal thread, conventions on the features for drawing as per BIS.
23.	- Free hand Sketches for bolts, nuts, screws and other screwed members.
24.	- Free hand Sketching of foundation bolts and types of washers.
25.	- Standard rivet forms as per BIS (Six types).
26.	- Riveted joints-Butt & Lap (Drawing one for each type).
27.	- Orthogonal views of keys of different types
28.	- Free hand Sketches for simple pipe, unions with simple pipe line drawings.
29.	- Concept of preparation of assembly drawing and detailing. Preparation of simple assemblies & their details of trade related tools/job/exercises with the dimensions from the given sample or models.
30.	-Free hand sketch of trade related components / parts (viz., single tool post for the lathe, etc.)
31.	- Study of assembled views of Vee-blocks with clamps.
32.	- Study of assembled views of shaft and pulley.
33.	- Study of assembled views of bush bearing.
34.	- Study of assembled views of a simple coupling.
35.	- Free hand Sketching of different gear wheels and nomenclature.
36.	- Free hand Details and assembly of simple bench vice.
37.	- Reading of drawing. Simple exercises related to missing lines, dimensions. How to make queries.
38.	- Simple exercises relating missing symbols. - Missing views
39.	- Simple exercises related to missing section.
40.	-Free hand sketching of different types of bearings and its conventional representation.
41.	- Free hand sketching of different gear wheels and nomenclature/ Simple duct (for RAC).

	Free hand sketch of Reciprocating compressor - open type (for RAC)
42.	- Solution of NCVT test. - Simple exercises related to trade related symbols. - Basic electrical and electronic symbols
43.	- Study of drawing & Estimation of materials.
44.	- Solution of NCVT test papers.
45.	Revision
46.	Examination

LIST OF TOOLS & EQUIPMENTS

Sl. No.	NAME OF TOOLS / EQUIPMENTS	QUANTITY
1.	Drawing Board	20
2.	Models : Solid & cut section	as required
3.	Table for trainees	20
4.	Stool for trainees	20
5.	Cupboard (big)	01
6.	White Board (size: 8ft. x 4ft.)	01
7.	Trainer's Table	01
8.	Trainer's Chair	01

Syllabus for
Workshop Calculation & Science

GENERAL INFORMATION
(Workshop Calculation & Science)

1. **Name of the subject :** WORKSHOP CALCULATION & SCIENCE
2. **Hours of Instruction:** 220 hrs.
3. **Examination:** The examination for the subject will be held at the end of training.
4. **Instructor Qualification:** Degree in Engineering with two years experience OR
Diploma in Engineering with one year experience
5. **Desirable:** Craft Instructor Certificate in RoD & A course under NCVT.
6. **Instructor:**

One full time instructor is required for 144 Engineering seats sanctioned in the institute. Additional instructor will be required on increase in every 144 students.
For seats less than 144, the instructor may be out sourced/ hired on contract basis.

SYLLABUS FOR WORKSHOP CALCULATION AND SCIENCE

(Total duration – 220 hrs.)

Topic No	Workshop Calculation	Workshop Science
1.	Unit: Systems of unit- FPS, CGS, MKS/SI unit, unit of length, Mass and time, Conversion of units	Material Science : properties -Physical & Mechanical, Types -Ferrous & Non-Ferrous, difference between Ferrous and Non-Ferrous metals, introduction of Iron, Cast Iron, Wrought Iron, Steel, difference between Iron and Steel, Alloy steel, carbon steel, stainless steel, Non-Ferrous metals, Non-Ferrous Alloys.
2.	Fractions : Fractions, Decimal fraction, L.C.M., H.C.F., Multiplication and Division of Fractions and Decimals, conversion of Fraction to Decimal and vice versa. Simple problems using Scientific Calculator.	Mass .Weight and Density : Mass, Unit of Mass, Weight, difference between mass and weight, Density, unit of density, specific gravity of metals.
3.	Square Root: Square and Square Root, method of finding out square roots, Simple problem using calculator.	Speed and Velocity: Rest and motion, speed, velocity, difference between speed and velocity, acceleration, retardation, equations of motions, simple related problems.
4.	Ratio & Proportion : Simple calculation on related problems.	Work, Power and Energy: work, unit of work, power, unit of power, Horse power of engines,
5.	Percentage : Introduction, Simple calculation. Changing percentage to decimal and fraction and vice-versa.	mechanical efficiency, energy, use of energy, potential and kinetic energy, examples of potential energy and kinetic energy.
6.	Algebra : Addition, Subtraction, Multiplication, Division, Algebraic formula, Linear equations (with two variables).	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.
7.	Mensuration : Area and perimeter of square, rectangle, parallelogram, triangle, circle, semi circle, Volume of solids - cube, cuboid, cylinder and Sphere. Surface area of solids -cube, cuboid, cylinder and Sphere.	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.
8.	Trigonometry: Trigonometrical ratios, measurement of angles. Trigonometric tables	Levers and Simple Machines: levers and its types. Simple Machines, Effort and Load, Mechanical Advantage, Velocity Ratio, Efficiency of machine, Relationship between Efficiency, velocity ratio and Mechanical Advantage.
9.	- Geometrical construction & theorem: division of line segment, parallel lines, similar angles, perpendicular lines, isosceles triangle and right angled triangle.	- Forces definition. - Compressive, tensile, shear forces and simple problems. -Stress, strain, ultimate strength, factor of safety. -Basic study of stress-strain curve for MS.
10.	- Area of cut-out regular surfaces: circle and	- Temperature measuring instruments. Specific

	segment and sector of circle.	heats of solids & liquids.
11.	- Area of irregular surfaces. - Application related to shop problems.	- Thermal Conductivity, Heat loss and heat gain.
12.	- Volume of cut-out solids: hollow cylinders, frustum of cone, block section. - Volume of simple machine blocks.	- Average Velocity, Acceleration & Retardation. - Related problems.
13.	- Material weight and cost problems related to trade.	- Circular Motion: Relation between circular motion and Linear motion, Centrifugal force, Centripetal force
14.	- Finding the value of unknown sides and angles of a triangle by Trigonometrical method.	
15.	- Finding height and distance by trigonometry.	
16.	- Application of trigonometry in shop problems. (viz. taper angle calculation).	
17.	Graph: - Read images, graphs, diagrams - bar chart, pie chart. - Graphs: abscissa and ordinates, graphs of straight line, related to two sets of varying quantities.	- Friction- co-efficient of friction, application and effects of friction in Workshop practice. Centre of gravity and its practical application.
18.	Simple problem on Statistics: - Frequency distribution table - Calculation of Mean value. - Examples on mass scale productions. - Cumulative frequency -Arithmetic mean	- Magnetic substances- natural and artificial magnets. - Method of magnetization. Use of magnets.
19.	Acceptance of lot by sampling method (within specified limit size) with simple examples (not more than 20 samples).	- Electrical insulating materials. - Basic concept of earthing.
20.		- Transmission of power by belt, pulleys & gear drive. - Calculation of Transmission of power by belt pulley and gear drive.
21.		- Heat treatment and advantages.
22.		Concept of pressure - units of pressure, atmospheric pressure, absolute pressure, gauge pressure -gauges used for measuring pressure
23.		Introduction to pneumatics & hydraulics systems.

BLOCK – II

DURATION: 09 MONTHS (39 weeks)

Industry level training

BROAD LEARNING TO BE COVERED IN INDUSTRY FOR TOOL & DIE MAKER (DIES & MOULDS) TRADE:

- 1. Safety and best practices /Basic Industrial Culture (5S, KAIZEN, etc.)**
- 2. Record keeping and documentation**
- 3. Different machining operations**
- 4. Manufacturing components, Dies & Moulds as per drg.**
- 5. Routine check for different machines**

DETAILS OF PRACTICAL SKILLS TO BE COVERED DURING INDUSTRY TRAINING FOR TOOL & DIE MAKER (DIES & MOULDS) TRADE

Duration of training: - 09 Months

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

The candidate should be competent to execute following operation/ skills after completion of the industrial training: -

1. Safety precautions & best practices related to the shop floor.
2. Produce different components involving all the types of operations on conventional/CNC machines viz., lathe, milling, drilling & grinding.
3. Mould Polishing Technique – Purpose, Different methods and care while polishing, Tools and Equipment used for polishing etc.
4. Manufacture of pressure die casting die, process planning for the manufacture of dies and moulds.
5. Manufacture different job/ dies using Pantograph machine/ Copy milling machine.
6. Manufacture of plunger type transfer mould.
7. **Wire Cut-** Machining practice / observation on machine.
8. Technique of forming cavities by different methods.
9. Manufacture of Hand Injection Mould, two cavity injection mould, single compression mould, perform stage inspection and check for functionality.
10. 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.

11. Program generation & Simulation with CAD/CAM software for dies & moulds
12. Prepare different types of documentation as per industrial need by different methods of recording information
13. 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.

NOTE: -

1. In addition to the above mentioned skills/ operations industry may impart training on any other skills/ operations related to the trade.
2. All the operations/ skills indicated above related to milling machine may be executed both in conventional and CNC machine.
3. Utility jobs-such as actual machine parts-components, accessories etc. should be given to trainees for machining
4. Assignment should be planned so that the apprentices may spend 20% 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.

BLOCK – III

DURATION: 3 months (13 weeks)

Institute level training

For last three months candidates will be engaged in following works: -

1. Revision of theoretical components covered during Block – I.
2. Practical practice and report submission
3. Preparing candidate to face interview, preparation of bio-data, awareness about different jobs in the related field and grooming to be an entrepreneur.
4. Self study and final AITT examination

Note:-

1. The training may be conducted in Block mode i.e. few months in ITI & few in Industry.
2. The training may be conducted in flexible mode i.e. few days of a week in ITI & few days in Industry.
3. Nine months industrial training is mandatory.
4. Last three months of training in ITI is mandatory.
5. No admission of trainees without signing MOU with industry by the Institute (ITI).
6. To sign MOU with ITI, industry must ensure the training facility should be available to impart different skill sets as indicated in Block-II. At least 60% of total skill set in Block-II for Fitter and 75% of total skill set in Block-II for Turner, Machinist & TDM(Dies & Moulds) to be covered in industry.
7. If the industry ensures delivery of skill training as per Sl. 6 then 2nd MOU is not necessary.
8. However, Industry should ensure 100% skill training indicated in Block-II & necessary arrangement to be made to cover training on rest skill set (beyond the % indicated in sl.6) in collaboration with any other related industries. Extensive use of E-learning process may also be adopted.

TRADE: TOOL AND DIE MAKER (DIES AND MOULDS)
(Dual mode)

LIST OF TOOLS & EQUIPMENTS FOR 16 TRAINEES

A: Trainee's Tool Kit :

Sl. No.	Description of Tools	Quantity
1.	Steel Rule 150 mm English and Metric combined	16 nos.
2.	Engineer's Square 150 mm with knife edge	16 nos.
3.	Hacksaw frame adjustable with pistol grip for 200-300 mm blade	16 nos.
4.	Centre punch 100 mm	16 nos.
5.	Prick punch 150 mm	16 nos.
6.	File flat bastard 300 mm	16 nos.
7.	File flat 2 nd cut 250 mm	16 nos.
8.	File flat safe edge 200 mm	16 nos.
9.	File triangular smooth 200 mm	16 nos.

B: Tools and Equipments:

Sl. No.	Name of Tools and Equipments	Quantity
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 ^o and 60 ^o	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.
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 0 5 to 0 12 mm in steps of 0.5 mm	1 set
35.	Twist Drill St. Shank 0 8 mm to 0 12 mm in steps of 2 mm	1 set
36.	Taper shank drills 0 6 mm to 0 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.	Drill chuck 12 mm capacity with key	1 no.
39.	Allen key metric 3 to 12 mm set	2 sets
40.	Centre drills 3, 4,5 mm	2 each
41.	Safety goggles (Personal Protective Equipments)	4 nos.
42.	Snips 200 mm blade	1 no.
43.	Workbench 240 cm x 120 cm x 75 cm with 150 mm vice (Each bench fitted with 4 vices)	4 nos.
44.	Bench Vice 150 mm	16 nos.
45.	Steel lockers for 16 trainees (Pigeon Cup Board)	2 nos.
46.	Steel cupboard 180 cm x 60 cm x 45 cm	6 nos.
47.	Metal rack 180 cm x 60 cm x 45 cm	1 nos.
48.	Fire extinguisher	2 nos.
49.	Fire buckets with stand	4 nos.
50.	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
51.	Metric Screw pitch gauge-Range 0.4 -6 mm pitch 600 (21 leaves)	1 set
52.	Radius gauge 1 - 3 mm by 0. 25 mm and 3.5-7mm by 0.5 mm (34 leaves)	1 no.
53.	Vernier height gauge - Range 300 mm, with 0.02 mm least count	1 no.
54.	Universal vernier caliper-Range 200 mm, with 0.02 mm least count	2 nos.
55.	Dial vernier caliper 0-200 mm, with 0.02 mm least count	1 no.
56.	Vernier caliper-Range 300 mm Vernier scale 0.02 mm	2 nos.
57.	Vernier bevel protractor-Blade range 150 and 300 mm, dial 10 , least count 5' (min.) with head, Acute Angle attachment	1 no.
58.	Outside micrometer 0-25 mm, with 0.01 mm least count	2 nos.
59.	Outside micrometer 25-50 mm, with 0.01 mm least count	1 no.
60.	Combination square sets-300 mm blade with square head, centre head, protractor head	1 set
61.	Telescopic gauge range 8 -150 mm (6 pcs/set)	1 set
62.	Sine bar 150 mm with stopper plate	1 no.
63.	Sine table 200 mm length with magnetic bed	1 no.
64.	Slip Gauge Box (workshop grade) -87 pieces per set	1 set
65.	Gauge block accessories consisting holders, half round jaws, scriber point, centre point , triangular straight edge (14 pcs/set)	1 set
66.	Central square - Size 400 x 250 mm blade	1 no.
67.	Magnetic V-Block 100x100x125 mm	2 pairs
68.	Angle plate-adjustable 250x250x300 mm	1no.
69.	Inside micrometer - Range 50-63 mm with std extension rods upto 200mm.	1 set
70.	Depth micrometer - Range 0-25 mm, accuracy 0.01 mm with std set of extension rods.	1set.

71.	Magnetic stand with magnetic base 60 x 47.5 mm and with universal swivel clamp, dial holding rod (150 mm) scribe	2 nos.
72.	Dial test indicator-Lever type- Range 0-0.8 mm -Graduation 0.01mm, reading 0-50-0 with accessories	1 nos.
73.	Dial test indicator - Plunger type-Range 0-10 mm , Graduation 0.01 mm, Reading 0-100 with revolution counter	1 nos.
74.	Bore gauge with dial indicator (1 mm range, 0-0.01 mm graduation)- Range of bore gauge 18-150 mm	1 set
75.	Straight edge-Single beveled-Size 150 mm and 250 mm	1 each
76.	Tool makers clamp 50 mm & 75 mm	2 nos. each
77.	C - clamp- 50 mm & 75 mm	2 nos. each

C : Cutting Tools :

Sl. No.	Name of Tools and Equipments	Quantity
1.	Side and face milling cutter 100 x 10 X 0 25 mm	2 nos.
2.	Cylindrical milling cutter 63 x 70 x 0 27 mm	2 nos.
3.	Slitting Saw cutter 100 x 6 X 0 27 mm	2 nos.
4.	Single angle cutter 75 x 16 x 0 27mm - 60 ⁰	2 nos.
5.	Single angle cutter 75 x 20 x 0 27 - 45 ⁰	2 nos
6.	Equal angle cutter 75x 30 x 0 27 - 90 ⁰	2 nos
7.	Shell End Mill 75 mm x 50 x 0 22 (preferably inserted tip type)	2 nos.
8.	Parallel shank end mills 6, 10 and 16 are (double fluted), 20 mm & 25mm (four fluted)	4 nos. each
9.	Concave Milling cutter 63 x 6 radius x 27 mm	1 nos.
10.	Convex Milling cutter 63 x 6 radius x 27 mm	1 nos.
11.	Disc type form milling cutter (involute form -2 module, 20° pressure angle)	1 set
12.	Tool holder (straight) to suit 6, 8 mm sq. bit size	2 nos. each
13.	Parting tool holders to suit 3 and 4 mm thick tool blade.	2 nos.
14.	Boring bars with holders to accommodate 4, 6 and 8 mm HSS tool bits	3 each
15.	Knurling tool (straight & diamond)	2 nos. each

D : General Machinery & Installation:

(Note: The specification given under "General Machinery & Installation" can be considered to the nearest size according to the availability in the Indian Market.)

Sl. No.	Name of Machineries and Equipment	Qty.
1.	Pillar/column type Drilling machine - 25 mm capacity-motorized with drill chuck, key etc.	1No.
2.	Power hacksaw machine to accommodate 21" or more length blade. (One per institute)	1no.
3.	Double ended Pedestal Grinder with 178 mm wheels(one fine and one rough wheel)	1 no.
4.	SS and SC centre lathe (all geared) with minimum specification as: Centre	3 nos.

	height 150 mm and centre distance 1000 mm along with 3 & 4 jaw chucks, auto feed system, safety guard, taper turning attachment, motorized coolant system, lighting arrangement & standard accessories.	
5.	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 accessories and electrode holder (ii) Welding cable to carry 400 amps 50 meter with flexible rubber cover. (iii) Lugs for cable (iv) Earth clamps (v) Arc welding table (all metal top) 122cm x 12 cm x 60 cm with positioner (vi) Oxy-acetylene gas welding set-equipment with hoses, regulator and other accessories (vii) Gas welding table with positioner (viii) Welding torch tips of different sizes (ix) Gas lighter (x) Trolley for gas cylinders (xi) Chipping hammer (xii) Gloves (Leather) (xiii) Leather apron (xiv) Welding torches 5 to 10 nozzles (xv) Spindle key for cylinder valve (xvi) Welding goggles (xvii) Welding helmets with coloured glass (xviii) Tip cleaner	1 complete set each
6.	Universal Milling Machine -	1 no
	Longitudinal traverse 700 - 800 mm Cross traverse 300 - 400 mm Vertical traverse 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.	
7.	Horizontal and Vertical milling machine	2 Nos.
	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	(1 each)
8.	Hydraulic Surface Grinding Machine	2 Nos.
	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.	
9.	Tool and Cutter Grinder	1No.

	Largest diameter of cutter that can be ground 100 mm Max. admit between centers 230 mm Max. length of cutting edges ground 120 mm With standard equipment like adaptor bushes, cutter head holder assembly, adaptors, extension spindle, flanges for grinding wheel, etc.	10-	
10.	Universal cylindrical Grinding Machine		1No.
	Max. dia ground (effective) Max. grinding length Height of centre Max. distance between centers With special accessories like face plate, steady, radius and face dressers, find hand feed attachment etc.	250 mm 300 mm 130 mm 340 mm	
11.@	Pantograph / Engraving 3D machine		1No.
	Working area (rectangle) Max. height of work Work table traverse: Longitudinal x Transverse Work clamping area With attachment like index head, roll engraving attachment, type template holders, circular table, raised and sunk letters etc.	320 x 145 mm 380 mm 160 x300 mm 360x200 mm	
12.@	Muffle Furnace - Heating Chamber 300 x 300 x 450 mm for 1050 ⁰ C Quenching tank-600 x600 x 600 mm		1No.
13.@	Rockwell Hardness Testing Machine with standard accessories		1No.
14.@	Spark erosion EDM with standard accessories		1 No.
15.@	Polishing kit		1 No.
16.@	Hand Injection Moulding Machine 103 hand injection		1 No.
17.@	Hand Compression Moulds: Compression moulding process (Mechanical for 50 gms) Minimum 25 Ton capacity.		1 No.
18.@	Screw Type Injection Moulding Machine (capacity 50 gms) (Not required if plastic processing operator trade is available in the institute)		1 No.
19.@	Blow Moulding Machine (Not required if plastic processing operator trade is available in the institute)		1 No.
20.@	CAD/CAM software (Program generation and simulation software for moulds and dies)		4 nos.
21.@	Desktop computers with latest configuration suitable for CAD/CAM software with necessary furniture		5 sets

Note: The operations/ skill sets involving machines marked “@” if carried out at industry then the institute (ITI) need not to procure these machines.

ALLOTMENT OF TIME & MARKS AMONG

THE SUBJECTS FOR EXAMINATION

Sl. No.	SUBJECTS	Duration of exam (in Hrs.)	Full Marks	Pass Marks
1.	Trade Theory + E/S (150+50)	3	200	80
2.	Workshop Cal. & Sc.	3	50	20
3.	Engineering Drawing	4	50	20
4.	Internal Marks (ITI)	--	50	30
5.	Trade Practical –I*	4	50	30
6.	Internal Marks (Industry)	--	50	30
7.	Trade Practical-II** + Project work (200+50)	8	250	150
GRAND TOTAL			700	360

Note:-

- a. “*” represents practical conducted at ITI
- b. “**” represents practical conducted at Industry at the end of training
- c. 40% pass marks for theory subjects and 60% pass marks for practical
- d. The project work will be conducted at industry and industry will allot marks for the same.

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 :			Block:			Duration of the Trade/course:								
Operation/Skill:														
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														

LIST OF TRADE COMMITTEE MEMBERS

Sl. No.	Name & Designation	Organization
1.	Smt Sandhya Salwan, Director of Training	DGT, MSDE
2.	Shri.A.Mahendiran, Director	FTI Bangalore
3.	Shri.Satya Shankar.BP, Director	APEX-Hi-Tech, Bangalore
4.	Shri N.K Thakur, DGM	L&T Chennai.
5.	Shri Rajeev Khurana, GM	Maruti Suzuki India Ltd Gurgoan.
6.	Shri. Nirmalya Nath, ADT	CSTARI Kolkata.
7.	Shri P. MOULI, ADT	DGT Delhi.
8.	Shri R N Manna, TO	CSTARI Kolkata.
9.	Shri Anil. V. Bhide, Manager	NTTF, Bangalore
10.	Shri Kashinath. P, Director (Training), Bangalore	ACE Designers,
11.	Shri Shankara H. S.	BFW, Bangalore
12.	Shri C. Sekharan, Retd. AGM	HMT, Bangalore
13.	Shri Hemant D. Ganjare, DDT	APEX-Hi-Tech, Bangalore