

CURRICULUM

FOR THE TRADE OF

TOOL & DIE MAKER

(Press Tool, Jigs & Fixture)

(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 (PRESS TOOL
JIGS & FIXTURE) 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 (Press Tool, Jigs & Fixture) (Dual mode)
2. NCO Code No.	:	7222.0200, 7222.0300, 7223.0200
3. Duration of Craftsmen Training	:	Two years (Three Blocks)
4. Power norms	:	20 KW
5. Space norms	:	166 Sq. mt.
6. Entry qualification	:	Passed 10 th Class with Science and Mathematics under 10+2 system of Education or its equivalent
7. Trainees per unit	:	16 (Supernumeraries/Ex-Trainee allowed:5)
8 a. Qualification for Instructor	:	Degree in Mechanical Engineering from recognized Engineering College/university with minimum two-year experience in the relevant field. OR Diploma in Tool and Die making from recognized board of technical education with three-year experience in the relevant field. OR 10 th Class Pass + NTC/NAC in the Trade of “Tool and Die Maker (Press Tool and Jigs & Fixtures)” with three-year post qualification experience in the relevant field.
8 b. Desirable Qualification	:	Preference will be given to a candidate with Craft Instructor Certificate (CIC) in TDM (Dies & Mould)/TDM (Press Tool, Jigs & Fixture) Trade.

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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.	<ol style="list-style-type: none"> 1. Introduction of trade skill and work application. (02 hrs) 2. Safety attitude development of the trainee by educating them to use Personal Protective Equipment (PPE). (05 hrs) 3. First Aid Method and basic training.(02 hrs) 4. Safe disposal of waste materials like cotton waste, metal chips/burrs etc. (02 hrs) 5. Hazard identification and avoidance. (02 hrs) 6. Identification of safety signs for Danger, Warning, caution & personal safety message.(01hrs) 7. Preventive measures for electrical accidents & steps to be taken in such accidents.(02 hrs) 8. Use of Fire extinguishers.(07 hrs) 9. Practice and understand precautions to be followed while working in fitting jobs. (02 hrs) 10. Importance of trade training, List of tools & Machinery used in the trade.(01 hrs) 11. Safe use of tools and equipments used in the trade. (01 hrs) 12. Knowing games and memory training. (15 hrs) 13. Motivational talk by experts.(05 hrs) 14. 5S training. (03 hrs) 	<p>All necessary guidance to be provided to the newcomers to become familiar with the working of Industrial Training Institute system including store's procedures.</p> <p>Safe working practices.</p> <p>Soft Skills, its importance and Job area after completion of training.</p> <p>Importance of safety and general precautions observed in the industry/shop floor.</p> <p>Introduction of First aid. Operation of electrical mains and electrical safety. Introduction of PPEs.</p> <p>Response to emergencies e.g. power failure, fire, and system failure.</p> <p>Importance of housekeeping & good shop floor practices.</p> <p>Introduction to 5S concept & its application.</p> <p>Occupational Safety & Health:</p> <p>Health, Safety and Environment guidelines, legislations & regulations as applicable.</p>
2.	<ol style="list-style-type: none"> 15. Identification of tools & equipments as per desired specifications for filing and marking, visual inspection of raw material for rusting, scaling, corrosion etc.(03 hrs) 16. Familiarisation of bench vice. (01 hrs) 17. Filing- File top of the "U" channel, check and measure with steel rule. (10 hrs) 18. Mark with scribe and steel rule. (01 hr) 19. Measuring practice with steel rule, outside 	<p>Bench work – Metal working hand tools and devices –Work bench – vices – files – hacksaw – hammer – chisels – spanners – screw drivers – scrapers.</p> <p>Linear measurements- its units, steel rule dividers, callipers – types and uses, Punch – types and uses.</p>

	& inside callipers. (10 hrs)	Description, use and care of marking table.
3.	<p>20. File, mark straight and parallel lines with odd leg callipers/scraper and steel rule as per drawing. (05 hrs)</p> <p>21. Dot punching and letter and number punching. (05 hrs)</p> <p>22. File "U" channel to size using straight edge, try-square and vernier calliper for measuring and checking- Accuracy +/- 0.1mm. (25 hrs)</p> <p>23. Sawing different types of metals of different sections- round piece and Angle Iron. (10 hrs)</p> <p>24. Prepare mushroom head on round bar by hammering. (05 hrs)</p>	<p>Vernier calliper – its parts, principles, reading, uses and care.</p> <p>Outside micrometer – its parts, principles, reading, uses and care, vernier height gauge.</p> <p>Marking tools – scriber, Dividers, Dot punch, Centre punch.</p> <p>Marking out – Coordinates system, Rectangular – Polar – Rules for marking.</p> <p>Bevel protractor, combination set- their components, uses and cares.</p> <p>Pedestal grinder, star wheel dresser, safety precautions, care and maintenance.</p>
4.	<p>25. Make "S" bend by Hammering on flat piece. (04 hrs)</p> <p>26. Grinding, centre punch, dot punch, flat chisel and scriber. (04 hrs)</p> <p>27. Drill gauge filing (06 hrs)</p> <p>28. Drill Centring Practice. (05 hrs)</p>	<p>Marking media, marking blue, Prussian blue, red lead, chalk and their special application, description.</p> <p>Surface plate and auxiliary marking equipment, 'V' block, angle plates, parallel block, description, types, uses, accuracy, care and maintenance.</p> <p>Bevel protractor, combination set- their components, uses and cares.</p> <p>Drill, Tap, Die-types & application. Determination of tap drill size.</p> <p>Reamer- material, types (Hand and machine reamer), parts and their uses, determining hole size for reaming, Reaming procedure.</p> <p>Drilling machines-types and their application, construction of Pillar & Radial drilling machine. Countersunk, counter bore and spot facing-tools and nomenclature.</p> <p>Cutting Speed, feed, depth of cut and Drilling time calculations.</p>
5.	29. Drill Plate filing to an accuracy of $\pm 0.05\text{mm}$. (25 hrs)	Dial test indicator-its parts, types, construction and uses.
6.	<p>30. Marking for centre punching, drilling, reaming, tapping, counter boring, counter sinking. (04 hrs)</p> <p>31. Centre punching, drilling, reaming, tapping, counter boring, counter sinking on drill plate. (08 hrs)</p>	<p>Interchangeability: Necessity in Engineering. field, Limit- Definition, types, terminology of limits and fits-basic size, actual size, deviation, high and low limit, zero line, tolerance zone, allowances. Different standard systems of fits and limits. Geometrical tolerance. British</p>

	<p>32. Die pass on standard material (M8). (02hrs)</p> <p>33. Chipping flat surfaces along a marked line on pre-machined piece. (08 hrs)</p> <p>34. Slot, straight and angular chipping. (08 hrs)</p> <p>35. Cutting tool filing and grinding on standard material. (20 hrs)</p>	<p>standard system, BIS system.</p> <p>Study of tools used in chipping and scraping.</p>
7.	<p>36. Make Male & Female 'Open' fitting with accuracy ± 0.05 mm. (25 hrs)</p>	<p>Introduction about metals, difference between Metal and Non Metal, properties of metal, Classification of metals and its applications, pig – iron, cast iron, wrought iron, steel-plain carbon steel(Low carbon steel, medium and high carbon steels, high speed steel, stainless steel, carbides, etc.)</p>
8.	<p>37. Make male & female for square fit with accuracy ± 0.05 mm. (30 hrs)</p> <p>38. Scrapping exercise on 3 pieces using two female piece of square fit.(20 hrs)</p>	<p>Heat treatment of metals, process- such as annealing, nit riding, hardening, tempering, case hardening, carburizing, cyaniding, flame hardening, Induction hardening, purposes and its effects on the properties of steel.</p>
9.	<p>39. Angular fitting with male & female. (40 hrs)</p> <p>40. Assembly fit with male & female by dowelling and screwing. (10 hrs)</p>	<p>Getting to know the lathe with its main components, lever positions and various lubrication points as well.</p> <p>Definition of machine & machine tool and its classification.</p>
10.	<p>41. Identify & function of different parts of lathe. Practice on operation of lathe (dry/idle run). (25 hrs)</p> <p>42. Setting lathe on different speed and feed. (05 hrs)</p> <p>43. Cone turning using hand tools-radius external and internal. (20 hrs)</p> <p>44. Bush turning, drilling and boring/reaming. (15 hrs)</p>	<p>Introduction to lathe- its types. Centre lathe construction, detail function of parts, specification.</p> <p>Safety points to be observed while working on a lathe.</p> <p>Different types of Lathe operations - facing, turning, parting-off, grooving, chamfering, boring etc.</p> <p>Lathe cutting tool-different types, shapes and different angles (clearance, rake etc.), specification of lathe tools.</p> <p>Types of chips, chip breaker.</p> <p>Tool life, factors affecting tool life.</p> <p>Driving mechanism, speed and feed mechanism of Lathe.</p> <p>Concept of Orthogonal and Oblique Cutting.</p> <p>Chucks & different types of job holding devices on lathe and advantages of each type. Mounting and dismounting of chucks.</p> <p>Knurling-types, grade & its necessity.</p>

		Vernier Bevel Protractor – parts, reading and uses. Tool angles and their effects on cutting various material.
11.	45. Identification of milling machine. (02 hrs) 46. Demonstrate working principle of Milling Machine. (04 hrs) 47. Set vice & job on the table of Milling Machine. (05 hrs) 48. Set arbor on the spindle of milling machine. (08 hrs) 49. Set the cutter on arbor. (04 hrs) 50. Safety points to be observed while working on a milling machine. (02 hrs)	Milling Machine: importance, types, construction and specification. Driving and feed mechanism of Milling Machine Nomenclature of milling cutters, different milling cutter angles, Milling cutter materials. Job holding devices-vice, clamps, V-block, parallel block etc. Milling cutter holding devices, work holding devices, milling process – Up milling and Down milling.
12.	51. Demonstrate Up Milling and Down Milling Process. (05 hrs) 52. Perform sequence of milling for six faces of a solid block 2 numbers. (13 hrs) 53. Check the accuracy with the help of tri-square and vernier height gauge. (02 hrs) 54. Perform Step milling using side and face cutter checking with depth micrometer. (05 hrs)	Calculation of cutting speed, feed, machining time for milling machine. Milling machine operations. Milling machine attachments – vertical milling attachment, universal milling attachment, circular milling attachment, dividing head attachment, etc. Chain, Sprocket and their applications. Spline – types and uses.
13.	55. Milling blank piece (plain milling). (10 hrs) 56. Slot milling with side and face cutter (08 hrs) and Slot cutting by slitting saw. (07 hrs)	Introduction to coolant & lubricant-difference between them, types and uses of each. Dividing head – Introduction, construction, types. Simple and universal dividing head. Indexing methods – direct indexing, simple indexing, angular indexing, differential indexing and its calculations.
14.	57. Identification of different types of grinding machine. (02 hrs) 58. Wheel balancing & truing. (06 hrs) 59. Dressing of grinding wheel. (02 hrs) 60. Grinding of block (six sides) in surface grinding machine with an accuracy of ± 0.01 mm. (15 hrs)	Grinding machine introduction, types, Surface & Cylindrical grinding Machine- their parts, functions, specification, and uses. Safety points to be observed while working on a Grinding machine.
15.	61. Grinding of step block in surface grinding machine with an accuracy of ± 0.01 mm. (15 hrs) 62. Grinding of slot block in surface grinding machine with an accuracy of ± 0.01 mm. (10 hrs)	Grinding wheel shapes and sizes. Standard marking system. Selection of grinding wheel. Specification and Identification of grinding wheels.

16.	Cylindrical grinding: 63. External Parallel grinding (Both holding in chuck/ collet and in between centres. (17 hrs) 64. Plunge grinding. (08hrs)	Procedure for mounting of grinding wheels, balancing of grinding wheels. Dressing, types of dresser. Glazing and Loading of wheels – its Causes and remedies. Roughness values and their symbols. Explain the importance and necessity of quality.
17.	Cylindrical grinding: 65. Internal Parallel grinding (Both holding in chuck/collet and in between centres). (25 hrs)	-do-
18.	66. Grinding of step in Cylindrical grinding machine with an accuracy of ± 0.01 mm (15 hrs) 67. Grinding of external taper in Cylindrical grinding machine with an accuracy of ± 0.01 mm. (10 hrs)	Selection procedure of grinding wheels. Abrasives - its types, Bond, Grade, Grit, structure. Standard marking system of Grinding Wheel.
19.	68. Demonstrate and practice of grinding of end mill cutter of different sizes. (25 hrs)	Tool & cutter grinder-construction, use and specification.
20.	69. Prepare simple mould design drawings with basics of AutoCAD viz., Basic and advanced 2D drafting, Draw commands, Constraints, Modify commands, Layers, Line types block, Texts, Attribute, Table, Dimensioning, Isometric, Solid modelling, View port. (50 hrs)	AutoCAD: Introduction to AutoCAD, creating first drawing, learning the tools trade, organizing the work, drawing the first mould.
21.	70. Prepare solid modelling of simple mould with Pro-E [Sketch, Part (solid, surface, free style, flexible modelling, sheet metal.), Assembly, Creo direct, Creo simulate]. (25 hrs) 71. Creating (NC assembly and mould cavity) drawing. (10 hrs) 72. Part drawing of the universal coupling assembled all the parts and solid modelling and denoted by coloured combination. (15hrs)	Pro-E: Familiarization of interface/ Windows, Sketching, basic modeling, advanced modeling, assembling, drawing, surface modeling, manufacturing – mould design awareness.
22.	73. Introduction to gas welding/ arc welding/ MIG welding equipment, simple welding and brazing practice. (25 hrs) 74. Practice on die welding, welding on hardened die block as well as on die casting dies. (25 hrs)	Explanation of gas welding, arc welding and MIG welding techniques description of welding equipments and welding joints. Knowledge about flux, filler rod material. Die welding techniques.
23.	75. Make simple drilling jig (20 hrs) 76. Manufacturing of indexing jigs. (20 hrs)	Introduction to tooling. Introduction to Jigs and Fixtures, Plane of movements, possible movements of work piece, location of work piece, types of Jigs, Types of Fixtures, Jigs and machine relations.

		<p>Method of restricting the possible movement (principle, 3-2-1 pin method). Locating method. Introduction of locating devices, its material, types of locators, locator for flat, surface, internal diameter and external profit. Clamping and work holding devices: Ejectors, clamping devices, types of clamps for jig and fixture. Material for ejector and clamps. Drill Bushes Type of drill jigs. Type of fixture. Fixture and machine relations, cutting force on jigs and fixtures, elements of jigs and fixtures, jigs and fixture cutting tool relations, design of jigs and fixtures, failure of jigs and fixtures.</p>
24.	<p>77. Manufacturing of milling fixture and application. (50 hrs) OR 78. Manufacturing of turning fixture and application. (50 hrs) OR 79. Manufacturing of grinding fixture and application. (50 hrs)</p>	<p>Types of press Tools/ Operations: Guide Plate tool, piercing tool, blanking tool, progressive tool, compound tool, cut off tool, parting tool, etc. (03 hrs) Theory of Shearing: Shearing Theory Description in Press Tool, Critical Stage of shearing.</p>
25.	<p>80. 2D and 3D machining with CAM software. (50 hrs)</p>	<p>Preparing for contour and profile machining. Safety precaution – Safe handling of tools, equipment of EDM/ wire cut machine. Control specification and machine axes. Describe machine tool elements, feed drives. Advantage and disadvantage of wire cut machine. (Video Demo of machine operation to be given)</p>
26.	<p>81. Study of CNC lathe, key board and specifications. (05 hrs) 82. Machine starting & operating in Reference Point, JOG, and Incremental Modes. (15 hrs) 83. Co-ordinate system points, assignments and simulations Absolute and incremental programming assignments and simulations. (20 hrs) 84. Co-ordinate points, assignments and simulations. Identification of machine over travel limits and emergency stops. (10 hrs) 85. Work and tool setting. Automatic Mode operation: facing, profile turning, drilling, tapping, reaming, thread cutting</p>	<p>Safety Precautions: Safe handling of tools, equipment & CNC machines, CNC turning with FANUC CNC CONTROL- (Fanuc-Oi-T latest) CNC Machine &Control specifications. CNC system organization Fanuc-0i-T. Co-ordinate systems and Points. CNC lathe, Types, Machine axes.</p>

	etc. (25 hrs)	
27.	<p>86. Study of CNC Machining centre, key board and specifications. (05 hrs)</p> <p>87. Machine starting & operating in Reference Point, JOG, and Incremental Modes. (10 hrs)</p> <p>88. Co-ordinate system points, assignments and simulations Absolute and incremental programming assignments and simulations. (15 hrs)</p> <p>89. Polar co-ordinate points, assignments and simulations. Identification of machine over travel limits and emergency stops. (20 hrs)</p> <p>90. Work and tool setting. Automatic Mode operation: Face Milling, profile milling, drilling, tapping, reaming etc. (25 hrs)</p>	<p>Safety Precautions: Safe handling of tools, equipment & CNC machines, CNC Mill with FANUC CNC CONTROL- (Fanuc-0i-M latest) CNC Machine & Control specifications. CNC system organization Fanuc-0i-M. Co-ordinate systems and Points. CNC Machines Milling, Types, Machine axes.</p>
28.	<p>91. Manufacturing die as per drawing dimension and maintain die clearance and die land, provide angular clearance after die land. (25 hrs)</p> <p>92. Manufacturing of Punch as per drawing dimension. (15 hrs)</p> <p>93. Manufacturing stripper plate bottom plate (die press) tap plate, punch holder, gauges and shank, thrust plate, stop pin. (35 hrs) (May use the plates from turning, milling and grinding exercises)</p>	<p>Cutting clearance: Importance of cutting clearance, typical appearance characteristics, determination of punch and die dimensions.</p> <p>Land and angular clearance: Importance if angular clearance, methods of providing angular clearance.</p> <p>Basic design of guide plate tool.</p> <p>Alignment technique between Punch and Die while assembly.</p> <p>Guide Plate Tool: Construction, function of elements, related design.</p> <p>Cutting force: calculation of cutting force for press tool operations, selection of suitable press, method of reducing cutting force.</p> <p>Stock material: Relation of piece part and stock strip, stock material used in press work, differentiate stock strip and unit stock.</p> <p>Strip layout: Importance of strip layout, different types of strip layout, economic layout.</p> <p>Punch: Cutting punches, non-cutting punches, hybrid punches, types of punches, selection of punches.</p> <p>Buckling of punches: Buckling theorem, problems, types of loading coming on a punch, determining of the size of the punch.</p> <p>Die Block: Types of dies, requirement of die block.</p>
29.	94. Construct a piercing and blanking tool as	Stoppers: Function, basic stop principles,

	per the design given. (all components of tool to be the exercises of other machines) (50 hrs)	<p>construction of different types of stoppers.</p> <p>Strippers: Function, types of stripper, constructional details.</p> <p>Gauge: Function of gauge, types of gauge.</p> <p>Pilots: Purpose of pilot, types of pilot, function of pilot, different methods of piloting.</p> <p>Side cutter</p> <p>Shank and positioning</p> <p>Die Set: Different types of die set, die set components, die set material, types of die set, shut height.</p> <p>Presses: Classification of press, types of a press, parts of a press, press selection, strip feeding arrangement, die cushion.</p> <p>Blanking Tool: Construction, function of elements, related design.</p> <p>Piercing Tool: Construction, function of elements, related design.</p> <p>Ejector and shedders</p> <p>Progressive tool: Construction, function of elements, related design of progressive too.</p>
30.	<p>95. Identification and familiarisation of various types of hydraulic & pneumatic elements such as cylinder, valves, actuators and filters. (10 hrs)</p> <p>96. Study of simple hydraulic & pneumatic circuit. (40 hrs)</p>	<p>Basic principles of hydraulics/ pneumatics system, advantages and disadvantages of hydraulics and pneumatics systems, theory of Pascal's law, Brahma's press, Pressure and flow, types of valves used in hydraulics and pneumatics system.</p>
31.	<p>97. Measure Current, Voltage and Resistance using simple Ohm's Law Circuit and familiarizing multi-meter. (05hrs)</p> <p>98. Soldering Techniques. (05hrs)</p> <p>99. Step up and step down transformers. (05hrs)</p> <p>100. Working with Solenoids and Relays. (05hrs)</p> <p>101. Working of Motor & generators. (05hrs)</p> <p>102. Behaviour of Proximity Sensors. (05hrs)</p> <p>103. Behaviour of ultrasonic sensors. (05hrs)</p> <p>104. Logical operation of sensors. (05hrs)</p> <p>105. Limit & Level Control using Sensors. (05hrs)</p> <p>106. Interfacing of Sensors with Electrical Actuators. (05hrs)</p>	<p>Study of basic Electricals- Voltage –Current etc. Working of Solenoids, Inductors, Motors, Generator based On Electromagnetic Induction Principle</p> <p>Switches, Fuse and Circuit Breakers</p> <p>Introduction to Sensors--Fundamental of Sensor Proximity Sensors Classification and Operation-Proximity Sensor-Types Of Proximity Sensor And Their Working-Industrial Application</p> <p>Sensors for Distance and Displacement -LVDT-Linear Potentiometer -Ultrasonic and Optical Sensors-Industrial Application</p>
32.	107. Construct a compound tool as per the drawing using various tool room machines and equipments. (75 hrs)	<p>Compound Tool: Introduction, description of different parts and their function, calculation of clearance, construction.</p>

		-Shaving tool.
33.	108. Construct a progressive tool as per the drawing (145 hrs) 109. Prepare different types of documentation as per industrial need by different methods of recording information for the project. (05 hrs)	Bending tool: Principles of bending, plastic deformation due to bending, bending elements, blank length, bending stress, bending force, spring back, stripping “U” bend, effect of grain direction.
34.	110. Perform Periodic Lubrication system on Machines. (10 hrs) 111. Perform simple repair work. (15hrs) 112. Perform the routine maintenance with check list. (05 hrs) 113. Inspection of Machine tools such as alignment, levelling etc. (10 hrs) 114. Accuracy testing of machine tools such as geometrical parameters. (10 hrs)	Lubricating system-types and importance Maintenance: Definition, Types and its necessity. System of symbol and colour coding. Possible causes for failure and remedies.
35.	115. Construct a “V” bending tool as per the drawing (75 hrs)	Forming tool: Construction, function of elements, related design Drawing Tool: Description of drawing and deep drawing, deep drawing cylindrical cup, force acting on a component while drawing, metal flow during drawing, wrinkling and puckering, blank development, drawing force, press capacity, blank holding force, die and punch radius, draw beads, air vents, lubrication, number of draws drawing flanged components, metal flow in rectangular shells, fault occurring during deep drawing.
36.	116. Construct a draw tool (single stage) as per the drawing given using various machine tools and equipments. (75 hrs)	Factors effecting tool life Fine Blanking Tool
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

DURATION: 110 HOURS

CORE SKILL – EMPLOYABILITY SKILL	
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 known people, picture reading, gain confidence through role-playing and discussions on current happenings, job description, asking about someone's job habitual actions. Cardinal (fundamental) numbers ordinal numbers. Taking messages, passing on messages and filling in message forms, Greeting and introductions, office hospitality, Resumes or curriculum vitae essential parts, letters of application reference to previous communication.
2. IT Literacy	
Duration : 20 hrs Marks : 09	
Basics of Computer	Introduction, Computer and its applications, Hardware and peripherals, Switching on-Starting and shutting down of computer.
Computer Operating System	Basics of Operating System, WINDOWS, the user interface of Windows OS, Create, Copy, Move and delete Files and Folders, Use of External memory like pen drive, CD, DVD etc., Use of Common applications.
Word Processing and Worksheet	Basic operating of Word Processing, Creating, opening and closing Documents, use of shortcuts, Creating and Editing of Text, Formatting the Text, Insertion & creation of Tables. Printing document. Basics of Excel worksheet, understanding basic commands, creating simple worksheets, understanding sample worksheets, use of simple formulas and functions, Printing of simple excel sheets.
Computer Networking and Internet	Basic of computer Networks (using real life examples), Definitions of Local Area Network (LAN), Wide Area Network (WAN), Internet, Concept of Internet (Network of Networks), Meaning of World Wide Web (WWW), Web Browser, Website, Web page and Search Engines. Accessing the Internet using Web Browser,

	<p>Downloading and Printing Web Pages, Opening an email account and use of email. Social media sites and its implication.</p> <p>Information Security and antivirus tools, Do's and Don'ts in Information Security, Awareness of IT - ACT, types of cyber crimes.</p>	
3. Communication Skills		<p>Duration : 15 hrs</p> <p>Marks : 07</p>
Introduction to Communication Skills	<p>Communication and its importance</p> <p>Principles of effective communication</p> <p>Types of communication - verbal, non-verbal, written, email, talking on phone.</p> <p>Non-verbal communication-characteristics, components-Para-language</p> <p>Body language</p> <p>Barriers to communication and dealing with barriers.</p> <p>Handling nervousness/ discomfort.</p>	
Listening Skills	<p>Listening-hearing and listening, effective listening, barriers to effective listening, guidelines for effective listening.</p> <p>Triple- A Listening - Attitude, Attention & Adjustment.</p> <p>Active listening skills.</p>	
Motivational Training	<p>Characteristics essential to achieving success.</p> <p>The power of positive attitude.</p> <p>Self-awareness</p> <p>Importance of commitment</p> <p>Ethics and values</p> <p>Ways to motivate oneself</p> <p>Personal goal setting and employability planning.</p>	
Facing Interviews	<p>Manners, Etiquettes, Dress code for an interview.</p> <p>Do's & Don'ts for an interview.</p>	
Behavioral Skills	<p>Problem Solving</p> <p>Confidence Building</p> <p>Attitude</p>	
4. Entrepreneurship Skills		<p>Duration : 15 hrs</p> <p>Marks : 06</p>
Concept of Entrepreneurship	<p>Entrepreneur - Entrepreneurship - Enterprises:-Conceptual issue</p> <p>Entrepreneurship vs. management, Entrepreneurial motivation.</p> <p>Performance & Record, Role & Function of entrepreneurs in relation to the enterprise & relation to the economy, Source of business ideas,</p> <p>Entrepreneurial opportunities, The process of setting up a business.</p>	
Project Preparation & Marketing analysis	<p>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.</p>	
Institutions Support	<p>Preparation of Project. Role of Various Schemes and Institutes for self-</p>	

	employment i.e. DIC, SIDA, SISI, NSIC, SIDO, Idea for financing/ non financing support agencies to familiarizes with the Policies /Programmes & procedure & the available scheme.
Investment Procurement	Project formation, Feasibility, Legal formalities i.e., Shop Act, Estimation & Costing, Investment procedure - Loan procurement - Banking Processes.
5. Productivity	Duration : 10 Hrs. Marks : 05
Benefits	Personal / Workman - Incentive, Production linked Bonus, Improvement in living standard.
Affecting Factors	Skills, Working Aids, Automation, Environment, Motivation - How improves or slows down.
Comparison with developed countries	Comparative productivity in developed countries (viz. Germany, Japan and Australia) in selected industries e.g. Manufacturing, Steel, Mining, Construction etc. Living standards of those countries, wages.
Personal Finance Management	Banking processes, Handling ATM, KYC registration, safe cash handling, Personal risk and Insurance.
6. Occupational Safety, Health and Environment Education	Duration : 15 Hrs. Marks : 06
Safety & Health	Introduction to Occupational Safety and Health importance of safety and health at workplace.
Occupational Hazards	Basic Hazards, Chemical Hazards, Vibroacoustic Hazards, Mechanical Hazards, Electrical Hazards, Thermal Hazards. Occupational health, Occupational hygienic, Occupational Diseases/ Disorders & its prevention.
Accident & safety	Basic principles for protective equipment. Accident Prevention techniques - control of accidents and safety measures.
First Aid	Care of injured & Sick at the workplaces, First-Aid & Transportation of sick person.
Basic Provisions	Idea of basic provision legislation of India. safety, health, welfare under legislative of India.
Ecosystem	Introduction to Environment. Relationship between Society and Environment, Ecosystem and Factors causing imbalance.
Pollution	Pollution and pollutants including liquid, gaseous, solid and hazardous waste.

Energy Conservation	Conservation of Energy, re-use and recycle.	
Global warming	Global warming, climate change and Ozone layer depletion.	
Ground Water	Hydrological cycle, ground and surface water, Conservation and Harvesting of water.	
Environment	Right attitude towards environment, Maintenance of in -house environment.	
7. Labour Welfare Legislation		Duration : 05 Hrs. Marks : 03
Welfare Acts	Benefits guaranteed under various acts- Factories Act, Apprenticeship Act, Employees State Insurance Act (ESI), Payment Wages Act, Employees Provident Fund Act, The Workmen's compensation Act.	
8. Quality Tools		Duration : 10 Hrs. Marks : 05
Quality 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.	

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.	Engineering Drawing
1.	<p>Engineering Drawing: Introduction and its importance</p> <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.	<p>Drawing Instruments: their Standard and uses</p> <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.	<p>Lines:</p> <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.	<p>Lettering and Numbering as per BIS SP46-2003:</p> <ul style="list-style-type: none"> - Single Stroke inclined Upper case and Lower case numbers. - Practice of lettering and numbering
5.	<p>Sizes and Layout of Drawing Sheets</p> <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)
6.	<p>Drawing of Geometrical Figures: Definition, nomenclature and practice of</p> <ul style="list-style-type: none"> - Angle: Measurement and its types, method of bisecting. - Triangle-different types - Rectangle, Square, Rhombus, Parallelogram. - Circle and its elements.
7.	<p>Free hand drawing of</p> <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.	<ul style="list-style-type: none"> - Construction of Scales and diagonal scale

9.	Dimensioning: <ul style="list-style-type: none"> - Definition, types and methods of dimensioning (functional, non-functional and auxiliary) - Types of arrowhead - Leader Line with text
10.	Method of presentation of Engineering Drawing <ul style="list-style-type: none"> - Pictorial View - Orthogonal View - Isometric view
11.	Dimensioning practice: <ul style="list-style-type: none"> - 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
12.	. Construction of Geometrical Drawing Figures: <ul style="list-style-type: none"> - Different Polygons and their values of included angles. Inscribed and Circumscribed polygons. Conic Sections (Ellipse& Parabola)
13.	- Drawing of Solid figures (Cube, Cuboids, Cone, Prism, Pyramid, Frustum of Cone and Pyramid) with dimensions.
14.	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 - Piping joints and fittings
15.	Free Hand sketch of hand tools and measuring tools used in respective trades.
16.	Projections: <ul style="list-style-type: none"> - 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.
17.	Drawing of Isometric projection from Orthographic projection
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.	Design an open type Drill Jig
22.	Design an indexing type Drill Jig
23.	Design a single component holding milling fixture
24.	Design a gang milling fixture
25.	Design of Guide plate tool
26.	Draw a progressive tool with fixed stop
27.	Design of progressive tool with front acting trigger stop with detail drawing
28.	Design a progressive tool with side cutter
29.	Design a compound tool with direct knock out
30.	Design a “V” bending tool
31.	Design a progressive tool parting off methods
32.	Design a compound tool with indirect knock out
33.	Design a “U” bending tool
34.	Design a simple draw open tool
35.	Design a progressive tool with cut and carry method
36.	Design a Guide plate tool in AutoCAD
37.	Draw a progressive tool with fixed stop in AutoCAD
38.	Design a compound tool with direct knock out in AutoCAD
39.	Design of progressive tool with front acting trigger stop with detail drawing
40.	Design a progressive tool with side cutter
41.	Project drawings in AutoCAD

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

Sl. No.	Workshop Calculation and Science
1.	<u>Unit</u> : Systems of unit- FPS, CGS, MKS/SI unit, unit of length, Mass and time, Conversion of units
2.	<u>Fractions</u> : 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.
3.	<u>Square Root</u> : Square and Square Root, method of finding out square roots, Simple problem using calculator.
4.	<u>Ratio & Proportion</u> : Simple calculation on related problems.
5.	<u>Percentage</u> : Introduction, Simple calculation. Changing percentage to decimal and fraction and vice-versa.
6.	<u>Material Science</u> : 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.
7.	<u>Mass, Weight and Density</u> : Mass, Unit of Mass, Weight, difference between mass and weight, Density, unit of density, specific gravity of metals.
8.	<u>Speed and Velocity</u> : Rest and motion, speed, velocity, difference between speed and velocity, acceleration, retardation, equations of motions, simple related problems.
9.	<u>Work, Power and Energy</u> : 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.
10.	<u>Algebra</u> : Addition, Subtraction, Multiplication, Division, Algebraic formula, Linear equations (with two variables).
11.	<u>Mensuration</u> : Area and perimeter of square, rectangle, parallelogram, triangle, circle, semi-circle. Volume of solids – cube, cuboids, cylinder and Sphere. Surface area of solids – cube, cuboids, cylinder and Sphere.
12.	<u>Trigonometry</u> : Trigonometrical ratios, measurement of angles. Trigonometric tables
13.	<u>Heat & Temperature</u> : 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.
14.	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.
15.	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.
16.	- Area of cut-out regular surfaces: circle and segment and sector of circle.
17.	- Area of irregular surfaces. - Application related to shop problems.
18.	- Volume of cut-out solids: hollow cylinders, frustum of cone, block section. - Volume of simple machine blocks.
19.	- Material weight and cost problems related to trade.
20.	- Finding the value of unknown sides and angles of a triangle by Trigonometrical method.
21.	- Finding height and distance by trigonometry.
22.	- Application of trigonometry in shop problems. (viz. taper angle calculation).
23.	- Forces definition - Compressive, tensile, shear forces and simple problems. -Stress, strain, ultimate strength, factor of safety. -Basic study of stress-strain curve for MS.
24.	- Temperature measuring instruments. Specific heats of solids & liquids.
25.	- Thermal Conductivity, Heat loss and heat gain.
26.	- Average Velocity, Acceleration & Retardation. - Related problems.
27.	- Circular Motion: Relation between circular motion and Linear motion, Centrifugal force, Centripetal force
28.	Graph: - Read images, graphs, diagrams - bar chart, pie chart. - Graphs: abscissa and ordinates, graphs of straight line, related to two sets of varying quantities.
29.	Simple problem on Statistics: - Frequency distribution table - Calculation of Mean value - Examples on mass scale productions -Cumulative frequency -Arithmetic mean
30.	Acceptance of lot by sampling method (within specified limit size) with simple examples (not more than 20 samples).

31.	- Friction- co-efficient of friction, application and effects of friction in Workshop practice. Centre of gravity and its practical application.
32.	- Magnetic substances- natural and artificial magnets. - Method of magnetization. Use of magnets.
33.	- Electrical insulating materials. - Basic concept of earthing.
34.	- Transmission of power by belt, pulleys & gear drive. - Calculation of Transmission of power by belt pulley and gear drive.
35.	- Heat treatment and advantages.
36.	Concept of pressure – units of pressure, atmospheric pressure, absolute pressure, gauge pressure – gauges used for measuring pressure

BLOCK – II

DURATION: 09 MONTHS (39 weeks)

Industry level training

BROAD LEARNING TO BE COVERED IN INDUSTRY FOR TOOL & DIE MAKER (PRESS TOOL, JIGS & FIXTURE) TRADE:

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

DETAILS OF PRACTICAL SKILLS TO BE COVERED DURING INDUSTRY TRAINING FOR TOOL & DIE MAKER (PRESS TOOL, JIGS & FIXTURE) 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. Tool grinding/re-sharpening Technique – Purpose, Different methods and care while re-sharpening, Tools and Equipment used for ling etc.
4. Jig Grinding Machines - working Die Pillar Grindings.
5. Jig Boring Machines - working any plates Bore Grinding & eccentric Grindings.
6. Double Stroke Power Press Machine -- Working two stroke making e.g. Boules and Plates etc.
7. **Wire Cut-** Machining practice / observation on machine.
 - a. Identify different parts of EDM/ wire cut machining centres and read specification.
 - b. Perform machine starting and operating in reference point.
 - c. Identification of machine over travel limits on emergency.
 - d. Part program preparation entry, editing, and simulation on wire cut machine software of wire cut machine.
 - e. Carry out tool path tool path simulation.

8. Technique of designing & Tool design by different methods.
9. Manufacturing of Press tool, perform stage inspection and check for functionality.
10. Quality check and Inspection of Tools and Dies – Stage Inspection of Tools, Dies and profiles, sizes and accuracy. Inspection of additional tooling like Electrodes, Templates, Masters etc. Final inspection of the system incorporated in the Press tools, Jigs & Fixtures in respect of alignment, Matching, Feed System, Ejection System, etc. and product inspection.
11. Program generation & Simulation with CAD/CAM software for dies & tools.
12. Prepare different types of documentation as per industrial need by different methods of recording information, process planning and layout.
13. Identify potential causes for non conformities to quality assurance standards for different dies and tools – Trouble shooting – Rectification of tools – Maintenance of tools – Simple hydraulic/ pneumatic circuits.
14. Working knowledge of different types of Feeders and decoders.
15. Operation & maintenance of machines used in advance Sheet metal operation viz., fire blanking, shaving, deep drawing, notching, trimming.
16. Operation & maintenance of different types of presses viz., Transfer press, spotting press, pneumatic & hydraulic presses.
17. Working on die pillar grinding, any plates bore grinding & eccentric grinding and two stroke making e.g. bowls and plates etc.
18. Awareness on automation.

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 machining 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 them 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 75% of total skill set in Block-II for TDM (Press Tool, Jigs & Fixtures) 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
(PRESS TOOL, JIGS & FIXTURE)
(Dual mode)**

LIST OF TOOLS & EQUIPMENTS FOR 16 TRAINEES

TOOL AND DIE MAKER (PRESS TOOL, JIGS & FIXTURE)			
LIST OF TOOLS AND EQUIPMENT (For batch of 16 candidates)			
A. TRAINEES TOOL KIT			
Sl. No.	Name of the Tool & Equipments	Specification	Quantity
1.	Steel Rule	150 mm English and Metric combined	16 nos.
2.	Engineers Square	100 mm with knife edge	16 nos.
3.	Hacksaw frame adjustable with pistol grip	200-300 mm blade	16 nos.
4.	Centre punch	100 mm	16 nos.
5.	Dot punch	100 mm	16 nos.
6.	File flat bastard	300 mm	16 nos.
7.	File flat 2nd cut	250 mm	16 nos.
8.	Cleaning bench brush		16 nos.
9.	File flat safe edge	200 mm	16 nos.
10.	Cleaning brush	1"	16 nos.
11.	File triangular smooth	150 mm	16 nos.
12.	Hammer cross peen	0.5 kg	16 nos.
B: TOOLS AND EQUIPMENTS			
13.	Screw driver	150 mm	5 nos.
14.	Screw driver	200 mm	5 nos.
15.	Cleaning brush		5 nos.
16.	Oil can	250 ml	1 nos.

17.	File flat smooth	200 mm	5 nos.
18.	File flat second cut with safe edge	200 mm	5 nos.
19.	File half round bastard	300 mm	5 nos.
20.	File half round second cut	250 mm	5 nos.
21.	File triangular bastard	250 mm	5 nos.
22.	File triangular second cut	200 mm	5 nos.
23.	File round bastard	250 mm	5 nos.
24.	File square bastard	300 mm	5 nos.
25.	File square second cut	250 mm	5 nos.
26.	Knife edge file	150 mm	5 nos.
27.	Needle file assorted (12 nos.)	150 mm	5 nos.
28.	File card/ file spattle		5 nos.
29.	Scraper flat	250 mm	5 nos.
30.	Hammer Ball Peen	0.5 kg with handle	5 nos.
31.	Hammer Cross Peen	0.5 kg with handle	5 nos.
32.	Chisel cold flat	18 x 150 mm	10 nos.
33.	Chisel Cross Cut	10 x 3 x 200 mm	5 nos
34.	Chisel Half Round	10 x 250 mm	5 nos
35.	Chisel diamond point Chipping guard(Bench stop)	10 x 200 mm	5 nos 10 nos
36.	Scribing block universal	300 mm	2 nos
37.	C.I. Surface plate	300 x 300 mm	2 nos
38.	Granite Surface plate	600 x 600x80 mm	1 no
39.	Tap extractor	3 mm to 12 mm x 1.5 mm (easy out)	2 set
40.	Screw extractor sizes	1 to 8	2 set
41.	Taps and dies metric	5 mm to 12 mm complete set in a box	2 sets
42.	Twist Drill with St. Shank	Ø 1 to Ø 12 mm in steps of 0.5 mm	3 set
43.	Twist Drills	Dia 3.2, 4.1, 4.2, 5.2, 6.8, 8.5, 3.8, 4.8, 5.8, 7.7, 9.7, 11.7	2 nos. each

44.	Taper shank drills	Ø 12 mm to Ø 20 mm in steps of 1 mm	1 set
45.	D.E spanners	3-4 , 6-8, 10-12, 13-14, 15-16, 18-19, 20-22, 24-26 (8 spanners)	2 sets
46.	Letter punch	5 mm set	3 set
47.	Number punch	5 mm set	3 set
48.	Drill chuck	12 mm capacity with key	4 no.
49.	Allen key metric	3 to 12 mm set	3 sets
50.	Centre drills	No. 3, 4 & 5	5 each
51.	Parallel hand reamer	6 mm to 12 mm in steps of 2 mm with suitable wrench	2 set
52.	Star dresser		2 nos.
53.	Diamond dresser with holder		2 nos.
54.	Safety goggles (Personal Protective Equipments)		10 nos.
55.	Demagnetizer		1 no.
56.	Snips	200 mm	1 no.
57.	Workbench	150 cm x 80 cm x 75 cm with 150 mm vice (Each bench fitted with 2 vices)	10 nos.
58.	Bench Vice	150 mm	20 nos.
59.	Steel lockers for 20 trainees (Pigeon Cup Board)		2 nos.
60.	Steel cupboard	180 cm x 60 cm x 45 cm	6 nos.
61.	Metal rack	180 cm x 60 cm x 45 cm	1 nos.
62.	Fire extinguisher		2 nos.
63.	Fire buckets with stand		2 nos.
64.	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)	2 set
65.	Metric Screw pitch gauge-Range	0.4 -6 mm pitch 600 (21 leaves)	2 set
66.	Radius gauge	1 - 3 mm by 0.25 mm and 3.5-7mm by 0.5 mm (34 leaves)	2 no.
67.	Vernier height gauge	Range 300 mm, with 0.02 mm least count	2 no.

68.	Universal vernier caliper-Range	200 mm, with 0.02 mm least count	5 nos.
69.	Dial vernier caliper	0-150 mm, with 0.02 mm least count	2 nos.
70.	Vernier caliper-Range	300 mm Vernier scale 0.02 mm	2 nos.
71.	Vernier bevel protractor-Blade range	150 and 300 mm, dial 1 ⁰ , least count 5 (min.) with head, Acute Angle attachment	1 nos.
72.	Outside micrometer	0-25 mm, with 0.01 mm least count	5 nos.
73.	Outside micrometer	25-50 mm, with 0.01 mm least count	5 nos.
74.	Outside micrometer	50-75mm, with 0.01 mm least count	5 nos.
75.	Combination square sets	300 mm blade with square head, centre head, protractor head	1 set
76.	Telescopic gauge range	8 -150 mm (6 pcs/set)	1 set
77.	Sine bar with stopper plate	150 mm	1 no.
78.	Sine table with magnetic bed	200 mm length	1 no.
79.	Slip Gauge Box (workshop grade)	87 pieces per set	1 set
80.	Gauge block accessories consisting holders, half round jaws, scriber point, centre point, triangular straight edge (14 pcs/set)		1 set
81.	Central square Size	400 x 250 mm blade	1 no.
82.	V-Block-Approx.	32 x 32 x 41 mm with clamping capacity of 25 mm with clamps	2 pairs
83.	V-Block-Approx.	65x65x80 mm with clamping capacity of 50 mm with clamps	1 pair
84.	Magnetic V-Block	100x100x125 mm	2 pairs
85.	Angle plate	150 x 150 x 200 mm	2 no.
86.	Angle plate-adjustable	250x250x300 mm	1no.
87.	Inside micrometer Range	50-63 mm with std extension rods upto 200mm	1 set
88.	Depth micrometer	Range 0-25 mm, accuracy 0.01 mm with std set of extension rods.	1set
89.	Magnetic stand with magnetic base	60 x 47.5 mm and with universal swivel clamp, dial holding rod (150 mm) scriber	2 nos.

90.	Dial test indicator-Lever type- Range	0-0.8 mm Graduation 0.01mm, reading 0-50-0 with accessories	2 nos.
91.	Dial test indicator Plunger type-Range	0-10 mm , Graduation 0.01 mm, Reading 0-100 with revolution counter	2 nos.
92.	Bore gauge with dial indicator	(1 mm range, 0-0.01 mm graduation)-Range of bore gauge 18-150 mm Range of 7 – 18 mm	1 set
93.	Straight edge-Single beveled-Size	100 mm and 150 mm	5 each
94.	Tool makers clamp	50 mm & 75 mm	5 nos. each
95.	C clamp	50 mm & 75 mm	2 nos. each
96.	Pin Gauge set		1 set

C. TOOLS & EQUIPMENT OF ELECTRICAL & SENSORS

i) Electrical

97.	Digital Multimeter	0 – 400 Volt	2 no.
98.	Variable Resistance Box, Resistors	With 220 Ω , 150 Ω , 1k Ω , 33 Ω , 100 Ω , 1.2 Ω	1 each
99.	9V DC Battery With Cap		1 no.
100.	Dual Power Supply	(230V, 50Hz, Fuse-800mA)	1 no.
101.	Solder Iron, Solder Lead, PCB Board (Groove Board), Solder Wick	(350V)	1 set
102.	Inductor	(400 Turns, 200 Turns, 600 Turns, 1200 Turns) , I-Core , E-Core, U-Core, Laminated Core	1 each
103.	Relay, LED	(5V)	1 no.
104.	Function Generator	(230V, 50Hz, Watts-12VA, Fuse-150mA)	1 no.
105.	Bread Board		1 no.
106.	Synchronous Motor, Capacitor For Synchronous Motor	(240V, 60rpm), (0.8mf \pm 5% 450 VAC)	1 no.
107.	Power Chord, Connecting Probes, Single Strand & Multi strand Wires		As required

ii) Sensors

108.	Power Supply	(0-30V DC, 3A)	1 no.
109.	Sensor Kit		1 set
	i. Mounting Plate		
	ii. Power Distribution Box	(24V DC, 4A)	
	iii. Counter Box	(10-30V DC/0.05A)	
	iv. Indication Box	(24V Dc)	
	v. Material Box		
	vi. Inductive Sensor	(10-30 V DC, PNP, NO, 5mm (Range))	
	vii. Capacitive Sensor	(10-30 V Dc, PNP, NO, 2-8mm(Range))	
	viii. Magnetic Sensor	(10-60 V DC , PNP, NO, 60mm (Range))	
	ix. Ultrasonic Sensor	(20-30 V DC, PNP, NO, 80-300mm(Range))	
	x. Connecting Wires		
xi. Motor With Control Unit	(24V DC,1A)		

D. CUTTING TOOLS

110.	Side and face milling cutter	Ø 100 x 10 X Ø 27 mm	2 nos.
111.	Side and face cutter	Ø 80 x 10 X Ø 27 mm	2 nos.
112.	Cylindrical milling cutter	Ø 63 x 70 x Ø 27 mm	2 nos.
113.	Slitting Saw cutter	Ø 75 x 4 X Ø 27 mm	2 nos.
114.	Slitting Saw cutter	Ø 100 x 6 X Ø 27 mm	2 nos.
115.	Single angle cutter	Ø 75 x 16 x Ø 27mm – 60 ⁰	2 nos.
116.	Dovetail cutter	Dia 20 X 8 mm shank x 60 ⁰	2 nos.
117.	Single angle cutter	Ø 75 x 20 x Ø 27 – 45 ⁰	2 nos.
118.	Equal angle cutter	Ø75x 30 x Ø 27 - 90 ⁰	2 nos.
119.	Shell End Mill	Ø 50 x 36 x Ø 22 (preferably inserted tip type)	2 nos.
120.	Shell End Mill	Ø 75 mm x 50 x Ø 22 (preferably inserted tip type)	2 nos.
121.	Parallel shank end mills	Ø6, Ø10 and Ø 16 are (double fluted), Ø 20 mm & Ø 25mm (four fluted)	4 nos. each
122.	T slot cutter with parallel shank	Ø 17.5 x 8 mm width x dia.	2 nos.

		of shank 8 mm	
123.	Concave Milling cutter	Ø 63 x 6 radius/10 radius x Ø 27 mm	1 no. each
124.	Convex Milling cutter	Ø 63 x 6 radius / 10 radius x Ø 27 mm	1 no. each
125.	Disc type form milling cutter	(involute form -2 module, 20° pressure angle) (for gear cutting)	1 set
126.	Tool holder (straight) to suit	6, 8 mm sq. bit size	2 nos. each
127.	Parting tool holders to suit	3 and 4 mm thick tool blade.	2 nos.
128.	Boring bars with holders	to accommodate 4, 6 and 8 mm HSS tool bits	3 each
129.	Knurling tool (straight & diamond)		2 nos. each
E. GENERAL MACHINERY & INSTALLATION:			
130.	Sensitive drilling machine	capacity 1 to 13mm Motorized –with drill chuck and key etc.	1 no.
131.	Pillar/column type Drilling machine	25 mm capacity-motorized with drill chuck, key etc	1 no.
132.	Radial Drill machine to drill up to	32 mm diameter.	1 no.
133.	Power hacksaw machine to accommodate	21” or more length blade.	1no.
134.	Double ended Pedestal Grinder with	178 mm wheels(one fine and one rough wheel)	1 no.
135.	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.
136.	Shearing machine (lever type)hand operated complete with	300 mm blade length	1 no.
137.	<i>Arc and gas welding and cutting equipment (Not required if Welding Trade is available in the Institute)</i>		
	(i) Transformerwelding set 300 amps-continuous welding current with all accessories and electrode holder		1 no.
	(ii) Welding cable to carry 400 amps 50 meter with flexible rubber cover		1 set
	(iii) Lugs for cable		4 nos.
	(iv) Earth clamps		2 nos.

	(v) Arc welding table (all metal top)		1 set
	(vi) Oxy-acetylene gas welding set-equipment with hoses, regulator and other accessories		1 no.
	(vii) Gas welding table with positioner		1 set
	(viii) Welding torch tips of different sizes		4 nos.
	(ix) Gas lighter		1 no.
	(x) Trolley for gas cylinders		1 no.
	(xi) Chipping hammer		1 no.
	(xii) Gloves (Leather)		1 pair
	(xiii) Leather apron		1 no.
	(xiv) Welding torches 5 to 10 nozzles		1 set
	(xv) Spindle key for cylinder valve		1 no.
	(xvi) Welding goggles		2 pair
	(xvii) Welding helmets with coloured glass		10 sets
	(xviii) Tip cleaner		2 nos.
138.	Universal Milling Machine	<p>Longitudinal traverse 700 - 800 mm Cross traverse 250 - 400 mm Vertical traverse 200 - 350 mm Swivel of table on either side 45⁰ Speed range rpm 30 to 1800</p> <p>With universal dividing head, circular table, long arbors, slab arbor, slotting attachment, vertical indexing head, etc.</p>	1 no.
139.	Horizontal and Vertical milling machine	<p>Table Length x width 1350x310 mm Longitudinal traverse 700 - 800 mm</p>	1 no.

		<p>Cross traverse 200 - 265 mm</p> <p>Vertical traverse 300 - 400 mm</p> <p>Speed range rpm 20 to 1800</p>	
140.	Hydraulic Surface Grinding Machine	<p>Table</p> <p>Clamping area 600 x 178 mm (approximate)</p> <p>Grinding area 400 x 200 mm (approximate)</p> <p>Distance table-centre of spindle 400 - 500 mm (approximate)</p> <p>Table speed 1-25 m/min.</p> <p>With standard accessories like dust extractor with water separator, balancing device, table-mounted Radius-tangent wheel dresser, wheel flanges, etc.</p>	1 no.
141.	Tool & Cutter Grinder	<p>Largest diameter of cutter that can be ground 10-100 mm</p> <p>Max. admit between centers 230 mm</p> <p>Max. length of cutting edges ground 120 mm</p> <p>With standard equipment like adaptor bushes, cutter head holder assembly, adaptors, extension spindle, flanges fro grinding wheel, etc.</p>	1 no.
142.	Universal cylindrical Grinding Machine	<p>Max. dia ground (effective) 250 mm</p> <p>Max. grinding length 300 mm</p> <p>Height of centre 130 mm</p> <p>Max. distance between centers 340 mm</p> <p>With special accessories like face plate, steady, radius and face dressers, find hand feed attachment etc.</p>	1no.
143.	Polishing kit		1 no.

144.	Multimedia CNC teach ware and simulation software		2 nos.
145.	Desktop computers with latest configuration suitable for CAD/CAM necessary furniture		As per Annex-A
146.	CNC milling machine/ Vertical machining centre (VMC)	[specification as per Annex-A & A (II)]	As per Annex-A & A (II)
147.	CNC lathe/CNC turn Centre	[specification as per Annex-A & A (I)]	As per Annex-A & A (I)
148.	Co-ordinate measuring machine (optional)		01
149.	Profile projector (optional)		01
150.	Fly press (any model)	Minimum 2 tonne capacity	2 nos.
151.	Power press m/c (mechanical/Hydraulic)	Minimum 5 tonne capacity standard and required optional accessories	1 no.
F. SOFTWARES			
152.	Auto CAD	Latest version	21 Licence
153.	Solid Works	Latest Version	21 Licence

NOTE:

1. No additional items are required to be provided to the batch working in the second and third shift except the items under trainee's toolkit.
2. Institute having centralized computer lab may use the existing infrastructure to impart simulation training.

Tools & Equipments for Employability Skills

S 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-A

CNC Lab						
Space and Power Requirement						
1	Space Required (in Sq. Meter)	40 (For below 8(4+4) units) 65 (For above 8(4+4) units)				
2	Power Required (in KW)	6 (For below 4(2+2) units) 12.5 (For 4(2+2) & above units)				
CNC Lab Infrastructure						
S. N.	Name of Item	Category	Quantity		Unit	Remark
			4 (2+2) units & Above	Below 4 (2+2) units		
1	CNC turn Centre [specification as per Annex-A (I)]	Machine	1	NIL	No.	Refer Instructions
2	CNC Vertical Machining Centre [specification as per Annex-A (II)]	Machine	1	NIL	No.	Refer Instructions
3	Multimedia based simulator for CNC technology and interactive CNC part programming software for turning & milling with virtual machine operation and simulation using popular operation control system such as Fanuc, Siemens, etc. (Web-based or licensed based) (12 trainees + 1 faculty) <i>With help of this software the trainees should be able to Write, Edit, Verify & Simulate</i>	Software	17	17	users	
4	Desktop Computers compatible to run simulation software with LAN facility	Machine	17	17	No.	
5	Printer - (Laser/ Inkjet)	Machine	1	1	No.	Optional
6	Air Conditioner - Split - 2.0 Ton	Machine	1	1	No.	Optional
7	UPS - 2 KVA	Machine	1	1	No.	Optional
Instructions						

For units less than 4(2+2), ITI can enter into MoU with Facilitator who will provide the Training to Trainees admitted and undergoing training in above Trades.

- a) The Facilitator should be Government ITI, Engineering/ Polytechnic College, Recognized Training Institute, Industry, Private ITI (Facilitators are arranged in descending preference order). The Facilitator should have all the above training infrastructure. (Including CNC Machines and Multimedia software for CNC). If any of the facility is not available with facilitator then the same should be provided in the ITI. The facilities of CNC should be made available to ITI trainees at the time of examination. This clause should be part of MoU to be signed. The training provider must be within the range of 15 Km or within city whichever is less.

- b) **NOTE: -** *“It is on the discretion of the ITI that it may procure CNC simulation software with extra features in addition to the specification defined against CNC simulator”.*

ANNEXURE-A (I)

Detailed specification for CNC Lathe			
1.	MACHINE CAPACITY	Units	Size
a	Max. load on Chuck	Kg	Maximum 40
b	Machine weight nett	kg	1500 or higher
2.	SPINDLE		
a	Maximum spindle speed	RPM	4000 or higher
b	Type of drive	AC servo spindle motor (digital)	
c	Front Bearing Dia. (ID)	mm	60 or higher
3.	AXES		
a	X - axis Travel	mm	200 or higher
b	Z - axis Travel	mm	290 or higher
c	Rapid traverse - X	m/min	10/15 or higher
d	Minimum programmable command- X/ Z	mm	0.001
e	Programmable feed range - X, Z axes	mm/min	10 - 10000
f	Type of drive	AC servo motor	
g	Motor Torque - X axes	Nm	3 or higher
h	Motor torque - Z axis	Nm	6 or higher with brake
5.	ACCURACY as per ISO 230-2		
a	Positioning accuracy for X,Y & Z axes	mm	0.012
b	Repeatability for X,Y & Z axes	mm	±0.007
6.	CNC SYSTEM		
a	Control System	FANUC/Siemens	
b	Machine control panel	Feed rate, spindle speed override knob	
c	MPG (Manual pulse generator)	On machine operator panel	
d	CNC Features	Tool Offsets MDI	
7.	COOLANT/LUBRICATION		
a	Coolant tank Capacity	Litres	100 or higher
b	Coolant pump motor	kW	0.25
c	Coolant pump output	lpm	20 or higher
8.	POWER SOURCE		
a	Mains supply (± 10 %)		415 V, 3 Ph., 50Hz
b	Total connected load requirement		Approx. 15 kVA
9.	STANDARD EQUIPMENT		
a	Voltage Stabilizer	15 kVA	
b	Backup CD for PLC Ladder Logic	1 no.	
c	Machine lightning	1 no.	
d	Levelling pads and jacking screws	4 nos.	
e	Operation manual	1 no.	
f	Maintenance manual	1 no.	
g	Installation kit	1 no.	
h	Maintenance tool kit	1 no.	
10.	MAKES OF CRITICAL COMPONENTS		
a	LM Guideways	HIWIN/THK/PMI/STAR	

b	Ball Screws	HIWIN/THK/TSUBAKI/PMI/STAR/HMT/NSK				
c	Spindle Bearings	RHP/NSK/FAG/SKF/NRB				
d	Stabilizer	NEEL/SE RVOMAX/CONSUL/FARMAX				
e	Lubrication	CENLUBE/DROPCO				
f	Coolant Pump	RAJAMANE/GRU NDFOS				
11.	Cutting Tools & Tool Holders (for BT30 or BT40 as per machine supplied)					
S No.	Item	Quantity		Inserts	Quantity	
		1 year	3 years		1 year	3yrs
a.	OD turning tool	2	4	Suitable inserts	5 sets	15
b.	OD grooving tool	2	4	Suitable inserts	5 sets	15
c.	Thread cutting tool	2	4		20	60
d.	ID turning tool	2	4		20	60
e.	ID threading tool	2	4	Suitable inserts	10	30
f.	C spanner for tightening tools in holder	1	2			
g.	Magnetic dial stand	1	2			
h.	Mallet	2	4			
i.	Tap wrench	1	2			
j.	Hands tools set (spanners, Allen keys, etc.)	1 box				
k.	T Nuts, Strap clamps, Clamping Nuts and studs	1 set				
l.	Hands tools set (spanners, Allen keys, etc.,)	1 box				
m.	T Nuts, Strap clamps, Clamping Nuts and studs	1 set				

ANNEXURE-A (II)

Detailed specification for CNC Vertical Machining Centre			
1.	MACHINE CAPACITY	Units	Size
a	Table size	mm	500x250 or higher
b	Max. load on table	Kg	150 or higher
c	T slot dimension (N x W x P)	mm	3 x 14 x 100 or higher
d	Table height from floor	mm	800 ~ 900
e	Cast Iron grade for bed and saddle	Grade 25 or equivalent	
f	Machine net weight	kg	1500 or higher
2.	SPINDLE		
a	Spindle nose	BT30 / BT40	
b	Minimum distance (spindle nose to table)	mm	100 - 150
d	Maximum spindle speed	RPM	6000 or higher
e	Spindle power, continuous	kW	3.7 or higher
f	Type of drive	AC servo spindle motor (digital)	
g	Spindle bearing class	P4	
h	Front Bearing Dia. (ID)	mm	50 or higher
3.	AXES		
a	X - axis Travel	mm	300 or higher
b	Y - axis Travel	mm	250 or higher
c	Z - axis Travel	mm	250 or higher
d	Rapid traverse - X/Y/Z	m/min	20/20/20 or higher
e	Minimum programmable command- X/Y/ Z	mm	0.001
f	Programmable feed range - X, Y & Z axes	mm/min	10 - 10000
g	Type of drive	AC servo motor	
h	Motor Torque - X & Y axes	Nm	3 or higher
i	Motor torque - Z axis	Nm	6 or higher with brake
j	Ball screw - X, Y & Z axes (diameter x pitch)	mm	25 x 10 or higher
k	Ball screw finish - X, Y & Z axes	Ground and hardened	
l	Ball screw class - X, Y & Z axes	Pre-loaded with C3 or better	
m	Guideways - X, Y & Z axes	Antifriction linear motion guideway	
n	Guideways size - X, Y & Z axes	mm	25 or higher
o	Guideway precision - X, Y, & Z axes	P Class	
4.	AUTOMATIC TOOL CHANGER		
a	Number of tool pockets	Nos	8 or higher
b	Max tool diameter	mm	80 or higher
c	Tool selection	Bi-directional	
d	Tool shank type	BT30 / BT40	
e	Tool weight max	kg	2.5 for BT30 / 6 for BT40
f	Tool length max	mm	100 ~150 for BT30 / 150~200 for BT40
g	Tool change time (chip to chip)	sec	5 or lower
h	Tool clamp & unclamp	Disc Spring & Hydro-Pneumatic	
5.	ACCURACY as per ISO 230-2		

a	Positioning accuracy for X,Y & Z axes	mm	0.012
b	Repeatability for X,Y & Z axes	mm	±0.007
c	Geometrical Alignment		ISO 10791-Part 1
d	Accuracy of finish test piece		ISO 10791-Part 7
6.	CNC SYSTEM		
a	Control System	FANUC/Siemens	
b	Motors & Drives	Compatible with CNC controllers as mentioned above	
c	System resolution	0.001 mm	
d	Tool number display	On machine operator panel	
e	Machine control panel	Feed rate, spindle speed override knob	
f	MPG (Manual pulse generator)	On machine operator panel	
g	CNC Features	Graphic Simulation, Programming help, Tool Offsets MDI,	
		Absolute/Incremental Positioning, Pitch error compensation	
7.	COOLANT/LUBRICATION		
a	Coolant tank Capacity	Litres	100 or higher
b	Coolant pump motor	kW	0.37
c	Coolant pump output	lpm	20 or higher
d	Lubrication type		Automatic centralized lubrication
e	Lubrication tank capacity	Litres	3 or higher
8.	AIR COMPRESSOR FOR TOOL UNCLAMP		
a	Compressor Type		Screw type with dryer, filter & air receiver
b	Tank capacity	litres	200 or higher
c	Air Flow	CFM	10 or higher
d	Pressure	bar	7 max.
9.	POWER SOURCE		
a	Mains supply (± 10 %)		415 V, 3 Ph., 50Hz
b	Total connected load requirement		Approx. 15 kVA
10.	STANDARD EQUIPMENT		
a	Voltage Stabilizer	15 kVA	
b	Air conditioning unit for electrical cabinet	1 no.	
c	Backup CD for PLC Ladder Logic	1 no.	
d	Machine lightning	1 no.	
e	Levelling pads and jacking screws	4 nos.	
f	Operation manual	1 no.	
g	Maintenance manual	1 no.	
h	Installation kit	1 no.	
i	Maintenance tool kit	1 no.	
j	6 rack tool trolley (Size 25"x22"x45") with lock	1 no.	
h	Machine guarding with safety compliance	1 no.	
11.	MAKES OF CRITICAL COMPONENTS		
a	LM Guideways	HIWIN/THK/PMI/STAR	
b	Ball Screws	HIWIN/THK/TSUBAKI/PMI/STAR/HMT/NSK	
c	Spindle Bearings	RHP/NSK/FAG/SKF/NRB	
d	ATC	PRAGATI/GIFU	
e	Panel AC	WERNER FINLEY/RITTAL/LEXTECNOID	
f	Stabilizer	NEEL/SE RVOMAX/CONSUL/FARMAX	
g	Lubrication	CENLUBE/DROPCO	

h	Coolant Pump	RAJAMANE/GRU NDFOS				
i	Cutting tools and holders	SANDVIK/TAEGUTEC/KEN NAMETAL/SECO/MITSUBISHI				
j	Air compressor (capacity:6 kg/cm ² - 300 lpm min.)	GODREJ/ELGI/KAESER/ATLASCOPCO				
12.	Cutting Tools & Tool Holders (for BT30 or BT40 as per machine supplied)					
S No.	Item	Quantity		Inserts	Quantity	
		1 year	3 years		1 year	3yrs
a.	Face mill 45 degree 63 mm., insert type	2	4	Suitable inserts	5 sets	15
b.	Face mill square shoulder 50 mm., insert type	2	4	Suitable inserts	5 sets	15
c.	Twist drill HSS straight shank 6, 6.7, 8.5, 9.7	2	4		20	60
d.	Spot drill Carbide, dia. 8 mm X 90°	2	4		20	60
e.	Drill insert type - 16 mm	2	4	Suitable inserts	10	30
f.	Solid carbide Twist drill straight shank - 8 mm	2	4			
g.	Solid carbide End mill straight shank - 10, 12 mm dia.	2	4			
h.	End mill insert type straight shank - 16 mm dia.	2	4	Suitable inserts	10	30
i.	Machine Taps HSS - M8, M10	2	4		10	30
j.	Solid carbide Reamer straight shank - 10 mm	2	4		10	30
k.	Finish boring bar dia. 20 to 25 mm	1	3	Suitable inserts	10	30
l.	Holder for face mills (Adapter)	2	4		20	60
m.	Collets for above drills, reamers, end mills	2 sets	4 sets			
n.	Collet holder suitable for collets	4	4			
o.	Side lock holder for 16 mm insert drill	1	2			
p.	Machine vice 0-150 mm range - Mechanical type	1	1			
q.	C spanner for tightening tools in holder	1	2			
r.	Magnetic dial stand	1	2			
s.	Mallet	2	4			
t.	Tap wrench	1	2			
u.	Hands tools set (spanners, Allen keys, etc.,)	1 box				
v.	T Nuts, Strap clamps, Clamping Nuts and studs	1 set				
w.	Hands tools set (spanners, Allen keys, etc.,)	1 box				
x.	T Nuts, Strap clamps, Clamping Nuts and studs	1 set				

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 Enrolment :								
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

List of members attended the Trade/ Expert Committee meeting to finalize syllabus **TDM (Press Tool, Jigs & Fixtures)** trade under Dual System of Training and alignment with NSQF level held at Conference Hall, PTI Building, New Delhi on 14th September' 2017

Sl. No.	Name & Designation	Organization with Address	Remarks
1.	Deepankan Mallick, DDG (C&P)	DGT, MSDE, New Delhi	Chairman
2.	Ashwani Rathore, Associated Vice President-SBU	Minda Silca Engg. Pvt. Ltd. Greater Noida	Member
3.	Sanjay Kumar, DT (C&P)	DGT, MSDE, New Delhi	Member
4.	Dr. Ranganath M. Singari, Professor	Delhi Technological University	Member
5.	A.K. Sehgal, Dean (Technical)	DITE, New Delhi	Member
6.	R.D. Sharma, Asst. Manager (Trg.)	DITE, New Delhi	Member
7.	Dr. Narayan Agrawal, DEAN (Academics) & HOD (Tool Engg.)	DITE, New Delhi	Member
8.	Diwakar Sharma, Proprietor	D.S. Tech, New Delhi	Member
9.	Amrit Pal Singh, DDT	DGT, MSDE, New Delhi	Member
10.	Ramchandra Mandal, DDT	CSTARI, Kolkata	Member
11.	Ajay Vashisht, Principal	ITI Arab Ki Sarai	Member
12.	Nirmalya Nath, ADT	CSTARI, Kolkata	Member cum Coordinator
13.	Pratap Singh, ADT	DGT, MSDE, New Delhi	Member
14.	Naman Bhatia, C.I.-Tool & Die	SCVR ITI, Dheerpur, Delhi	Member
15.	R.S. Upreti, G.I.	ITI Arab Ki Sarai	Member
16.	Umesh Kr. Sharma, C.I.	ITI Arab Ki Sarai	Member