

SYLLABUS FOR TOOLS & DIE MAKER (PRESS TOOLS, JIGS & FIXTURES) TRADE			
FIRST YEAR			
Duration	Reference Learning Outcome	Professional Skills (Trade Practical) With Indicative Hours	Professional Knowledge (Trade Theory)
Professional Skill 200 Hrs; Professional Knowledge 56 Hrs	Plan and organize the work to make job as per specification applying different types of basic fitting operation and check for dimensional accuracy following safety precautions. <i>[Basic fitting operation – Filing, Marking, Hack sawing, Drilling, Taping, chipping and Grinding etc. Accuracy: ± 0.1mm].</i>	<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. (01 hr.) 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.) 	<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.</p> <p>Operation of electrical mains and electrical safety.</p> <p>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: Health, Safety and Environment guidelines, legislations & regulations as applicable. (14 Hrs)</p>

		<p>10. Importance of trade training, List of tools & Machinery used in the trade. (01 hr.)</p> <p>11. Safe use of tools and equipments used in the trade. (01 hr.)</p> <p>12. Knowing games and memory training. (15 hrs.)</p> <p>13. Motivational talk by experts. (05 hrs.)</p> <p>14. 5S training. (03 hrs.)</p>	
		<p>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.)</p> <p>16. Familiarisation of bench vice. (01 hr.)</p> <p>17. Filing- File top of the “U” channel, check and measure with steel rule. (10 hrs.)</p> <p>18. Mark with scribe and steel rule. (01 hr)</p> <p>19. Measuring practice with steel rule, outside & inside callipers. (10 hrs.)</p>	<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. Description, use and care of marking table. (07 Hrs)</p>
		<p>20. File, mark straight and parallel lines with odd leg callipers/scribe 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</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 – scribe, Dividers, Dot punch, Centre</p>

		<p>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>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. (14 Hrs)</p>
		<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 grinding practice. (06 hrs.)</p> <p>29. 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>

			Cutting Speed, feed, depth of cut and Drilling time calculations. (07 Hrs)
		<p>30. Drill Plate filing to an accuracy of ± 0.05mm. (10 hrs.)</p> <p>31. Marking for centre punching, drilling, reaming, tapping, counter boring, counter sinking. (04 hrs.)</p> <p>32. Centre punching, drilling, reaming, tapping, counter boring, counter sinking on drill plate. (08 hrs.)</p> <p>33. Die pass on standard material (M8). (02 hrs.)</p> <p>34. Chipping flat surfaces along a marked line on pre-machined piece. (08 hrs.)</p> <p>35. Slot, straight and angular chipping. (08 hrs.)</p> <p>36. Cutting tool filing and grinding on standard material. (10 hrs.)</p>	<p>Dial test indicator-its parts, types, construction and uses. 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 standard system, BIS system. Study of tools used in chipping and scraping. (14 Hrs)</p>
<p>Professional Skill 125 Hrs;</p> <p>Professional Knowledge 35 Hrs</p>	<p>Make different fit of components for assembling as per required tolerance observing principle of interchangeability and check for functionality.</p> <p>[Different Fit –Open, Angular, & Square Fit; Required tolerance: ± 0.05 mm, angular</p>	<p>37. 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.) (07 Hrs)</p>

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	tolerance: 1 degree.]	<p>38. Make male & female for square fit with accuracy \pm 0.05 mm. (30 hrs.)</p> <p>39. Scrapping exercise on 3 pieces using two female piece of square fit. (20 hrs.)</p>	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. (14 Hrs)
		<p>40. Angular fitting with male & female. (40 hrs.)</p> <p>41. Assembly fit with male & female by dowelling and screwing. (10 hrs.)</p>	Getting to know the lathe with its main components, lever positions and various lubrication points as well. Definition of machine & machine tool and its classification. (14 Hrs)
Professional Skill 50 Hrs; Professional Knowledge 14 Hrs	Set different shaped jobs on different chuck and demonstrate conventional lathe machine operation observing standard operation practice. <i>[Different chucks:3 jaws & 4 jaws, different shaped jobs: round, square, hexagonal]</i>	<p>42. Identify & function of different parts of lathe. Practice on operation of lathe (dry/idle run). (25 hrs.)</p> <p>43. Setting lathe on different speed and feed. (5 hrs.)</p> <p>44. Cone turning using hand tools-radius external and internal. (20 hrs.)</p>	Introduction to lathe- its types. Centre lathe construction, detail function of parts, specification. Safety points to be observed while working on a lathe. (14 Hrs)
Professional Skill 100 Hrs; Professional Knowledge 28 Hrs	Prepare different cutting tool to produce jobs to appropriate accuracy by performing different turning operations. <i>[Different cutting tool – V tool, side cutting, parting, thread</i>	<p>45. Grinding of R.H. and L.H. tools, parting tool, Round nose tool. (05 hrs.)</p> <p>46. Checking of angles with angle gauge / bevel protractor. (02 hrs.)</p> <p>47. Grinding of “V” tools for threading of Metric/ British threads. (08 hrs.)</p> <p>48. Plain turning (holding in 4 – jaw chuck), step turning</p>	Different types of Lathe operations - facing, turning, parting-off, grooving, chamfering, boring etc. Lathe cutting tool-different types, shapes and different angles (clearance, rake etc.), specification of lathe tools. Types of chips, chip breaker. Tool life, factors affecting tool life.

<p><i>cutting (both LH & RH), Appropriate accuracy: $\pm 0.06\text{mm}$, Different turning operation – Plain, facing, drilling, boring (counter & stepped), grooving, Parallel Turning, Step Turning, parting, chamfering, U -cut, Reaming, internal recess, knurling.]</i></p>	<p>and forming shoulder, chamfering in between centres as per dimensions. (28 hrs.)</p> <p>49. Pillar turning between centres (07 hrs.)</p>	(14 Hrs)
	<p>50. Bush turning, drilling and boring/reaming. (10 hrs.)</p> <p>51. Spur gear blank turning, drilling and boring. (05 hrs.)</p> <p>52. Turning and die passing in a standard material. (03 hrs.)</p> <p>53. Pin punch turning and knurling (05 hrs.)</p> <p>54. Using 4 – jaw chuck; face both side of a plate thickness as per drawing. (02 hrs.)</p>	<p>Driving mechanism, speed and feed mechanism of Lathe. Slotter – Classification, principle, construction, Safety precaution. Comparative study with a shaping machine. Introduction and their indexing process on a Slotter by its Rotary table graduations.</p> <p>Driving mechanisms, quick return motion and speed ratio.</p> <p>Safety points to be observed while working on a Slotter.</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> <p>Vernier Bevel Protractor – parts, reading and uses. (07 Hrs)</p>
	<p>55. Eccentric turning male and female work pieces and assembly. (25 hrs.)</p>	<p>Various material for single point cutting tools, tip tools-their brazing and grinding process. Tool angles and their effects on cutting various material. (07 Hrs)</p>

<p>Professional Skill 25 Hrs; Professional Knowledge 07 Hrs</p>	<p>Set the different machining parameters to produce threaded components applying method/ technique and test for proper assembly of the components with an accuracy of ± 0.05 mm. <i>[Different threads viz., metric/ BSW/ Square]</i></p>	<p>56. External thread cutting on step turned work piece. (Metric, BSW & Square Thread) (15 hrs.) 57. Turn job for Internal thread and cut internal thread (10 hrs.).</p>	<p>Calculations of taper turning by off-setting tail stock. Sine Bar – description & uses Slip gauge –description and uses. (07 Hrs)</p>
<p>Professional Skill 150 Hrs; Professional Knowledge 42 Hrs</p>	<p>Set the different machining parameters and cutters to prepare job by performing different milling operation and indexing. <i>[Different machining parameters – feed, speed and depth of cut. Different milling operations – plain, stepped, angular, dovetail, T-slot, contour, gear milling]</i></p>	<p>58. Identification of milling machine. (02 hrs.) 59. Demonstrate working principle of Milling Machine. (04 hrs.) 60. Set vice & job on the table of Milling Machine. (05 hrs.) 61. Set arbor on the spindle of milling machine. (08 hrs.) 62. Set the cutter on arbor. (04 hrs.) 63. Safety points to be observed while working on a milling machine. (02 hrs.) 64. Demonstrate Up Milling and Down Milling Process. (05 hrs.) 65. Perform sequence of milling for six faces of a solid block 2 numbers. (13 hrs.) 66. Check the accuracy with the help of tri-square and</p>	<p>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. (07 Hrs) Job holding devices-vice, clamps, V-block, parallel block etc. Slotting tools-types, tool angles. Comparison of tool angle. Milling cutter holding devices, work holding</p>

		vernier height gauge. (02 hrs.) 67. Perform Step milling using side and face cutter checking with depth micrometer. (05 hrs.)	devices, milling process – Up milling and Down milling. (07 Hrs)
		68. Milling blank piece (plain milling). (10 hrs.) 69. Slot milling with side and face cutter (08 hrs.) and Slot cutting by slitting saw. (07 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. (07 Hrs)
		70. 90 ⁰ angular milling with equal angle cutter. (08 hrs.) 71. Dove tail milling. (09 hrs.) 72. Tee slot milling. (08 hrs.)	Use of tool with holder for internal operations. Precautions to be observed during slotting internal operations. Use of circular marks on the table for slotting curves. Chain, Sprocket and their applications. (07 Hrs)
		73. Step milling by straddle milling process. (09 hrs.) 74. Concave and Convex milling. (16 hrs.)	Spline – types and uses. Introduction to coolant & lubricant-difference between them, types and uses of each. (07 Hrs)
		75. Spur gear milling. (15 hrs.) 76. Key way slotting. (10 hrs.)	Dividing head – Introduction, construction, types. Simple and universal dividing head. Indexing methods – direct indexing, simple indexing, angular indexing, differential indexing and its calculations. (07 Hrs)

Professional Skill 100 Hrs; Professional Knowledge 28 Hrs	Produce components of high accuracy by surface grinding operation. <i>[Accuracy of +/- 0.02 mm]</i>	77. Identification of different types of grinding machine. (02 hrs.) 78. Wheel balancing & truing. (06 hrs.) 79. Dressing of grinding wheel. (02 hrs.) 80. 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. (07 Hrs)
		81. Grinding of step block in surface grinding machine with an accuracy of ± 0.01 mm. (15 hrs.) 82. 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. (07 Hrs)
		83. Set and perform angular grinding using sign plate to stranded angle. (20 hrs.) 84. Make slide fit (male/female) (12 hrs.) 85. Perform form grinding. (08 hrs.) 86. Taper angle fitting. (10 hrs.)	Specification and Identification of grinding wheels. (14 Hrs)
Professional Skill 75 Hrs; Professional Knowledge 21 Hrs	Produce components of high accuracy by cylindrical grinding operations. <i>[Accuracy of +/- 0.02mm.]</i>	Cylindrical grinding: 87. External Parallel grinding (Both holding in chuck/ collet and in between centres. (17 hrs.) 88. 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. (07 Hrs)
		Cylindrical grinding:	Selection procedure of

		89. Internal Parallel grinding (Both holding in chuck/collet and in between centres). (25 hrs.)	grinding wheels. Abrasives - its types, Bond, Grade, Grit, structure. Standard marking system of Grinding Wheel. (14 Hrs)
		90. Grinding of step in Cylindrical grinding machine with an accuracy of ± 0.01 mm (15 hrs.)	
		91. Grinding of external taper in Cylindrical grinding machine with an accuracy of ± 0.01 mm. (10 hrs.)	
Professional Skill 25 Hrs; Professional Knowledge 07 Hrs	Sharpen different cutter or multipoint cutting tool. [Different cutters – end mill cutter, side & face milling cutter, single angle cutter, Reamer]	92. Demonstrate and practice of grinding of end mill cutter of different sizes. (25 hrs.)	Tool & cutter grinder-construction, use and specification. (07 Hrs)
Professional Skill 100 Hrs; Professional Knowledge 28 Hrs	Develop isometric drawing and solid modelling of mould using CAD & Pro-E.	93. 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 modeling, View port. (50 hrs.)	AutoCAD: Introduction to AutoCAD, creating first drawing, learning the tools trade, organizing the work, drawing the first mould. (14 Hrs)
		94. Prepare solid modeling of simple mould with Pro-E [Sketch, Part (solid, surface, free style, flexible modeling, sheet metal.), Assembly, Creo direct,	Pro-E: Familiarization of interface/ Windows, Sketching, basic modeling, advanced modeling, assembling, drawing, surface modeling, manufacturing –

		<p>Creo simulate]. (25 hrs.)</p> <p>95. Creating (NC assembly and mould cavity) drawing. (10 hrs.)</p> <p>96. Part drawing of the universal coupling assembled all the parts and solid modeling and denoted by coloured combination. (15hrs.)</p>	<p>mould design awareness. (14 Hrs)</p>
<p>Professional Skill 50 Hrs;</p> <p>Professional Knowledge 14 Hrs</p>	<p>Set the welding plant with appropriate parameters & perform different welding operations. [Appropriate parameter- electrode size, voltage, current, position, travel speed, torch angle.]</p>	<p>97. Introduction to gas welding/ arc welding/ MIG welding equipment, simple welding and brazing practice. (25 hrs.)</p> <p>98. Practice on die welding, welding on hardened die block as well as on die casting dies. (25 hrs.)</p>	<p>Explanation of gas welding, arc welding and MIG welding techniques description of welding equipments and welding joints.</p> <p>Knowledge about flux, filler rod material.</p> <p>Die welding techniques. (14 Hrs)</p>
<p>In-plant training/ Project work</p> <p>Broad area</p> <p>a) Tool Maker's Clamp</p> <p>b) Grinding Wheel Dressing Fixture</p>			

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SECOND YEAR			
Duration	Reference Learning Outcome	Professional Skills (Trade Practical) With Indicative Hours	Professional Knowledge (Trade Theory)
Professional Skill 50 Hrs; Professional Knowledge 18 Hrs	Manufacturing of drill Jig and produce component on drill machine by using Jigs and check for correctness. (Simple template & Plate Jig)	99. Make simple drilling jig (12 hrs.) 100. Use simple Jigs for drilling, reaming and tapping. (03 hrs.) 101. Manufacturing of indexing jigs. (13 hrs.) 102. Manufacturing of ring jigs, box jigs, and diameter jigs. (10 hrs.) 103. Manufacturing of channel jig, sandwich jig, tumble jig. (12 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. 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. (18 hrs.)
Professional	Manufacturing of	104. Manufacturing of milling	Types of press Tools/

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<p>Skill 50 Hrs; Professional Knowledge 18 Hrs</p>	<p>fixtures (milling, turning and grinding).</p>	<p>fixture and application. (12 hrs.) 105. Manufacturing of turning fixture and application. (13 hrs.) 106. Manufacturing of grinding fixture and application. (25 hrs.)</p>	<p>Operations: Guide Plate tool, piercing tool, blanking tool, progressive tool, compound tool, cut off tool, parting tool, etc. Theory of Shearing: Shearing Theory Description in Press Tool, Critical Stage of shearing. (18 hrs.)</p>
<p>Professional Skill 75 Hrs; Professional Knowledge 27 Hrs</p>	<p>Set (both job and tool) CNC lathe and produce components as per drawing by preparing part programme.</p>	<p>107. Study of CNC lathe, key board and specifications. (05hrs.) 108. Machine starting & operating in Reference Point, JOG, and Incremental Modes.(15hrs.) 109. Co-ordinate system points, assignments and simulations Absolute and incremental programming assignments and simulations.(20hrs.) 110. Co-ordinate points, assignments and simulations. Identification of machine over travel limits and emergency stops. (10hrs.) 111. Work and tool setting. Automatic Mode operation: facing, profile turning, drilling, tapping, reaming, thread cutting etc. (25hrs.)</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-Oi-T. Co-ordinate systems and Points. CNC lathe, Types, Machine axes. (27 hrs.)</p>

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<p>Professional Skill 75 Hrs; Professional Knowledge 27 Hrs</p>	<p>Set (both job and tool) CNC machining centre and produce components as per drawing by preparing part programme.</p>	<p>112. Study of CNC Machining centre, key board and specifications. (05 hrs.) 113. Machine starting & operating in Reference Point, JOG, and Incremental Modes. (10 hrs.) 114. Co-ordinate system points, assignments and simulations Absolute and incremental programming assignments and simulations. (15 hrs.) 115. Polar co-ordinate points, assignments and simulations. Identification of machine over travel limits and emergency stops. (20 hrs.) 116. 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-Oi-M latest) CNC Machine &Control specifications. CNC system organization Fanuc-Oi-M. Co-ordinate systems and Points. CNC Machines Milling, Types, Machine axes. (27 hrs.)</p>
<p>Professional Skill 50 Hrs; Professional Knowledge 18 Hrs</p>	<p>Perform 2D & 3D machining with CAM software.</p>	<p>117. 2D and 3D machining with CAM software. (50 hrs.)</p>	<p>Preparing for contour and profile machining. (18 hrs.)</p>
<p>Professional Skill 50 Hrs; Professional</p>	<p>Produce components using Electric Discharge machine (EDM) and Wire EDM</p>	<p>118. Identify different parts of EDM/ wire cut machining centres and read specification. (08</p>	<p>Safety precaution – Safe handling of tools, equipment of EDM/ wire cut machine.</p>

<p>Knowledge 18 Hrs</p>	<p>as per drawing by preparing part programme with accuracy of $\pm 0.02\text{mm}$.</p>	<p>hrs.) 119. Perform machine starting and operating in reference point. (08 hrs.) 120. Identification of machine over travel limits on emergency. (10hrs.) 121. Part program preparation entry, editing, and simulation on wire cut machine software of wire cut machine. (20 hrs.) 122. Carry out tool path tool path simulation. (4 hrs.)</p>	<p>Control specification and machine axes. Describe machine tool elements, feed drives. Advantage and disadvantage of wire cut machine. (18 hrs.)</p>
<p>Professional Skill 75 Hrs; Professional Knowledge 27 Hrs</p>	<p>Manufacturing of blanking (simple) die set for square/round/ rectangular/ elliptical component and verify the component. (individual)</p>	<p>123. Manufacturing die as per drawing dimension and maintain die clearance and die land, provide angular clearance after die land. (25 hrs.) 124. Manufacturing of Punch as per drawing dimension. (15 hrs.) 125. Manufacturing stripper plate bottom plate (die press) tap plate, punch holder, gauges and shank, thrust plate, stop pin. (35hrs.) (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. Land and angular clearance: Importance if angular clearance, methods of providing angular clearance. Basic design of guide plate tool. Alignment technique between Punch and Die while assembly. Guide Plate Tool: Construction, function of elements, related design. Cutting force: calculation of cutting force for press tool operations, selection of</p>

			<p>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. Die Block: Types of dies, requirement of die block. (27 hrs.)</p>
<p>Professional Skill 50 Hrs; Professional Knowledge 18 Hrs</p>	<p>Construct a Piercing & Blanking tool & test and verify the component. (Individual)</p>	<p>126. Construct a piercing and blanking tool as per the design given. (all components of tool to be the exercises of other machines) (50 hrs.)</p>	<p>Stoppers: Function, basic stop principles, 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 Progressive tool: Construction, function of elements, related design of progressive too. (18 hrs.)</p>
<p>Professional Skill 50 Hrs; Professional Knowledge 18 Hrs</p>	<p>Construct circuit of pneumatics and hydraulics observing standard operating procedure & safety aspect.</p>	<p>127. Identification and familiarisation of various types of hydraulic & pneumatic elements such as cylinder, valves, actuators and filters. (10 hrs.)</p> <p>128. 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. (18 hrs.)</p>
<p>Professional Skill 50 Hrs; Professional Knowledge 18 Hrs</p>	<p>Demonstrate function of basic electrical circuit and sensors.</p>	<p>129. Measure Current, Voltage and Resistance using simple Ohm's Law Circuit and familiarizing multi-meter. (05 hrs.)</p> <p>130. Soldering Techniques. (05 hrs.)</p> <p>131. Step up and step down transformers. (05 hrs.)</p> <p>132. Working with Solenoids and Relays. (05 hrs.)</p>	<p>Study of basic Electricals- Voltage –Current etc. Working of Solenoids, Inductors, Motors, Generator based On Electromagnetic Induction Principle Switches, Fuse and Circuit Breakers Introduction to Sensors-- Fundamental of Sensor Proximity Sensors</p>

		<p>133. Working of Motor & generators. (05hrs.)</p> <p>134. Behaviour of Proximity Sensors. (05 hrs.)</p> <p>135. Behaviour of ultrasonic sensors. (05 hrs.)</p> <p>136. Logical operation of sensors. (05 hrs.)</p> <p>137. Limit & Level Control using Sensors. (05 hrs.)</p> <p>138. Interfacing of Sensors with Electrical Actuators. (05 hrs.)</p>	<p>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. (18 hrs.)</p>
<p>Professional Skill 75 Hrs;</p> <p>Professional Knowledge 27 Hrs</p>	<p>Construct a Compound Tool & test and verify the component. (Group of 5 trainees)</p>	<p>139. Construct a compound tool as per the drawing using various tool room machines and equipments. (75 hrs.)</p>	<p>Compound Tool: Introduction, description of different parts and their function, calculation of clearance, construction. -Shaving tool. (27 hrs.)</p>
<p>Professional Skill 150 Hrs;</p> <p>Professional Knowledge 54 Hrs</p>	<p>Construct a Progressive tool & test and verify the component. (Group of 5 trainees)</p>	<p>140. Construct a progressive tool as per the drawing (145 hrs.)</p> <p>141. Prepare different types of documentation as per industrial need by different methods of recording information for the project. (05 hrs.)</p>	<p>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. (54 hrs.)</p>
<p>Professional Skill 50 Hrs;</p> <p>Professional Knowledge 18 Hrs</p>	<p>Plan and perform simple repair, overhauling of different machines and check for functionality. <i>[Different Machines – Drill Machine, milling</i></p>	<p>142. Perform Periodic Lubrication system on Machines. (10 hrs.)</p> <p>143. Perform simple repair work. (15 hrs.)</p> <p>144. Perform the routine maintenance with check list. (05 hrs.)</p>	<p>Lubricating system-types and importance</p> <p>Maintenance: Definition, Types and its necessity.</p> <p>System of symbol and colour coding.</p> <p>Possible causes for failure and remedies. (18 hrs.)</p>

	<i>machine and Lathe]</i>	<p>145. Inspection of Machine tools such as alignment, levelling etc. (10 hrs.)</p> <p>146. Accuracy testing of machine tools such as geometrical parameters. (10 hrs.)</p>	
<p>Professional Skill 75 Hrs;</p> <p>Professional Knowledge 27 Hrs</p>	<p>Manufacture “V” bending tool & test. (5 trainees in a group)</p>	<p>147. Construct a “V” bending tool as per the drawing (75 hrs.)</p>	<p>Forming tool: Construction, function of elements, related design</p> <p>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. (27 hrs.)</p>
<p>Professional Skill 75 Hrs;</p> <p>Professional Knowledge 27 Hrs</p>	<p>Construct a draw tool (single stage) and test to verify the component. (5 trainees in a group)</p>	<p>148. Construct a draw tool (single stage) as per the drawing given using various machine tools and equipments. (75 hrs.)</p>	<p>Factors effecting tool life Fine Blanking Tool. (27 hrs.)</p>
<p>Project work (assembly of drawing tool and test/ Draw die) (Component cup shape)/ Compound tool</p>			