

7. TRADE SYLLABUS

SYLLABUS- OPERATOR ADVANCED MACHINE TOOL			
FIRST YEAR			
Duration	Reference Learning Outcome	Professional Skills (Trade Practical) With Indicative Hours	Professional Knowledge (Trade Theory)
Professional Skill 300 Hrs; Professional Knowledge 84 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. [Basic fitting operation – marking, Hack sawing, Chiselling, Filing, Drilling, Taping and Grinding etc. Accuracy: $\pm 0.25\text{mm}$]	<ol style="list-style-type: none"> 1. Importance of trade training, List of tools & Machinery used in the trade. (2 hrs.) 2. Safety attitude development of the trainee by educating them to use Personal Protective Equipment (PPE). (3 hrs.) 3. First Aid Method and basic training. (2 hrs.) 4. Safe disposal of waste materials like cotton waste, metal chips/burrs etc. (2 hr.) 5. Hazard identification and avoidance. (1 hr.) 6. Identification of safety signs for Danger, Warning, caution & personal safety message. (3 hrs.) 7. Preventive measures for electrical accidents & steps to be taken in such accidents. (3 hrs.) 8. Use of fire extinguishers. (2 hrs.) 9. Practice and understand precautions to be followed while working in fitting jobs. (4 hrs.) 10. Safe use of tools and equipments used in the trade. (3 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>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: Health, Safety and Environment guidelines, legislations & regulations as applicable.</p> <p>Basic understanding on Hot work, confined space work and material handling equipment.</p> <p>(07 hrs)</p>

		<p>Basic Fitting</p> <p>11. Preparation of filing. (2 hrs.)</p> <p>12. Standing posture with respect to bench vice for filing. (4 hrs.)</p> <p>13. Marking lines on the job surface for filing to the marked lines. (5 hrs.)</p> <p>14. Gripping the job suitably in the vice jaws for filing. (5 hrs.)</p> <p>15. Balancing of file, using rough file. (4 hrs.)</p> <p>16. Measurement by using inside/ outside calipers and scale. (5 hrs.)</p>	<p>Basic Fitting</p> <p>Vice - purpose, types, description, size, construction method to use and maintenance.</p> <p>File - purpose, types, description, size and method to use. Use of file card, printing of file, convexity of file and proper filing technique.</p> <p>Rule - purpose, types, description and method to use.</p> <p>(07 hrs.)</p>
		<p>17. Use of simple measuring instruments such as steel rule, Vernier caliper, Inside/Outside Micrometer. (5 hrs.)</p> <p>18. Care and precaution to be observed in handling these instruments. (3 hrs.)</p> <p>19. Exercises on measurement of various geometrical shapes. (8 hrs.)</p> <p>20. Exercise on marking out according to simple blue prints, using steel rule, scribe, marking blocks & divider. (6 hrs.)</p> <p>21. Scribing lines on chalked or coloured (blue) surfaces of the work piece. (4 hrs.)</p> <p>22. Marking location of the position of holes & scribing circles using dividers. (2 hrs.)</p> <p>23. Use of Dot and Center Punch for punching the lines, centers and circles. (5 hrs.)</p> <p>24. Demo on filing operation, using</p>	<p>Divider - purpose, types, description and method to use.</p> <p>Scriber - purpose, types, description and method to use.</p> <p>Marking Block - purpose, types, description and method to use.</p> <p>Punch - purpose, types, description and method to use.</p> <p>Micrometer - purpose, types, construction, calculation of least count, method to use and read, care and maintenance.</p> <p>Vernier Caliper - purpose, construction, calculation of vernier constant, method to use & read, care and maintenance.</p> <p>(14 hrs.)</p>

		<p>rough file. (3 hrs.)</p> <p>25. Exercise of filing flanges of a channel for balancing of file. (4 hrs.)</p> <p>26. Filing flat surface and flange of a channel maintaining parallelism between them using outside caliper within + or - 0.5mm. (10 hrs.)</p>	
		<p>27. Exercises on filing to develop control and Field layout the dimensional features of the work piece using vernier height gauge, engineering square, angle plate and surface plate. (6 hrs.)</p> <p>28. Exercise on filing the adjoining sides Squareness with respect to one reference surface. Filing faces for maintaining flatness, squareness of adjacent side using try- square, parallelism between opposite sides and reducing thickness. (6 hrs.)</p> <p>29. Filing with second cut file to prepare smooth surfaces. (5 hrs.)</p> <p>30. Exercise on filing for maintaining dimensions within + or -0.1mm using vernier caliper. (8 hrs.)</p>	<p>Vernier height gauge - purpose, types, Construction, method to use and read, care and maintenance. Engineer's square - purpose, description and method to use. Surface Plate - purpose, description, method to use, care and maintenance. Angle Plate - purpose, description and method to use. (07 hrs.)</p>
		<p>31. Marking of profiles - combination of straight lines, circles, arcs and angles using scale, divider height gauge, protractor, combination set etc. (3 hrs.)</p> <p>32. Marking geometrical profiles on</p>	<p>Combination set - purpose, description and method to use. Vernier bevel protractor - purpose, description, calculation of vernier constant, method to read and use, care and maintenance. Bench Grinder - purpose, description,</p>

		<p>sheet metal and filing to mark lines. (3 hrs.)</p> <p>33. Sharpening of marking tools, use of bench grinder for sharpening of scribe, centre punch, dot punch, divider etc. (1 hr.)</p> <p>34. Marking on the job piece for saw cuts. (1 hr.)</p> <p>35. Gripping the job suitably in the vice jaws for hack sawing to dimensions. (1 hr.)</p> <p>36. Hack sawing various metallic pieces (mild steel, aluminum, copper, brass, stainless steel etc.) of different thickness and cross sections, within + or - 0.5mm using hack saw blades of different pitches. (6 hrs.)</p> <p>37. Hack sawing different lengths with hack saw frame in horizontal & vertical positions Sawing along the parallel marked lines within 0.5mm allowance for filing. (6 hrs.)</p> <p>38. Hack sawing and filing steps and slots and open fitting of finished pieces. (4 hrs.)</p>	<p>procedure and precautions to be observed during grinding of marking tools, chisels and drill bits.</p> <p>Hack saw - purpose, types, description, method to use and precautions to be taken during hack sawing.</p> <p>Hack saw blade - purpose, types, description, select ON/OFF appropriate grade, fixing of blade and precautions to be observed.</p> <p>(07 hrs.)</p>
		<p>39. Hammering practice on vertical hold round job. (5 hrs.)</p> <p>40. Blind hammering practice. Stamping letters and numbers on M.S. plates. (5 hrs.)</p> <p>41. Exercise on stamping to develop judgment, control on hand and feel. (3 hrs.)</p> <p>42. Stamping practice on flat and round surfaces using flat,</p>	<p>Hammer - purpose, types, description, method to use and precautions to be observed.</p> <p>Bending of solid selections using fixtures. Letters and Numbers - purpose, description, method to use and precautions to be observed.</p> <p>Hollow Punch - purpose, description, method to use for preparations of</p>

		<p>cross cut and round nose chisels for chipping edges and square to the faces and edges. (8 hrs.)</p> <p>43. Checking with Try- square, use of cross peen hammer for stretching of metal strip. (4 hrs.)</p>	<p>gaskets and other packing materials. Pipe Fitting -material and types of pipes used in the trade. Method to cut, to thread and preparation of pipes for 'T' fitting elbow fitting, reducers etc. using unions. Method to fill ferrule. (07 hrs.)</p>
		<p>44. Preparation for drilling, marking out the position of holes and dot punching. (3 hrs.)</p> <p>45. Deepening the points with centre punch. (4 hrs.)</p> <p>46. Checking for centre distance. (1 hr.)</p> <p>47. Drilling practice on sensitive drilling machine using different types of drills and drill holding devices. (6 hrs.)</p> <p>48. Safety to be observed while working on drilling machine. (1 hr.)</p> <p>49. Marking, chain drilling and filing to produce square, round and triangular openings on 6mm thick plate. (6 hrs.)</p> <p>50. Preparing inserts and fitting in these openings.(2 hrs.)</p> <p>51. Drilling practice on varying thickness and different materials such as M.S., C.I., S.S., Cu, Brass, Nylon, Epoxy etc. (6 hrs.)</p> <p>52. Drilling on sheet metal, precautions and safety to be observed. (3 hrs.)</p> <p>53. Counter Sinking, counter boring, and spot facing</p>	<p>Drills - purpose, types, description, drill holding devices, method to use a drill with or without drill chuck (or collet) and precaution to be observed. Reamer -purpose, types, description, method to use, reaming allowance, coolant used and precautions to be observed during reaming. Drilling Machine with manual infeed, its purpose, types, description, drilling fixtures, method to drill and precautions to be observed during drilling. Procedure to be followed for counter sinking, counter boring, spot facing and reaming using bench drilling machine.</p> <p>Screw Threads - elements and forms screw threads single and multi-start thread, right and left hand thread. Taps and Tapping - purpose, types, description, precaution to be observed and method to use hand and machine taps during tapping. Types of coolant to be used. Calculation to drill size for tapping. Method to tap a blind hole, reasons for breakage of tap and method to</p>

		<p>operations using bench drilling machine. (3 hrs.)</p> <p>54. Exercise on reaming with hand reamers and machine reamers. (2 hrs.)</p> <p>55. Internal threading by hand using tap sets. (2 hrs.)</p> <p>56. External threading by split die and finishing of thread by die nut. (2 hrs.)</p> <p>57. Marking centre of a round bar with the help of 'V' block and clamp. (1 hr.)</p> <p>58. Drilling and reaming of blind holes along the axis of round jobs. (3 hrs.)</p> <p>59. Grinding of drills to specifications and checking of angles with gauges. (4 hrs.)</p> <p>60. Grinding of chisels. (1 hr.)</p>	<p>remove broken tap. Construction and method to use tap wrench. Die and dieing purpose, types, description and method to use and precaution to be observed. Description of die stock, procedure and precautions to be observed during dieing. (14 hrs.)</p>
		<p>61. Measurement of shaft and hole diameters using outside and inside micrometer. (2 hrs.)</p> <p>62. Filing round out of square bar within $\pm 0.1\text{mm}$. Filing to an accuracy of $\pm 0.1\text{ mm.}$, checking with an outside micrometer. (6 hrs.)</p> <p>63. Preparation of plates for a gauge fitting. (3 hrs.)</p> <p>64. Exercise on filing radius and angular filing using templates and gauges. (5 hrs.)</p> <p>65. Filing templates and gauges for checking lathe tool angles. (5 hrs.)</p> <p>66. Exercise on step and taper turning. (4 hrs.)</p>	<p>Defining and explanation of the elements of interchangeable system basis size, limits, tolerance, allowances. System of limits, fit and tolerances types of fit. Hole basis and shaft basis. Newal, British, I.S.I./B.S.I. systems, examples of fixing limit for various types of fit commonly met within the machine. (07 hrs.)</p>

		<p>67. Filing of various angle & clearances of lathe tool on square blanks. (6 hrs.)</p> <p>68. Checking with templates & gauge already prepared. (2 hrs.)</p> <p>69. Use of combination & round nose pliers to make different shapes/profiles by bending wire to match the blue print to develop manipulative skills, hand control & eye judgment. (5hrs.)</p> <p>70. Cold riveting. (3 hrs.)</p> <p>71. Marking out location of holes for riveting. (2 hrs.)</p> <p>72. Use of dolly and snap for forming rivet heads. (3 hrs.)</p> <p>73. Lap and butt joint by cold riveting. (4 hrs.)</p>	<p>Gauges & Template-purpose, types, description and method to use dial test indicator. Limit gauges - purpose, types, construction and method to use limit gauges. (07 hrs.)</p>
		<p>74. Cutting of sheet metal with chisel. Marking parallel clamp, 'C' clamp or micrometer stand using acquired skills. (8 hrs.)</p> <p>75. Simple project work. (17 hrs.)</p>	<p>Sheet metal work-purpose, types, description and method to use snip & stake. Description and method to use hand shear. Rivets & riveting-types & description of rivets. Method of lap & butt joint using dolly and snap. Cold & hot working of strips & pipes-method of bending solid sections, using fixtures for different physical conditions. Use of cutters for pipes & method to bend in hot and cold condition using fixtures. (07 hrs.)</p>
<p>Professional Skill 25 Hrs; Professional Knowledge 07 Hrs</p>	<p>Plan & perform simple repair, maintenance of different machines and check for functionality.</p>	<p>BASIC MAINTENANCE SKILLS</p> <p>76. Using hand tools such as screw driver, single end/double end spanners, box nut spanners, ratchet spanners, circlip, pliers, wrenches,</p>	<p>BASIC MAINTENANCE SKILLS</p> <p>Screw drivers - purpose, types, description and method to use screw drivers. Spanners- purpose, types, description and method to use box, socket, tubular, hook</p>

	<i>[Different Machines – Drill Machine, Power Saw and Bench Grinder]</i>	<p>pullers, extractors, drift. (6 hrs.)</p> <p>77. Correct method to be used and care to be taken in using those tools. (9 hrs.)</p> <p>78. Lubrication of different parts of machines. (4 hrs.)</p> <p>79. Care and maintenance of machines. (6 hrs.)</p>	<p>spanner etc. Wrenches - purpose, types, description and method to use T-socket, monkey, ratchet, pipe wrenches etc. Purpose, description, precautions to be observed and method to use drift, pullers and extractors. (07 hrs.)</p>
<p>Professional Skill 100 Hrs;</p> <p>Professional Knowledge 28Hrs</p>	<p>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 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, knurling.]</i></p>	<p>BASIC TURNING</p> <p>80. Safety precautions to be observed while handling machines. (6 hrs.)</p> <p>81. Demonstration of change gear in the gearbox. (5 hrs.)</p> <p>82. Practice of holding work piece and tool using different devices. (9 hrs.)</p> <p>83. Exercises on plain, stepped, taper and form turning, knurling etc. (20 hrs.)</p> <p>84. Exercises on drilling, reaming, boring, counter boring etc. (18 hrs.)</p> <p>85. Screw thread cutting both internal and external of different types. (12 hrs.)</p> <p>86. Exercise on eccentric turning. (8 hrs.)</p> <p>87. Grinding of lathe tools. (2 hrs.)</p> <p>88. Simple projects such as hollow punch, pulleys, gear blanks, simple coupling etc. (20 hrs.)</p>	<p>TURNING</p> <p>Types, construction features working principles, functions, use accessories and attachments of lathe machine. Driving mechanism – cone pulley, all geared headstock, quick-change gearbox and apron mechanism. Types, materials and angles of the lathe cutting tools. Purpose and method to perform various lathe operations. Using accessories and attachments. Determination and use of cutting speed, feed. Coolant and its applications. Lubrication system. Periodical maintenance of Lathe. (28 hrs.)</p>
<p>Professional Skill 100Hrs;</p> <p>Professional Knowledge 28Hrs</p>	<p>Set the different machining parameters and cutters to prepare job by performing different milling</p>	<p>BASIC MILLING</p> <p>89. Safety precautions in handling machine. (8 hrs.)</p> <p>90. Demonstration of various parts of the milling machines. (12 hrs.)</p>	<p>MILLING :</p> <p>Construction features, working principles, types, functions. Use of accessories and attachment of milling machine. Types of milling cutters.</p>

	<p>operation and indexing. [Different machining parameters – feed, speed and depth of cut. Different milling operations – plain, face, angular, form, gang, straddle milling]</p>	<p>91. Practice on different work and tool holding devices. (15 hrs.) 92. Exercises on: (30 hrs.) i) Parallel and angular milling. ii) Grooving using mills. iii) Milling square/hexagon using indexing head. iv) Use of slotting attachment for cutting key ways. v) Simple projects such as jaw, claw, 93. Oldham coupling, spline cutting etc. (10 hrs.) 94. Lubrication of different parts. Care and maintenance of machine. (10 hrs.)</p>	<p>Different method of holding work piece and cutters. Milling operations such as plain, step, angular milling, slot and groove cutting. Gear nomenclature -definitions, symbols, explanation and gear cutting calculations. Explanation of cutting speed, feed and depth of cut. Coolant for different materials. Common fault, defects and their rectification. (35 hrs.)</p>
<p>Professional Skill 150Hrs; Professional Knowledge 42Hrs</p>	<p>Produce components of high accuracy by different operations using grinding. [Different operations – surface grinding, cylindrical grinding with an accuracy of ± 0.01 mm]</p>	<p>GRINDING 95. Safety precautions to be observed while using machine. (12hrs.) 96. Demonstration of various parts of the grinding machines. (18 hrs.) 97. Use of drive - both mechanical and hydraulic. (12 hrs.) 98. Grinding wheel specifications, mounting, balancing, truing and dressing of grinding wheels. (18 hrs.) 99. Lubrication of different parts and care & maintenance of grinding machine. (25 hrs.) 100. Practice on different work holding devices and grinding various jobs.(40 hrs.) 101. Other machining process:</p>	<p>Types of machines- Constructional features, working principle, types, functions and use of surface and cylindrical grinding machine. Grinding wheels and their specifications - grit, grain, size, structure, bond, grades etc. Procedure to use grinding wheels for balancing and truing. Method to hold work and grind wheel. Method to perform various grinding operation selecting proper speed, Feed. Importance of coolant. Method to detect common faults, their rectification and preventive maintenance of grinding machine. Study of hydraulic system used on the machine. (42 hrs.)</p>

		<p>(25 hrs.)</p> <ul style="list-style-type: none"> ✓ Shaping ✓ Planning ✓ Slotting ✓ Hobbing ✓ Broaching ✓ Finish machining process like <ul style="list-style-type: none"> • Types • Coated Abrasives (Sandpaper, Emory Cloth) • Belt Grinders • Solid Belt • Mesh Belt (Hold Grinding Fluid via Surface Tension) • Wire Brushing • Wire Provides Metal Cutting/Burnishing Action • Wire (Metal) Acts as Abrasive • Honing (Interior of Holes) • Lapping (Flat Surfaces) • Polishing • Buffing • Electro-Polishing • Magnetic Float Polishing (Ceramic Ball Bearings) • Barrel Finishing • Abrasive Flow 	
<p>Professional Skill 75 Hrs; Professional Knowledge 21 Hrs</p>	<p>Set different components of machine & parameters to produce taper/angular components and ensure proper assembly of the components. <i>[Different</i></p>	<p>ADVANCED MACHINING SKILLS TURNING</p> <p>102. Taper turning by using taper attachment. (15 hrs.)</p> <p>103. Taper turning by using a form tool. (15 hrs.)</p> <p>104. Internal and external taper turning and matching to mating parts. (15 hrs.)</p> <p>105. Eccentric turning practice. (15</p>	<p>ADVANCED MACHINING SKILLS TURNING</p> <p>Taper turning attachment and form tool. Care to be taken for boring, step boring and taper boring in a blind hole. . Procedure and care to be taken eccentric turning. (21 hrs.)</p>

	<i>component of machine: Form tool, Compound slide, tail stock offset; Different machine parameters- Feed, speed, depth of cut.]</i>	hrs.) 106. Boring and stepped boring, position boring. (15 hrs.)	
Professional Skill 50 Hrs; Professional Knowledge 14 Hrs	Set the different machining parameters to produce screw & multi start threaded components applying method/ technique and test for proper assembly of the components.	107. Various Screw threads cutting to suit male and female threaded components. (30 hrs.) 108. Multi start threads cutting- 2start. (20 hrs.)	Procedure for cutting various internal and external screw threads. Care to be taken during internal threading in a blind hole. (14 hrs.)
Professional Skill 150Hrs; Professional Knowledge 42Hrs	Set the different machining parameters and cutters to prepare components by performing different milling operation and indexing. <i>[Different machining parameters – feed, speed and depth of cut. Different components – Rack, Spur Gear, External Spline, bevel gear, Helical Gear, worm & work wheel.]</i>	MILLING 109. Gang milling - milling jobs of different shapes and dimensions by using gang-milling process. (20 hrs.) 110. Milling hexagonal holes on a plate by attachment. Milling splines (external). (20 hrs.) 111. Milling gears by both simple and differential indexing (15hrs.) 112. Helical milling - milling helical groove on vertical milling machine by a slab mill cutter. (25 hrs.) 113. Milling helical gears. (20 hrs.) 114. Milling bevel gears. (20 hrs.) 115. Milling a rack. (20 hrs.) 116. Cutting worm and worm wheel on a milling. (25 hrs.)	MILLING Different types of milling operations. Indexing methods and its applications. Different types of gear & its application. Different cutters used in gear cutting operations and cutter nomenclature. Procedures for milling helical groove by a slab mill cutter on vertical milling machine. Care and precautions to be taken during milling. Procedure for milling helical gears, bevel gears, rack, worm and worm wheel. (42 hrs.)
Professional	Measure	INSPECTION	INSPECTION

<p>Skill 50 Hrs; Professional Knowledge 14 Hrs</p>	<p>components using different instrument/ gauge and test machine tool accuracy. <i>[Different instrument/ gauges- limit gauges, Sine Bar, snip gauges, tool maker's microscope and profile projector; Simple Machines – Drill Machine, Power Saw and Lathe]</i></p>	<p>117. Familiarization with inspection and master gauge checking of finished product with limit gauges for their accuracy and usability. (4 hrs.) 118. Use of Sine Bar, snip gauges along with standard balls and rollers for measurement of taper. (6 hrs.) 119. Measuring with tool maker's microscope. (5 hrs.) 120. Testing of gears for its measurements and accuracy. (5 hrs.) 121. Use of profile projector. (5 hrs.) 122. Geometrical accuracy test of machine as per test chart. (25 hrs.)</p>	<p>Definition, description and use of worker's inspection and master gauge. Principle, construction and use of sine bar and sine center. Types and description of slip gauges, purpose, construction and method to use tool makers. Microscope and profile projector. (07 hrs.)</p> <p>Defects and remedies of turning, milling and grinding. Defects such as: Taper, Chattering, Poor Surface finish, Parallelism. (07 hrs.)</p>
<p>In-plant training/ Project work (indicative)</p> <ul style="list-style-type: none"> a) Drill extension socket b) V-belt pulley c) Tail Stock Centre (MT – 3) d) Taper ring gauge e) Taper plug gauge. (Morse taper – 3) f) Pedestal bearing g) Crank shaft h) Arbor with clamping nut i) Threaded mandrel j) Quick change tool post 			

SYLLABUS- OPERATOR ADVANCED MACHINE TOOL

SECOND YEAR

Duration	Reference Learning Outcome	Professional Skills (Trade Practical) With Indicative Hours	Professional Knowledge (Trade Theory)
Professional Skill 475Hrs.; Professional Knowledge 171 Hrs.	Set (both job and tool) CNC turning centre and produce components as per drawing by preparing part programme.	CNC FUNDAMENTALS 123. Familiarization of computer as CNC works station. (10 hrs.) 124. Communication between CNC and computer i.e. series, parallel port. (30 hrs.)	CNC FUNDAMENTALS Background application, block diagram, input devices, output devices, CPU. Memory, Use of computer as CNC workstation. Communication between CNC and computer. Introduction to CNC machine, Types, construction, Different elements of CNC machine, Comparison between conventional machines & CNC machines, Advantages & Disadvantages of CNC machines. Axis designation. (18 hrs.)
		125. Demo / Identification of different elements of CNC machine. (25 hrs.) 126. Construction & functions, Axis designation. (40 hrs.)	Familiarization with co-ordinate system. Types of co-ordinate system and their applications. Different types/functions of G codes & M codes used in CNC part programming. Different types of interpolation & its applications. (27 hrs.)
		127. Practice on exercises with different coordinate systems with linear & circular interpolation. (100 hrs.)	Cutter Radius comp Tool wear comp Tool nose radius comp Tool nomenclature, tool changecommand, work & tool offset. (36 hrs.)
		128. Writing the part program for both turning & milling manually and practice on simulation software. (80 hrs.)	Introduction to part programming for both turning & milling using geometrical information & technological information (G & M

		129. Selection of tools Practice of work & tool offset on simulator. (100 hrs.)	codes) such as feed, speed, depth of cut. (63 hrs.)
		<p>CNC TURNING</p> <p>130. Operating the CNC machine in different modes such as JOG, MPG, MDI/MDA. (20 hrs.)</p> <p>131. Procedure for reaching reference point. (10 hrs.)</p> <p>132. Practice on Work & Tool offset measurement. (20 hrs.)</p> <p>133. Program loading and machine setting. (20 hrs.)</p> <p>134. Executing the program in auto Single Block and auto continuous mode. (20 hrs.)</p>	<p>CNC TURNING</p> <p>Modes of operation such as JOG, MPG, REF, MDI/MDA. Program execution in different modes like auto SBL and auto cont. mode. Knowledge on CNC cutting tools-Geometry, material, cutting speed, feed, and depth of cut. Techniques of tool off-setting and tool setting. Prepare various programs as per drawing. (27 hrs.)</p>
Professional Skill 500 Hrs.; Professional Knowledge 180 Hrs.	Set (both job and tool) CNC machining centre and produce components as per drawing by preparing part programme.	135. Practice of contour program for different profiles on CNC simulation software. (125 hrs.)	Concept of contour programming for different profiles. (45 hrs.)
		136. Practice on CNC lathe. (35 hrs.)	Program for different cycles such as stock removal, Grooving, Threading, Undercut & canned/ fixed cycles Tool type chart, TNRC(G41 and G42). Surface finish-Primary and Secondary. Surface roughness related BIS symbols. (27 hrs.)
		137. TURNING - parallel, taper, step, radius, groove and threads of different pitches. (40 hrs.)	
		<p>CNC MILLING</p> <p>138. Operating the CNC machine in different modes such as JOG, MPG, MDI/MDA. (20 hrs.)</p> <p>139. Procedure for reaching reference point. (15 hrs.)</p> <p>140. Practice on Work & Tool offset measurement. (20 hrs.)</p> <p>141. Program loading and machine setting. (20 hrs.)</p> <p>142. Executing the program in auto SBL and auto cont. mode. (25 hrs.)</p>	<p>CNC MILLING</p> <p>Modes of operation such as JOG, MPG, REF, MDI/MDA. Program execution in different modes like auto SBL and auto cont. mode. Knowledge on CNC cutting tools-Geometry, material, cutting speed, feed, and depth of cut. Techniques of tool off-setting and tool setting. Prepare various programs as per drawing. (45 hrs.)</p>

		143. Practice on CNC Milling such as Facemilling, Edge milling, slot milling (Radial & circumferential), Pocket milling (square & circular), Application of Canned/Fixed cycles. (125 hrs.)	Programming for different operation such as Face milling, Edge milling, Slot milling(radial & circumferential) Tool type chart, Application and effect of Cutter radius compensation (G41 and G42). Surface finish- Primary and Secondary. Surface roughness related BIS symbols Programming for Pocket milling (square & circular) & Canned / Fixed cycles for hole machining. (45 hrs.)
		144. Prepare different Types of documentation as per industrial need by different methods of recording information. (25 hrs.)	Importance of Technical English terms used in industry –(in simple definition only)Technical forms, process charts, activity logs, in required formats of industry, estimation, cycle time, productivity reports, job cards.(09 hrs.)
		145. Practice of contour program for different profiles on CNC simulation software. (50 hrs.)	Concept of contour programming for different profiles. (18 hrs.)
Professional Skill 25 Hrs.; Professional Knowledge 09 Hrs.	Plan and perform simple repair and maintenance of different machines and check for functionality. <i>[Different Machines – Drilling Machine, milling machine and Lathe]</i>	146. Practice on routine maintenance, Periodic checking for lubrication, Hydraulic oil level, Hydraulic system pressure, chuck Pressure adjustment for different material. (12 hrs.) 147. Cleaning & adjusting the Pneumatic Filter, Pressure regulator & Lubricator. (13 hrs.)	Preventive Maintenance, Predictive Maintenance & Concepts of TPM. Difference between breakdown and preventive maintenance – Its importance in productivity, types. Normal procedure followed for maintenance of machine tool in the shop floor. Importance of centralized lubrication system, Hydraulics & pneumatics. (08 hrs.)
In-plant training/ Project work (Any Project to be done involving CNC machine also) a) Crank and slotted link mechanism b) Stub arbor with collet and nuts c) Compound gear train			