SYLLABUS FOR TOOL & DIE MAKER (DIES & MOULDS) TRADE			
FIRST YEAR			
Duration	**Reference Learning Outcome**	**Professional Skills (Trade Practical) With Indicative Hours**	**Professional Knowledge (Trade Theory)**
Professional Skill 200Hrs.; 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. *[Basic fitting operation – Filing, Marking, Hack sawing, Drilling, Taping, chipping and Grinding etc. Accuracy: ± 0.1mm].*	1. Introduction of trade skill and work application. (03hrs.) 2. Safety attitude development of the trainee by educating them to use Personal Protective Equipment (PPE). (06hrs.) 3. First Aid Method and basic training. (03hrs.) 4. Safe disposal of waste materials like cotton waste, metal chips/burrs etc. (03hrs.) 5. Hazard identification and avoidance. (03hrs.) 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. (03hrs.) 8. Use of Fire extinguishers. (08hrs.) 9. Practice and understand precautions to be followed while working in fitting jobs. (02 hrs.)	All necessary guidance to be provided to the newcomers to become familiar with the working of Industrial Training Institute system including store's procedures. Safe working practices. Soft Skills, its importance and Job area after completion of training. Importance of safety and general precautions observed in the industry/shop floor. Introduction of First aid. Operation of electrical mains and electrical safety. Introduction of PPEs. Response to emergencies e.g. power failure, fire, and system failure. Importance of housekeeping & good shop floor practices. Introduction to 5S concept & its application. Occupational Safety & Health: Health, Safety and Environment guidelines, legislations & regulations as applicable. (14 Hrs.)

		10. Importance of trade training, List of tools & Machinery used in the trade. (01 hr.) 11. Safe use of tools and equipments used in the trade. (01 hr.) 12. Knowing games and memory training. (13hrs.) 13. Motivational talk by experts. (05 hrs.) 14. 5S training. (03 hrs.)	
		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 hr.) 17. Filing- File top of the "U" channel, check and measure with steel rule. (10 hrs.) 18. Mark with scriber and steel rule. (01 hr) 19. Measuring practice with steel rule, outside & inside callipers. (10 hrs.)	Bench work – Metal working hand tools and devices –Work bench – vices – files – hacksaw – hammer – chisels – spanners – screw drivers – scrapers. Linear measurements- its units, steel rule dividers, callipers – types and uses, Punch – types and uses. Description use and care of marking table. (07 Hrs.)
		20. File, mark straight and parallel lines with odd leg callipers/scriber and steel rule as per drawing. (05 hrs.) 21. Dot punching and letter and number punching. (05 hrs.) 22. File "U" channel to size using straight edge, try-square and vernier calliper for measuring and checking- Accuracy +/-0.1mm. (25 hrs.) 23. Sawing different types of	Vernier calliper – its parts, principles, reading, uses and care. Outside micrometer – its parts, principles, reading, uses and care, vernier height gauge. Marking tools – scriber, Dividers, Dot punch, Centre punch. Marking out – Coordinates system, Rectangular – Polar – Rules for marking. Bevel protractor, combination

		metals of different sections-round piece and Angle Iron. (10 hrs.) 24. Prepare mushroom head on round bar by hammering. (05 hrs.)	set- their components, uses and cares. Pedestal grinder, star wheel dresser, safety precautions, care and maintenance. (14 Hrs.)
		25. Make "S" bend by Hammering on flat piece. (04 hrs.) 26. Grinding, centre punch, dot punch, flat chisel and scriber. (04 hrs.) 27. Drill gauge filing (06 hrs.) 28. Drill grinding practice. (06 hrs.) 29. Drill Centring Practice. (05 hrs.)	Marking media, marking blue, Prussian blue, red lead, chalk and their special application, description. Surface plate and auxiliary marking equipment, 'V' block, angle plates, parallel block, description, types, uses, accuracy, care and maintenance. Bevel protractor, combination set- their components, uses and cares. Drill, Tap, Die-types & application. Determination of tap drill size. Reamer- material, types (Hand and machine reamer), parts and their uses, determining hole size for reaming, Reaming procedure. Drilling machines-types and their application, construction of Pillar & Radial drilling machine. Countersunk, counter bore and spot facing tools and nomenclature. Cutting Speed, feed, depth of cut and Drilling time calculations. (07 Hrs.)
		30. Drill Plate filing to an accuracy of ±0.05mm. (10 hrs.) 31. Marking for centre punching, drilling, reaming, tapping, counter boring,	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

		counter sinking. (04 hrs.) 32. Centre punching, drilling, reaming, tapping, counter boring, counter sinking on drill plate. (08 hrs.) 33. Die pass on standard material (M8). (02 hrs.) 34. Chipping flat surfaces along a marked line on pre-machined piece. (08 hrs.) 35. Slot, straight and angular chipping. (08 hrs.) 36. Cutting tool filing and grinding on standard material. (10 hrs.)	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.)
Professional Skill 125 Hrs.; Professional Knowledge 35Hrs.	Make different fit of components for assembling as per required tolerance observing principle of interchangeability and check for functionality. [Different Fit – Open, Angular, & Square Fit; Required tolerance: ±0.05 mm, angular tolerance: 1 degree.]	37. Make Male & Female 'Open' fitting with accuracy ±0.05 mm. (25 hrs.)	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.)
		38. Make male & female for square fit with accuracy ± 0.05 mm. (30 hrs.) 39. Scrapping exercise on 3 pieces using two female pieces of square fit. (20 hrs.)	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. (14 Hrs.)
		40. Angular fitting with male & female. (40 hrs.) 41. Assembly fit with male & female by dowelling and	Getting to know the lathe with its main components, lever positions and various lubrication points as well.

		screwing. (10 hrs.)	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. *[Different chucks:3 jaws & 4 jaws, different shaped jobs: round, square, hexagonal]*	42. Identify & function of different parts of lathe. Practice on operation of lathe (dry/idle run). (25 hrs.) 43. Setting lathe on different speed and feed. (5 hrs.) 44. Cone turning using hand tools-radius external and internal. (20 hrs.)	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 28Hrs.	Prepare different cutting tool to produce jobs to appropriate accuracy by performing different turning operations.*[Different cutting tool – V tool, side cutting, parting, thread cutting (both LH & RH), Appropriate accuracy: ±0.06mm, Different turning operation – Plain, facing, drilling, boring (counter & stepped), grooving, Parallel Turning, Step Turning, parting, chamfering, U -cut,*	45. Grinding of R.H. and L.H. tools, parting tool, Round nose tool. (05 hrs.) 46. Checking of angles with angle gauge / bevel protractor. (02 hrs.) 47. Grinding of "V" tools for threading of Metric/ British threads. (08 hrs.) 48. Plain turning (holding in 4 – jaw chuck), step turning and forming shoulder, chamfering in between centres as per dimensions. (28 hrs.) 49. Pillar turning between centres (07 hrs.)	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. (14 Hrs.)
		50. Bush turning, drilling and boring/reaming. (10 hrs.) 51. Spur gear blank turning, drilling and boring. (05 hrs.) 52. Turning and die passing in a standard material. (03 hrs.)	Driving mechanism, speed and feed mechanism of Lathe. Slotter – Classification, principle, construction, Safety precaution. Comparative study with a shaping machine.

	Reaming, internal recess, knurling.]	53. Pin punch turning and knurling (05 hrs.) 54. Using 4 – jaw chuck; face both side of a plate thickness as per drawing. (02 hrs.)	Introduction and their indexing process on a Slotter by its Rotary table graduations. Driving mechanisms, quick return motion and speed ratio. Safety points to be observed while working on a Slotter. Concept of Orthogonal and Oblique Cutting. Chucks & different types of job holding devices on lathe and advantages of each type. Mounting and dismounting of chucks. Knurling-types, grade & its necessity. Vernier Bevel Protractor – parts, reading and uses. (07 Hrs.)
		55. Eccentric turning male and female work pieces and assembly. (25 hrs.)	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.)
Professional Skill 25 Hrs.; Professional Knowledge 07 Hrs.	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. *[Different threads viz., metric/ BSW/ Square]*	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.).	Calculations of taper turning by off-setting tail stock. Sine Bar – description & uses Slip gauge –description and uses. (07 Hrs.)
(Professional	Set the different machining	58. Identification of milling machine. (02 hrs.)	Milling Machine: importance, types, construction and

Skill 150Hrs.; Professional Knowledge 42Hrs.)	parameters and cutters to prepare job by performing different milling operation and indexing. *[Different machining parameters – feed, speed and depth of cut. Different milling operations – plain, stepped, angular, dovetail, T-slot, contour, gear milling]*	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.)	specification. Driving and feed mechanism of Milling Machine Nomenclature of milling cutters, different milling cutter angles, Milling cutter materials. (07 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 vernier height gauge. (02 hrs.) 67. Perform Step milling using side and face cutter checking with depth micrometer. (05 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 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.)	Use of tool with holder for internal operations. Precautions to be observed during slotting

		72. Tee slot milling. (08 hrs.)	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. Keyway 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 28Hrs.	Produce components of high accuracy by surface grinding operation. *[Accuracy of +/- 0.02 mm]*	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, anduses. 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	Specification and Identification of grinding wheels.

		stranded angle. (20 hrs.) 84. Make slide fit (male/female) (12 hrs.) 85. Perform form grinding. (08 hrs.) 86. Taper angle fitting. (10 hrs.)	(14 Hrs.)
Professional Skill 75 Hrs.; Professional Knowledge 21 Hrs.	Produce components of high accuracy by cylindrical grinding operations. *[Accuracy of +/- 0.02mm.]*	**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: 89. Internal Parallel grinding (Both holding in chuck/collet and in between centres). (25 hrs.)	Selection procedure of grinding wheels. Abrasives - its types, Bond, Grade, Grit, structure. Standard marking system of Grinding Wheel. (14Hrs.)
		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.;	Develop isometric drawing and solid modelling of mouldusing CAD &	93. Prepare simple mould design drawings with basics of AutoCAD viz., Basic and advanced 2D drafting, draw	AutoCAD: Introduction to AutoCAD, creating first drawing, learning the tools trade, organizing the work, drawing the

Professional Knowledge 28Hrs.	Pro-E.	commands, Constraints, Modify commands, Layers, Line types block, Texts, Attribute, Table, Dimensioning, Isometric, Solid modelling, View port. (50 hrs.)	first mould. (14 Hrs.)
		94. 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.) 95. Creating (NC assembly and mould cavity) drawing. (10 hrs.) 96. 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. (14 Hrs.)
(Professional Skill 50 Hrs.; Professional Knowledge 14 Hrs.)	Set the welding plant with appropriate parameters & perform different welding operations. *[Appropriate parameter- electrode size, voltage, current, position, travel speed, torch angle.]*	97. Introduction to gas welding/ arc welding/ MIG welding equipment, simple welding and brazing practice. (25 hrs.) 98. 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. (14 Hrs.)
In-plant training/ Project work **Broad area** a) Tool Maker's Clamp b) Grinding Wheel Dressing Fixture			

SYLLABUS FOR TOOL & DIE MAKER (DIES & MOULDS) TRADE			
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.	Produce components of high accuracy by different operations using Electric Discharge machine (EDM) and Wire EDM with accuracy of ± 0.02mm.	99. EDM machining practice/ observation on EDM machine exercises. (25 hrs.) 100. Machining practice on Wire EDM machine. (25 hrs.)	Electrical discharge machine (EDM) introduction principle of operation, advantages and disadvantages and its applications. Introduction principle of operation advantaged and disadvantaged and applications. (18hrs.)
Professional Skill 100 Hrs.; Professional Knowledge 36 Hrs.	Set (both job and tool) CNC lathe and produce components as per drawing by preparing part programme.	101. Study of CNC lathe, keyboardand specifications. (10 hrs.) 102. Machine starting & operating in Reference Point, JOG, and Incremental Modes. (10 hrs.) 103. Co-ordinate system points, assignments and simulations Absolute and incremental programming assignments and simulations. (25 hrs.) 104. Co-ordinate points, assignments and simulations. Identification of machine over travel limits and emergency stops. (25 hrs.) 105. Work and tool setting. Automatic Mode operation: facing, profile	**Safety Precautions:** Safe handling of tools, equipment & CNC machines, CNC turning with FANUC CNC CONTROL- (Fanuc-Oi-T latest) CNC Machine and Control specifications. CNC system organization Fanuc-0i-T**.** Co-ordinate systems and Points. CNC lathe,Types, Machine axes. (36 hrs.)

		turning, drilling, tapping, reaming, thread cutting etc. (30 hrs.)	
Professional Skill 75 Hrs.; Professional Knowledge 27 Hrs.	Set (both job and tool) CNC machining centre and produce components as per drawing by preparing part programme.	106. Study of CNC Machining centre, keyboard and specifications. (10 hrs.) 107. Machine starting & operating in Reference Point, JOG, and Incremental Modes. (10 hrs.) 108. Co-ordinate system points, assignments and simulations Absolute and incremental programming assignments and simulations. (18hrs.) 109. Polar co-ordinate points, assignments and simulations. Identification of machine over travel limits and emergency stops. (17hrs.) 110. Work and tool setting. Automatic Mode operation: Face Milling, profile milling, drilling, tapping, reaming etc. (20hrs.)	**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. (27 hrs.)
Professional Skill 75 Hrs.; Professional Knowledge 27 Hrs.	Construct a Hand Injection Mould and try out/ test the mould assembly.	111. Manufacture hand injection mould. (May use the plates used in turning, milling and grinding exercise). (70 hrs.) 112. Try out and rectification. (05 hrs.)	Hand injection mould Introduction to plastic material: Types of plastics, differentiation of plastics, Properties, application, fillers and additives and reinforced plastics. Mould terminology: Core, cavity, impression, runner, gate, sprue bush, mould base etc. Parting line: Types of parting line, mould matching (Bedding down), vent and relief.

			Requirement for ejection: Types of ejector grids, ejector elements and ejector system. Feed System: Sprue, runner, gate, types, design and calculations, vent design, balancing, etc. (27 hrs.)
Professional Skill 50 Hrs.; Professional Knowledge 18 Hrs.	Demonstrate function of basic electrical circuit and sensors.	113. Measure Current, Voltage and Resistance using simple Ohm`s Law Circuit and familiarizing multi-meter. (05 hrs.) 114. Soldering Techniques. (05 hrs.) 115. Step up and step-down transformers. (05 hrs.) 116. Working with Solenoids and Relays. (05 hrs.) 117. Working of Motor & generators. (05 hrs.) 118. Behaviour of Proximity Sensors. (05 hrs.) 119. Behaviour of ultrasonic sensors. (05 hrs.) 120. Logical operation of sensors. (05 hrs.) 121. Limit & Level Control using Sensors. (05 hrs.) 122. Interfacing of Sensors with Electrical Actuators. (05 hrs.)	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 Classification and Operation-Proximity Sensor-Types of Proximity Sensor and Their Working-Industrial Application Sensors for Distance and Displacement -LVDT-Linear Potentiometer -Ultrasonic and Optical Sensors-Industrial Application. (18 hrs.)
Professional Skill 150 Hrs.; Professional Knowledge 54 Hrs.	Construct of two cavity injection mould and try out component.	123. Develop isometric drawing and manufacture 2 cavity injection moulds in a group of 5 trainees using various tool room machines (conventional and non-conventional machines). (130 hrs.) 124. Try out component and	Shrinkage: Introduction mould life, cavity/core dimensions, and various shrinkage values for different plastic materials. Temperature controlling of moulds: Introduction, factors effecting the cooling of moulds, layout and sizing of cooling channel, cooling integer type

		rectification. (20 hrs.)	mould plate (core cavity, Bolster), cooling core and cavity inserts and sub inserts, mould cooling requirements and calculations. Injection moulding machines: Introduction, clamping system/ injection system terminologies and specifications, screw terminology construction of screw, types of moulding machines, and sequence in the moulding cycle. Selection of mould base, material and no. of cavities: Introduction, Selection of mould base and material, advantages and disadvantages of single/ multi-cavity mould, calculation of no. of cavities. Splits: External undercut components, methods of operation, split locking methods, splits safety arrangements. Side cores and side cavities: Introduction, moulding embedded side holes/ recess/slots, Design requirements for side core/ side cavities, internal side core/side cavities. Moulding internal under cuts/ threads: Definition, form pin/ split core/ side core, stripping internal under cuts purpose of threads in plastics, moulding internal threads, power and transmission system layout of impression, and moulding of external threads. (54 Hrs.)

Professional Skill 100 Hrs.; Professional Knowledge 36 Hrs.	Construct single cavity mould (Compression mould/ plunger type transformer mould).	125. Manufacture single cavity plunger type transfer mould in a group of 5 trainees using various tools room machine (conventional and non-conventional) OR Manufacture single cavity compression mould construct a single cavity compression mould in a group of 5 trainees using various tool room machine (conventional and non-conventional) (100 hrs.)	Moulding of thermoset materials: Introduction, processing method, compression moulding, definition, pellet, compression moulding types, advantages and disadvantages of semi positive and fully positive mould, automatic compression mould, mould heaters and thermo couples, etc., Transfer moulding, types of transfer moulding, advantages and disadvantages of transfer moulding, Injection moulding of thermo set material, Advantages and disadvantages of injection moulding of thermo set material, Compression/ transfer moulding defects. Surface finish: Mould polishing, different types and appearance required after finishing, overview of the process, standard specification of finish, mechanical equipment of mould polishing, finishing process, problems in mould polishing and solutions, surface treatment method. Multi day light mould: Introduction, under feet mould with reverse tapered sprue, floating runner plate, working system for floating cavity plate, other standard designs, some non-standard latch/ locks, some sample multi-day light design. Introduction of blow moulding, types of blow moulding advantage and disadvantage of

			blow moulding. Material used in blow moulding, blow moulding fault & remedy. (36 Hrs.)
Professional Skill 50 Hrs.; Professional Knowledge 18 Hrs.	Construct circuit of pneumatics and hydraulics observing standard operating procedure& safety aspect.	126. Identification and familiarisation of various types of hydraulic & pneumatic elements such as cylinder, valves, actuators and filters. (15 hrs.) 127. Study of simple hydraulic &pneumatic circuit. (35 hrs.)	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.)
Professional Skill 50 Hrs.; Professional Knowledge 18 Hrs.	Plan and perform simple repair, overhauling of different machines and check for functionality. *[Different Machines – Drill Machine, milling machine and Lathe]*	128. Perform Periodic Lubrication system on Machines. (10 hrs.) 129. Perform simple repair work. (15hrs.) 130. Perform the routine maintenance with check list. (05 hrs.) 131. Inspection of Machine tools such as alignment, levelling etc. (10 hrs.) 132. 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. (18 Hrs.)
Professional Skill 300 Hrs.; Professional Knowledge 108 Hrs.	Develop isometric drawing and construct two cavity moulds with side core. OR Construct an injection mould with side cavities (with cam pin) (two cavities rounded square	133. Develop isometric drawing and manufacture 2 cavity injection moulds with side cavities in a group of 5 trainees using various tool room machines (conventional and non-conventional) (250hrs.) 134. Assemble all the parts of mould and try-out and find out fault of component and	Hot runner mould: Definition, runner less mould, advantages and disadvantages of hot runner moulding system, type of hot runner system, valve system, selecting a hot runner system, advantages and disadvantages of insulated runner mould and modified insulated runner mould, starting/ restarting nozzles in a manifold application. Injection moulding

	bobbin)	rectification. (25 hrs.) 135. Prepare different types of documentation as per industrial need by different methods of recording information for the project. (25 hrs.)	defects:Introduction, common faults, possible problems and remedies, analysis of moulding problems and solutions. Other moulding processes: Blow moulding, Extrusion moulding, rotational moulding, thermo forming, sheet and film forming. Multi-color moulding: Introduction, multi-colormoulding, multi-material moulding and multi-process moulding. Joining of plastics: Introduction, assembly techniques, chemical bonding system, thermal welding methods, and assembly with fastness. Maintenance of mould: Introduction, upkeep and maintenance, types of maintenance of idle moulds, maintenance control, and frequency of maintenance. Die cast mould: Introduction to Die casting, Die casting, gating system design, force calculation, defects and remedies. Die and mould economics: Estimation and casting of mould raw material, machining hour rate, business transactions, cost of components, activity-based costing, estimation of moulds and standard items. (108 Hrs.)
Project work (assembly of the mould and trail) document preparation The cavity injection moulding (Glass cover/ radio knob) [The candidates should develop the isometric drawing with solid modelling for the mentioned project]			