

MODULAR PATTERN OF CRAFT INSTRUCTOR TRAINING

**TRADE : TOOL & DIE MAKER  
(PRESS TOOLS, JIG&FIXTURES)  
( 3MONTHS )**

**MODULE - I : TRADE TECHNOLOGY - 1**

# SYLLABUS FOR TOOL & DIE MAKER (PRESS TOOLS, JIG & FIXTURES)

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### TRADE TECHNOLOGY (TT- 1) – 3 MONTHS

Week No.	Ex. No.	Trade Practical	Trade Theory
1		Practice on measurement of various geometrical shapes. Filing surfaces flat & parallel $\pm 0.1\text{mm}$ .	Course objective, Importance of tool and die making in mass production of interchangeable components. Importance of safety-safety precaution in machine shop, general safety precautions related to Tool and die making. Introduction to measuring instruments- Micrometer, Vernier caliper, Vernier bevel protractor, Vernier depth gauge, Vernier height gauge, Height master, dial test indicators, pitch gauge, feeler gauge, Sine bar - use, care and maintenance.
2		Filing surfaces flat and parallel $\pm 0.04\text{mm}$ . Filing and finishing angles within $\pm 1$ degree. Filing jobs to an accuracy of $\pm 0.05\text{mm}$ .	SI unit's conversion from MKS to SI. Engineering materials-Ferrous and non-ferrous material, properties of material. Limits, fits & Tolerance terminology as per IS 919-1993. Classification of metal cutting file, grade of file, cut of file, convexity of file and special files and uses. Combination of hole and shaft for a particular fit Table for tolerance zones and limits.
3		Exercise on grinding single point cutting tool and multi-point cutting tool on pedestal grinder. Exercise on grinding of multipoint and single point cutting tool using tool and cutter grinder.	All types of hand tools – Types - Uses Grinding Machine and classification, constructional features. Description of single point cutting tool. Tool angles and its importance. Effects of tool setting and tool angles.
4		Practice on Drilling through holes, Practice on Blind hole, drilling on PCD with the accuracy of 0.2mm. Practice on reaming, tapping and die	Drilling machine- classification, application and operations, specification. Description of drills and elements. Selection of cutting speed, feed and drilling time. Reamer, taps and dies – types, uses, applications, care and maintenance
5		Alignment of lathe centre Exercise on Step turning Exercise on turning between centre $\pm 0.02\text{mm}$ . Exercise on boring holes within accuracy of $\pm 0.02\text{mm}$ .	Lathe-classification – constructional features, accessories, operation, application and specification. Different tool materials. Cutting tool angle and their function. Calculation of total machining time. Cutting coolant and its importance.
6		Exercise on Internal recessing, step boring Exercise on Taper turning Exercise on Thread cutting	Classification of lubricants and its importance. Classification of Tapers, Standard tapers and their, uses Methods of taper turning. Type of threads and their elements, applications.

Week No.	Ex. No.	Trade Practical	Trade Theory
7		<p>Exercise on plain milling <math>\pm 0.1\text{mm}</math>.</p> <p>Exercise on Milling keyway, splines</p> <p>Exercise on Angular block milling <math>\pm 1^\circ</math></p> <p>Exercise on dovetail milling, milling 'V' block</p>	<p>Milling machine-classification – constructional features, accessories, operation, application and specification.</p> <p>Milling cutter- nomenclature , classification, material and specification , cutting speed and feed calculation.</p> <p>Special milling attachments</p>
8		<p>Exercise on Milling and matching profile</p> <p>Exercise on milling jobs using simple indexing.</p> <p>Exercise on Form milling.</p>	<p>Gear cutting methods-calculation of gear cutting</p> <p>Indexing methods and calculations .</p> <p>Influence of tooth angles on cutter performance</p>
9		<p>Exercise on surface grinding .</p> <p>Exercise on cylindrical grinding, external, internal and taper jobs</p>	<p>Engineering materials-Properties and uses of ferrous and non ferrous metals - their alloys.</p> <p>Structure of steel and types of steel, alloy steel and its elements.</p>
10		<p>Exercise on Heat treatment process such as annealing, normalizing, hardening, tempering, case hardening</p> <p>Exercise on hardness testing machines</p>	<p>Heat treatment process.</p> <p>Change in the structure of steel during heating and cooling.</p> <p>Purpose of heat treatment and its effects on the properties of steel. Annealing, normalizing, hardening and tempering, Case hardening, surface hardening, carburizing, nitriding, flame hardening and induction hardening.</p> <p>Material testing, hardness, tensile and compressive strength, crack detection, non-destructive methods..</p>
11		<p>Introduction of AUTO CADD</p> <p>Practice on 2D drawing</p> <p>Practice on 3D drawing</p> <p>Design &amp; drawing of simple tool components.</p>	<p>Introduction of computer and uses</p> <p>Introduction to AUTO CADD and its related software</p> <p>AutoCAD – features and elements, Drawing of Line, circle, polygon, Editing feature , 3D drawing</p>
12		<p>Practice on Master Cam and Solid works.</p>	<p>Introduction to Master cam and solid works</p> <p>Revision &amp; Test</p>

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**MODULE - II : TRADE TECHNOLOGY - 2**

# SYLLABUS FOR TOOL & DIE MAKER (PRESS TOOLS, JIG & FIXTURES)

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### TRADE TECHNOLOGY (TT- 2) – 3 MONTHS

Week No.	Ex. No.	Trade Practical	Trade Theory
1		Manufacture of simple blanking tool	Introduction to tooling – Press Tool nomenclature, types of press tool and applications Shearing theory Press tool – cutting and non cutting operations Cutting clearance, Land and angular clearance. Calculations on estimating clearance
2		Manufacture of simple blanking and piercing tool	Stock material, strip layout and Economic factor Cutting force calculation punch and die - Types and materials Strippers types and functions
3		Practice on V" and "U" bending tool	Stoppers types and functions Pilot locations and sizes, Side cutters Working principle of Ejector and shedder Principle of "V", "U" bending and calculations
3		Manufacture of Progressive tool	Constructions of progressive tool, compound tool, and combination tool. Fine blanking –application, working principle, clearance tool life, punch and die radius. Tool estimation.
4		Manufacture of Combination tool and Compound tool	Deep draw tool function and calculation Introduction to Press:parts, functions, Classification of presses, and specification
5		Manufacture of Draw tool Trial out the component on fly press and power press	Shut height and day light clearance Safety precaution on press work Selection of press Strip feeding Die cushion

Week No.	Ex. No.	Trade Practical	Trade Theory
6		Trouble shooting Rectifications of tool Maintenance of tool Manufacture of Plate jig / Box jig	Introduction to jigs and fixtures Jig-Parts and function Advantages and uses, Economy and cost Planes and movement Clamping and work holding devices Drill bushes-types Types of drill jigs parts and functions
7		Manufacture of Milling fixture / grinding fixture	fixtures- Types-construction parts and functions Cutting tool used with fixtures
8		Practice on EDM spark operations Practice on EDM CNC wire cut operations	Introduction to EDM - spark and wire cut function EDM process (spark and wire cut ) Circulation of dielectric fluid Advantages of EDM Traveling wire EDM
9		Practice on CNC machining centre for simple components.	Introduction to CNC Machining center Design features of CNC machines Hardware and software Relative tool motions Cartesian coordinate system Writing a manual part programme & SUB-programme, Safety features.
10		Practice on jig boring and jig grinding machine.	Introduction, parts and functions of Pantograph die sinking jig boring, jig grinding, optical comparator, CMM, robotics.
11		Design of hydraulic circuit /pneumatic circuit for clamping	Principle of hydraulics and pneumatics - symbols used in hydraulic and pneumatic controls. Principle of operation - Actuators, compressor, pumps, Directional control valves, flow control valves, pressure control valves. servo valves, Accumulators.
12		Project work /test	Introduction on Quality control Inspection of tool and gauges Product inspection, awareness on ISO Review and Assessment Test

**TOOL & DIE MAKER (PRESS TOOLS, JIG & FIXTURES)**  
**LIST OF TOOL AND EQUIPMENT**  
 (For a batch or unit of 20 trainees)

**1. Trainee's tool kit**

SL NO	DESCRIPTION OF TOOLS	FOR INSTRUCTOR	FOR BATCH OF 20
1	Steel rule 150 mm British and metric combined	1No	20 Nos
2	Engineer's square 150 mm with knife edge	1No	20 Nos
3	Hacksaw frame adjustable with pistol grip for 200-300 mm blade	1No	20 Nos
4	Hammer cross pane 0.5kg with handle	1No	20 Nos
5	Chisel cold flat 18 x 150 mm	1No	20 Nos
6	Hammer cross pane 0.7kg with handle	1No	20 Nos
7	Chisel cross cut 10 x 3 x 200 mm	1No	20 Nos
8	Chisel half round 10 x 250 mm	1No	20 Nos
9	Chisel diamond point 10 x 200 mm	1No	20 Nos
10	Centre punch 100 mm	1No	20 Nos
11	Prick punch 150 mm	1No	20 Nos
12	File flat bastard 350 mm	1No	20 Nos
13	File flat 2 <sup>nd</sup> cut 250 mm	1No	20 Nos
14	File flat safe edge 200 mm	1No	20 Nos
15	File three square smooth 200 mm	1No	20 Nos
16	Needle file assorted (20 Nos) 150 mm	1No	20 Nos
17	Scraper flat 250 mm	1No	20 Nos
18	File card	1No	20 Nos
19	Safety goggles	1No	20 Nos

## 2. Tools and instruments

SL NO	DESCRIPTION OF TOOLS	FOR INSTRUCTOR
1	Caliper inside spring type 150 mm	4 Nos
2	Caliper outside spring type 150 mm	4 Nos
3	Divider spring type 150 mm	4 Nos
4	Odd leg caliper firm joint 150mm	4 Nos
5	Screw driver 150 mm	4 Nos
6	Screw driver 200 mm	4 Nos
7	Screw driver Philips type no.1, 2 and 3	4 Nos (2 each)
8	Centre gauge 55, 60 °	4 Nos (1 each)
9	Plier side cutting 150 mm	4 Nos
10	Oil cane 250 ml	6 Nos
11	File flat bastard 300 mm	10 Nos
12	File flat smooth 200mm	8 Nos
13	File flat smooth with safe edge 200 mm	8 Nos
14	File half round bastard 300 mm	10 Nos
15	File half round smooth 250 mm	10 Nos
16	File three square bastard 250 mm	6 Nos
17	File three square smooth 200 mm	10 Nos
18	File round bastard 250 mm	10 Nos
19	File square bastard 300 mm	8 Nos
20	File square smooth 250 mm	10 Nos
21	Knife edge file 150 mm	10 Nos
22	Scribing block universal 300 mm	8 Nos
23	Granite surface plate grade 1 1000 mm x 630 mm with adjustable MS stand	8 Nos
24	Granite surface plate grade 1 600 mm x 300 mm with between centre and adjustable stand	2 Nos
25	Tap extractor 3 mm to 12 mm x 1.5 mm (ezy out)	1 set
26	Screw extractor sizes 1 to 8	1 set
27	Taps and dies ( metric) 3 mm to 25 mm complete set in a box	2 sets
28	Drill twist st.shamk dia 1.5 to 12.5 mm in steps of 0.5 mm	1 set
29	Drill twist st.shamk dia 8 mm to 12 mm in steps of 2 mm	1 set
30	Taper shank drills 6 to 25 mm in steps of 1 mm	1 set
31	D.E. spanners 3 mm to 4 mm, 6-8, 10-12, 13-14, 15-16, 18-19, 20-22, 24-26 (8 spanners)	2 sets

SL NO	DESCRIPTION OF TOOLS	FOR INSTRUCTOR
32	Letter punch 3 mm set	1 set
33	Number punch 3 mm set	1 set
34	Drill chuck 12 mm, capacity	2 Nos
35	Drill gauge 1.5 to 12.5mm in steps of 0.5 mm	1 No
36	Allen key metric 3 to 12 mm set	3 sets
37	Centre drills 1,2,3,4	4 each
38	Parallel hand reamer 3 mm to 25 mm in steps of 1 mm	2 sets
39	Long fluted machine reamer 6 mm to 25mm in steps of 1 mm	1 set
40	Hand taper pin reamer 4mm, 5mm,6mm,8mm,10mm and 12mm (set of 6 Nos)	2 sets
41	Reamers adjustable 10mm to 15mm in steps of 1mm	2 sets
42	Side and face milling cutter Ø125 x 12 mm width Ø 32 mm bore	2 Nos
43	Side & face milling cutter Ø 100mm x 10 mm width, Ø32 mm bore	2 Nos
44	Cylindrical milling cutter Ø 63 mm x 100 mm length Ø 27 mm bore	2 Nos
45	Slotting cutter Ø 63mm x 6mm width x Ø 22 mm bore	2 Nos
46	Slotting cutter Ø 83 mm x 8 mm width x Ø 27 mm bore	2 Nos
47	Slotting cutter Ø 100 mm x 12 mm width x Ø 32 bore	2 Nos
48	Single angle cutter Ø 50 mm x 12 mm width x dia 16 mm bore – 60 degree	2 Nos
49	Single angle cutter Ø 63 mm x 18 mm width Ø 22 mm bore – 70 °	2 Nos
50	Single angle cutter Ø 63 mm x 26 mm width Ø 22 mm bore – 85 °	2 Nos
51	Equal angle cutter Ø 63mm x 18 mm width Ø 22 bore – 90 °	2 Nos
52	Shell end mill dia 50 mm x 36 mm width x dia 22 bore	2 Nos
53	Shell end mill dia 100 mm x 50 mm width x dia 32 bore	2 Nos
54	Side and face cutter dia 63 mm x 6 mm width x dia 16 bore	2 Nos
55	Side and face cutter dia 63 mm x 10mm width x dia 22 bore	2 Nos
56	Side and face cutter dia 63 mm x 14 mm width x dia 22 bore	2 Nos
57	Face cutter dia 80 mm x 20 mm width x dia 27 bore	2 Nos
58	Face cutter dia 100 mm x 25 mm width x dia 32 bore	2 Nos
59	Parallel shank end mill dia 3, dia 6, dia 8, dia 10 and dia 12 mm	4 Nos each
60	T-slot cutter with parallel shank – cutter dia 17.5 x 8 mm width x dia. of shank 8 mm	2 Nos
61	Slitting cutter dia 100 mm x 2 mm width x 27 mm bore	2 Nos
62	Ball end mill dia 3 mm, dia 6 mm, dia 8 mm, dia 10 mm and dia 12 mm.	2 Nos each
63	Rivet snap and dollies 2 mm and 3 mm set	2 Nos each
64	Tool makers clamp 50 mm, 75 mm, 100 mm and 150 mm	4 Nos each
65	'C' clamp 75 mm, 100 mm, 150 mm and 200 mm	2 Nos each

SL NO	DESCRIPTION OF TOOLS	FOR INSTRUCTOR
66	Lathe tools (solid – HSS-square shank to suit size of the lathe)	6 Nos each
67	HSS tool bits 3mm, 4mm, 6mm, 8mm square 100 mm length	20 Nos each
68	Tool holders – straight, LH and RH to suit the size of lathe	6 each
69	Parting tool holders to suit the size of the lathe	2 Nos
70	Parting tool blades 3 mm and 4 mm width HSS	3 each
71	Boring bars with holders to accommodate 3 mm, 4 mm, 6 mm and 8 mm HSS tool bits	3 each
72	Knurling tool holders – revolving type	2 Nos
73	Tool makers buttons – dia 10mm and dia 12mm	4 each
74	Tool holders for shaper and slotter – straight, LH and RH to suit the machine available.	3 each
75	4 mm, 6 mm and 8 mm HSS tool bits	6 each
76	Oil stone assorted (10 mm square, dia 10 mm and 10 mm side triangular) 100 mm length	2 each
77	Star dresser	2 Nos
78	Diamond dresser with holder	2 Nos
79	Electric soldering iron 60 watt	2 Nos
80	Soldering iron straight	2 Nos
81	Blow lamp	2 Nos
82	Demagnetizer	1 No
83	Lapping cast iron plate 250 x 250	1 No
84	Lever shearing machine hand operated complete with 300 mm plate	1 No
85	Snips 200 mm blade	1No
86	Work bench 240 cm x 120cm x 75 cm with 150 mm vice	4 Nos (each bench fitted with 4vices)
87	Steel lockers 16 trainees	2 Nos
88	Steel cupboard 180 cm x 60 cm x 45 cm	6 Nos
89	Metal rock 180 cm x 60 cm x 45 cm	4 Nos
90	Fire extinguisher	4 Nos
91	Fire buckets with stand	4 Nos
92	Feeler gauge 0.05 mm to 0.3 mm by 0.05 to 0.4 mm to 1 mm by 0.1 mm (13 LEAVES)	2 Sets
93	Screw pitch gauge – range 0.4 – 7 mm metric 60 degree (21 leaves)	2 sets
94	Radius gauge 1-3 mm by 0.25 mm and 3,5-7 mm by 0.5 mm (34 leaves)	2 sets
95	Digital Vernier height gauge – range 300 mm vernier scale-0.02 mm	1 No
96	Digital Vernier height - range 500 mm vernier scale – 0.02 mm	1 No
97	Universal vernier caliper – range 200 mm, vernier scale – 0.02 mm	4 Nos
98	Dial vernier caliper 0-200 mm, graduation – 0.02 mm	1 No

SL NO	DESCRIPTION OF TOOLS	FOR INSTRUCTOR
99	Universal vernier caliper – range 300 mm vernier scale – 0.02 mm	4 Nos
100	Universal bevel protractor – blade range 150 and 300 mm, dial 1 degree, vernier 5' with head, acute angle attachment	2 Nos
101	Digital Outside micro meter 0 – 25 mm (0.01mm accuracy)	2 Nos
102	Digital Outside micro meter 25 – 50 mm (0.01 mm accuracy)	2 Nos
103	Digital Outside micro meter 50-75 mm (0.01 mm accuracy)	1 No
104	Digital Outside micro meter 75-100 mm (0.01 mm accuracy)	1 No
105	Combination square sets – 300mm blade with square head, centre head, protractor head	2 sets
106	Telescoping gauge range 8-150 mm(6 pieces/sets)	1 set
107	Sine bar 150 mm with stopper plate	1 No
108	Sine table 200 mm length with magnetic bed	1 NO
109	Gauge Blocks Workshop Grade – 87 Pieces Per Set	1 set
110	Gauge block accessories consisting holders, half round jaws, scriber point, centre point, triangular straight edge (14 pieces/set)	1 set
111	Centre square – size 400 x 250 mm blade	1 set
112	V – block – approx.32 x 32 x 41 mm with clamping capacity of 25 mm with clamps	2 pairs
113	V – block – approx.65 x 65 x 80 mm with clamping capacity of 50 mm with clamps	2 pairs
114	Magnetic V-block 100 x 100 x 125 mm	2 pairs
115	Angle plate 150 x 150 x 200 mm	1 No
116	Angle plate – adjustable 250 x 250 x 300 mm	1 No
117	Small hole gauge – range 3 – 13 mm (4 pieces/set)	1 set
118	Digital Inside micro meter – range 25 – 50 mm	1 No
119	Digital Inside micro meter – range 50 – 200 mm	1 No
120	Digital Depth micro meter – range 0-200 mm, accuracy 0.01 mm	1 No
121	Magnetic stand with magnetic base 60 x 47.5 mm and with universal swivel clamp, dial holding rod (150 mm) scriber	2 Nos
122	Dial test indicator – lever type – range 0-0.8 mm – graduation 0.001 mm, reading 0-40-0 with accessories.	2 Nos
123	Dial test indicator – plunger type – range 0-10 mm – graduation 0.001 mm, reading 0-100 with revolution counter.	2 Nos
124	Bore gauge with dial indicator (1 mm range 0-0.01 mm graduation)-range of bore gauge 18-150 mm	1 set
125	Straight edge – single beveled – size 150 mm and 250 mm	1 each
126	Parallel blocks 15 mm and 25 mm in pairs.	8 set

SL NO	DESCRIPTION OF TOOLS	FOR INSTRUCTOR
127	Height master range 300 mm, graduation 0.001 mm measuring blocks 10 mm, spacing blocks 10 mm	1 No
128	Digital Dial calipers	2 Nos
129	Machine vice - magnetic vice, rotary table, angle vice, quick release vice, tilting table, hydraulic vice	2 Nos each
130	Slip gauges – sets – 112 pieces- grade-'00' accuracy	2 sets
131	Master try square 150 mm	2 Nos
132	Needle files	1 sets
133	Hammer – nylon and copper	2 Nos each
134	Scrapers	2 Nos
135	Drill drift	3 Nos
136	Special purpose files	2 sets
137	Machine files	2 sets
138	Solid spanners	2 sets
139	Adjustable spanner	2 Nos
140	Angle gauges	1 set
141	Bench vice 4" , 6"	5 Nos each
142	Gear tooth vernier caliper	2 Nos
143	Indexing (simple & linear)	1 No each
144	Grinding wheels bore dia 31.75 mm and outer dia is 150 mm	5 Nos
145	File guard	2 Nos
146	Goggles and hand glows	3 Nos each
147	Three point internal micro meter with accuracy of 0.005 mm	2 sets
148	Two point self centering bore dial gauge with accuracy of 0.001 mm	2 Nos
149	Limit gauges	1 set
150	Spirit level	1 No
151	Collets (metric) 3 mm to 25 mm	1 No each
152	Knurling tool (knuckle joint)	3 No each
153	Milling cutters, counter bore and countersink tools as per exercise planned	As reqd
154	Silicon carbide dressing stick 1" square	2 Nos
155	Grease gun	3 Nos
156	Portable crane Capacity 500 kg	1 No
157	Wheel balancing unit with stand Size 150 mm x 150 mm x 250 height	1 No
158	Hand trolley 4 wheels 500 mm x 750 mm	1 No
159	2D height master Range - 600 mm	1 No

SL NO	DESCRIPTION OF TOOLS	FOR INSTRUCTOR
160	Electric hand drill 1/4"	1 No
161	Electric hand grinder – AG2	1 No
162	LCD projector	1 No
163	Personel computer with std. accessories (Latest version)	2 Nos

## 2. Equipments & machineries

SL NO	NAME OF THE MACHINE	Specification	Quantity
1	Centre Lathe	Bed Length – 1800 mm Centre height – 215 mm With all attachment 3-jaw and 4-jaw chuch with other standard accessories	3 Nos
2	Horizontal Milling m/c	Length – 1350 mm Width – 310 mm Long arbor dia 16, 22, 27 & 32 mm.universal dividing head with career, chuck, standard indexing plate with other standard accessories	2 No
3	Vertical milling m/c	Length – 1350 mm Width – 310 mm Stub arbor – dia 22, 27 & 32. Collets adaptor, rotary table 300 mm – 1degree division with other standard accessories	2 Nos

SL NO	NAME OF THE MACHINE	Specification	Quantity
4	Universal milling m/c	Lxw = 1350 x 310 mm Swivel base either side 45 degree Long arbor dia 16, 22, 27 & 32 mm. universal dividing head with career, chuck, standard indexing plate with other standard accessories	2 Nos
5	Pedestal grinding	Dia. Of wheel – 200 mm with other standard accessories	2 Nos
6	Hydraulic Surface grinding m/c	Table size 250 x 1000 mm clamping area 600 x 178 mm Accuracy 0.001 mm with other standard accessories	1 No
7	Universal grinding m/c	Centre height - 130mm Max.dia. ground 725mm max grinding length 300mm with other standard accessories	1 No
8	Tool & cutter grinding m/c	Largest diameter of cutter that can be ground 200mm, max admit between centre 230mm RPM 125 with other standard accessories	1 No
9	Hydraulic Shaping	Stroke length 450 mm	3 No
10	Double body fly press	Motorized with other standard accessories and attachment 3 tonne with other standard accessories	1 No
11	Hydraulic metal cutting band saw	Cutting: 2.5 mt, long : 20 mm Width : 10 tpi	1 No
12	Hardness tester Rockwell M/C	Scale for HRA, HRS, and HRC provided. With std. accessories	1 No
13	Pantograph die sinking m/c	Working area (rectangle) 320 x 145 mm ratio(3 dimensional) 1:1.5 to 1:10 Max.height of work : 380 mm with other standard accessories	1 No
14	Jig boring	RPM - 60 to 2250 Feed rate – 0.002 mm with other standard accessories	1 No
15	Jig grinding	RPM-1200 to 6000 Feed rate – 0.002 mm with other standard accessories	1 No
16	Optical Comparator m/c	Basic model with other standard accessories	1 No
17	Drilling DRO	accuracy 0.02mm 25 mm capacity with other standard accessories	1 No
18	Co ordinate measuring machine	1.2m with other standard accessories	1 No
19	Robotics	Basic model with other standard accessories	1 No

SL NO	NAME OF THE MACHINE	Specification	Quantity
20	EDM (spark erosion)	Over cut range – 0.005 to 0.1 mm Accuracy of 0.002 mm Approx 245.3 cm Normal metal removal rate is 16.38 cm with other standard accessories Electrode is 3:1	1 No
21	EDM (wire cut)	Dia. of wire is 0.2mm or less Average cutting rate is 10-15mm/min Accuracy 0.01 mm with other standard accessories	1 No
22	CNC (VMC)	X – AXIS – 350 TO 450.mm Y – AXIS – 300 TO 350.mm Z – AXIS – 300 TO 400.mm SPINDLE SPEED (RPM) 0 ABOVE – MIXMIUM 8,000 ABOVE ATC - NUMBER OF TOOLS – 12 5 hp air compressor Tool trally with locker BT 40 pull set Voltage stabilizer with other standard accessories Computer & UPS with laser printer (latest version) with all accessories (Auto CADD and CAM software)	1 No
23	Power press m/c	5 tonne capacity	1 No
24	Sensitive drilling m/c 12mm	Capacity 20 mm with other standard accessories	1 No
25	Universal Radial drilling m/c (1")	1200 mm area motorized with taping attachment with other standard accessories	1 No
26	Centre less grinding	with other standard accessories	1 No
27	Muffle furnace	300 x 300 x 450 mm for 1100 to 1200 degree C	1 No
28	Quenching tank	600 x 600 x 600 mm	1 No
29	Tool room lathe	Bed length – 1200 mm Centre height – 150 mm with standard accessories	3 Nos
30	Tool room milling	Adjustment range – 300 x 340 x 150 mm with DRO for X, Y & Z axis-poisoned accuracy 0.002mm. Including indexing head and micro boring head. with other standard accessories	1 No
31	Drill point grinding m/c	Capacity 25 mm with other standard accessories	1 NO
32	Cylindrical grinding machine	Centre height 130 mm internal grinding attachment and all other standard accessories	1 No