MAHARASHTRA STATE BOARD OF VOCATIONAL EDUCATION EXAMINATION, MUMBAI 51.

<table>
<tr><td>1</td><td>Name of Syllabus</td><td>C.C. in TOOL AND DIE MAKER
(303162)</td></tr>
<tr><td>2</td><td>Max. Nos of Student</td><td>25 Students</td></tr>
<tr><td>3</td><td>Duration</td><td>6 Months</td></tr>
<tr><td>4</td><td>Type</td><td>Full Time</td></tr>
<tr><td>5</td><td>Nos Of Days / Week</td><td>6 Days</td></tr>
<tr><td>6</td><td>Nos Of Hours /Days</td><td>7 Hrs</td></tr>
<tr><td>7</td><td>Space Required</td><td>Laboratory = 1000 Sq feet
Class Room = 200 Sq feet
TOTAL = 1200 Sq feet</td></tr>
<tr><td>8</td><td>Entry Qualification</td><td>S.S.C. + Any Course of Mechanical Group pass of MSBVEE OR ITI IN Tool & Die Maker / Machinist /COE in P&M /HSC Vocational in Mech.Tech. /Diploma / Degree in Mechanical / Production Group</td></tr>
<tr><td>9</td><td>Objective Of Syllabus/ introduction</td><td>1. Awareness of Safety precautions.
2. Application of Various Tools used in TOOL AND DIE MAKER (DIES AND MOULDS)
3. Awareness of various Dies & Moulds
4. Developed Dies & Moulds.
5. Operation on Dies & Moulds
6. Repair & Maintenance Dies & Moulds</td></tr>
<tr><td>10</td><td>Employment Opportunity</td><td>The trainee will either to be able to take up jobs with agencies which Develop, maintain and repair such Dies & Moulds Application or with working experience will be in a position to start his own independent Business.</td></tr>
<tr><td>11</td><td>Teacher’s Qualification</td><td>Diploma/Certificate in concern subject</td></tr>
<tr><td>12</td><td>Training System</td><td>Training System Per Week
<table>
<tr><td>Theory</td><td>Practical</td><td>Total</td></tr>
<tr><td>12 Hours</td><td>30 Hours</td><td>42 Hours</td></tr>
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<tr><td>13</td><td>Exam. System</td><td>
<table>
<tr><th>Sr. No.</th><th>Paper Code</th><th>Name of Subject</th><th>TH/PR</th><th>Hours</th><th>Max. Marks</th><th>Min. Marks</th></tr>
<tr><td>1</td><td>30316211</td><td>TOOL AND DIE MAKER (DIES AND MOULDS)</td><td>TH - I</td><td>3 hrs</td><td>100</td><td>35</td></tr>
<tr><td>2</td><td>30316221</td><td>BASIC TURNING & GRINDING (INCLUDING KNOWLEDGE OF MATERIAL & HEAT TREATMENT)</td><td>PR - I</td><td>3 hrs</td><td>100</td><td>50</td></tr>
<tr><td>3</td><td>30316222</td><td>TOOL AND DIE MAKER (DIES AND MOULDS)</td><td>PR - II</td><td>6 hrs</td><td>200</td><td>100</td></tr>
<tr><td></td><td></td><td>TOTAL</td><td></td><td></td><td>400</td><td>185</td></tr>
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TOOL AND DIE MAKER (DIES AND MOULDS)

Theory - I	**Practical - II**
Brief revision on drilling,turning,milling,grinding & c.n.c. Turning & milling,heat treatment Jig boring machine introduction, working principle, Constructional feature, specification and uses. Introduction to tooling - brief discr iption of press Tools, plastic moulds, diecasting die and jigs and Fixtures.	Exercises on jig boring Machine
Differentiating between thermoplastic & thermsetting Plastic properties & uses of commonly used thermo & Thermoset plastics,fillers & additives,reinforced plastic Mould relese agents, identification of common Thermoplastics. Pentograph engraving and copy milling machine working Principle, constructional feature, specification and Uses.	Exercises on Pentograph engraving And copy milling Machine
Differentiating between thermoplastic & thermsetting Plastic properties & uses of commonly used thermo & Thermoset plastics,fillers & additives,reinforced plastic Mould relese agents, identification of common Thermoplastics. Edm spark erosion machine working principle, Constructional feature, specification and uses.	Exercises on edm Spark erosion
Calculation of shot weight.plasticing capacity,minimum Cycle time,clamping,mould polishing technic,tools & Equipments used for polishing, methods and care while Polishing. Edm wirecut machine working principle, constructional Feature, specification and uses.	Exercises on edm Wirecut
Description of parts of system. Runner functions.different types of runner cross Section.selection of best runner crosssection. Function & types of gates . Selection of gates.calculation of gate & runner size	Project work - Manufacture of hand Injection mould
Different types of ejection system.functioning of Ejection system,ejector return system.ejection Methods.actuation methods for stripper plates, ejection From fixed half. Function & types of spure puller. Lapping of moulds and dies, lapping compound.	Aeeembly - tryout & Rectification of hand Injection mould
Types of parting surface. Selection of parting surface shrinkage factors, Governing shrinkage. Determination of core & cavity dimensions. Material selection for the manufacture of core and Cavity,pillars & other elements of dies & moulds.factor To be considered for the selection of material like Load,heat resistance,machinablity etc.selection of Material on the basis of manufacturing aspects and Processing aspects.application of non-ferrous materials	Project work - Manufacture of single Cavity injection mould

For the manufacture of moulds & dies.heat treatment-its Effect on functioning of different parts-different Method of heat treatment etc.	
Constructional details of a single injection mould(hand Injection mould). Constructional details of a single cavity two plate Injection mould	
Importance of temperature controlling in Moulds,method for controlling different parts of Moulds,cooling channels & their positions.mould cooling Calculation. Constructional details of two Cavity injection mould	Aeeembly - tryout & Rectification of single Cavity injection mould
Necessity of splits in mould,method of operation of Splits.split locking methods,split locking arrangements. Side core & side cavity. Assembly details of side core & side cavity. Method usde in actuating the side core & side cavity	Project work - Manufacture of two Cavity injection mould
Constructional details of two cavity injection mould With side core/side cavity	
Different methods used in moulding internal undercuts. Factor to be considered while desiging moulds for Components with threads. Methods employed in the removal of internally & Externally threaded components.	Aeeembly - tryout & Rectification of two Cavity injection mould
Quality and inspection of moulds and dies- stage Inspection of core, cavity and mould elements. Inspection Of additional tooling like electrodes, templates,masters Etc. Final inspection of the system incorporated in the Moulds in respect of alignment, matching feed system, Ejection system, cooling system,etc. And product Inspection	Project work - Manufacture of single Compression Mould/plunger type Transfer mould
Difference between single daylight & multi daylight Mould.under feed moulds,feed system in multiday light Moulds.triple daylight moulds. Elements of mould cycle. Importance of mould cycle diagram	
Construction/design details of injection mould (plate Selection) Mould estimation, process planning for manufacture of Dies and moulds.	
Construction/design details of injection mould with side Core movement by dog legged cam	Aeeembly - tryout & Rectification of single Compression Mould/plunger type Transfer mould
Identification of common moulding defects that occur During injection moulding,reasons for defect in the Component,mould material.	Project work - Manufacture of Pressure die casting Die.
Compression moulding process. Procedure of compression moulding process. Identification of common defects that occur during Comprsssion moulding.	

Transfer moulding process. Procedre of transfer moulding process. Identification of common defects that occur during Transfer moulding	
Compression & transfer mould calculations . Construction -design details of simple compression & Transfer mould	Aeeembly - tryout & Rectification of Pressure die casting Die
Introduction to blow moulding. Termoforming,rotational moulding,extrusion process. Introduction to blow moulding machine, extrusion Machine and their working princile. Project	Project work : self Design & Manufacturing of Injection / Compression/ die Casting
Die casting.hot chamber process & cold chamber procss. Basic design of a die casting die.	
Process variables-influence of die casting metal on the Process,influence of die casting die on the process. Ejection system in a die casting die. Moving cores-actuation of moving cores. Fault correction-cold type defects,hot type defects	
Revision & test Industrail visit (minimum two)	Aeeembly - tryout & Rectification of self Design & manufacturing die

II.GENERAL MACHINARY & INSTALLATION

Sr no	Item	Qty
1	Tool room lathe with 3 & 4 jaw chuck,face plate,driving Plate,taper turning attachment,steadies & set of lathe Tools & holders	01 no
2	Tool room milling machine with standard accessories and The following attachments: I. Machine vice plain 150 mm – 1 no Ii. Collet adaptor and collets (standard size) – 1 set Iii. Stub arbor, style ‘c’ dia 22, 27 and 32 mm – 1 each Iv. Rotary table 300 mm with indexing arrangement – 1 no V. Boring head – 1 no	01 no
3	Universal milling machine with standard accessories and The following attachments: I. Universal dividing head with set of change gears – 1 no. Ii. Long arbors dia 16, 22, 27 and 32 mm – 1 each Iii. Machine vice swivel base 150 mm – 1 no.	01 no
4	Vertical milling machine with standard accessories and The following attachments: I. Machine vice plain 150 mm – 1 no Ii. Collet adaptor and collets (standard size) – 1 set Iii. Stub arbor, style ‘c’ dia 22, 27 and 32 mm – 1 each Iv. Rotary table 300 mm with indexing arrangement – 1 no V. Boring head – 1 no	01 no

5	Hydraulic surface grinder wheel dia. 180 mm ,raciprocating table,longitudinal table traverse 200 mm Fitted with adjustable traverse stop,magnetic chuck 250x120mm.with set of grinding wheels,diamond toll Holder for dressing,tailstocks & set of spanners	01 no
6	Tool & cutter grinder with standard accessories and the Following attachments I)positive indexing attachment Ii)tap relieving & sharpening attachment Iii)radius grinding attachment Iv)face mill grinding attachment V)internal grinding attachment Vi)universal vice Vii)right & left hand tailstock Viii)radius wheel truing attachment	01 no
7	Universal grinding machine with standard accessories And the following attachments I) internal grinding attachment Ii) with 3 & 4 jaw chuck with set of grinding Wheels,diamond toll holder for dressing & set of Spanners	01 no
8	Pantograph engraving and copy milling machine Working area(rectangle) 320x145mm, ratios (3-dimensional) 1:1.5 to 1:1, max.height of work 380mm. Worktable traverse: longitudinal-160mm, transverse- 300mm, work clamping area- 360x200mm, master clamping Area- 320x520mm, drive motor-.25kw, spindle speeds- 1600 to 20,000 rpm With attachment like index head, roll engraving Attachment, type template holders, circular table,raised And sunk letters etc.	01 no
9	C.n.c. wire cut e.d.m. table traverse -400x300mm,table size - 670x490 mm,maximum workpiece height -250 mm,fixed Table,moving column machine, Maximum spool capacity -6 kg.,maximum jog speed-900 Mm/min.,positioning accuracy-.005mm, Wire electrodedia. -0.25mm (standard),0.1,0.15,0.2,0.30mm Liner optical scale with 5 axes c.n.c.	01 no
10	Jig boring machine table size 595x320mm,movement x-y-z- 400x250x400mm	01 no
11	Edm spark erosion machine	01 no
12	Drilling machine -25 mm capacity with fixed bed & coordinate Table(accuracy 0.01mm) preferably with dro	01 no
13	Muffle furnace heating chamber 300x300x450mm for 10500c	01 no
14	Hand injection moulding machine (shot capacity 50 gms)	01 no
15	Compression moulding process 25 t (shot capacity 50 gms)	01 no
16	Double ended grinder with 178 mm wheels motorised with Twist drill grinding attachments	01 no
17	Rockwall hardness testing machine with standard Accessories	01 no

PRACTICAL - I **BASIC TURNING & GRINDING (INCLUDING KNOWLEDGE OF MATERIAL & HEAT TREATMENT)**
Manufacturing process and their importance in Industries Introduction to an Engine Lathe, identification of different parts of engine lathe, holding the job in 3 jaw chuck, Perform facing and plain turning operation to an accuracy of ±0.1mm Use of Measuring instruments required for turning
Hold round job on independent chuck and perform the following operations. Facing Plain turning Step turning Taper turning
Turn an angular surface – By compound slide method. Set a grooving tool & perform anundercutting operation for threading Perform Chamfering operation Set a threading tool to cut 'V' thread and cut 'V' thread
Perform knurling operation Perform center drilling and drilling Perform boring operation. Cut "V" thread on through bore. Perform parting off operation Demo on parallel turning between centers
Safety precautions followed in grinding Re-sharpen of plain turning tool on pedestal grinding to an accuracy of one degree. Check the tool angle using bevel protractor. Familiarize with controls of surface grinding machine
Use of work holding devices on grinding machine Grind parallel surface and stepped surfaces to a dimensional accuracy of ± 0.05 mm on surface grinder Demonstration of taper grinding
Grind cylindrical external, step surfaces on a cylindrical grinder to a dimensional accuracy of ± 0.05 mm Balancing and truing of grinding wheel
Grind cylindrical internal surfaces on a cylindrical grinder to an accuracy of ± 0.05 mm Mounting and dressing of grinding wheel

TOOLS, MACHINERY, EQUIPMENTS

Sl No	Item	Qty
11	Surface plate 900 x 900 x 1200 mm with Table	1 No.
12	Marking off table 1200 x 1200 x 900mm high	1 No.
13	Scribing block universal 300 mm	2 Nos.
14	" V " block 100/7-80-A	2 Nos.
15	Try Square 150 mm	2 Nos.
16	Outside spring caliper 200 mm	2 Nos.
17	Divider spring 200 mm	2 Nos.
18	Steel rule 60 cm graduated both in English and Metric units	2 Nos.
19	Spirit level 2V 250, 05 metre	1 No.
20	Hammer B P 800 gms with handle	12 Nos.
21	Screw Driver, heavy duty 300 mm with handle	4 Nos.
22	Combination set 300 mm	1 No.
23	Reduction sleeve MT (to suit the machine)	1 set
24	Angle plate size 200 x 100 x 200 mm	2 Nos.
25	Solid parallels in pairs (Different sizes) in Metric	4 pairs
26	Oil can pressure feed 500 mg	6 Nos.
27	Oil stone 150 x 50 x 25 mm	2 Nos.
28	Twist Drill Taper shank set 12 to 20 mm in step of 1 mm	2 sets
29	Twist drills& Drill chucks including keyless drill chuck	1 set
30	Grinding wheel dresser (diamond)	1 No.
31	C-Clamps as required	2 Nos.
32	Clamps C 200 mm	1 set.
33	Assorted carbide lathe tools with holder different shapes and sizes	As Reqd.
34	Hacksaw frame adjustable 250 - 300mm with blades	2 Nos.
35	Universal table angle plate	1 No.
36	Plier cutting 200 mm	2 Nos.
37	Magnifying glass 75 mm	2 Nos.
38	Hand hammer 1 Kg with handle	2 Nos.
39	Centre drill 2,3,& 4	4 Sets
40	Micrometer outside 0-25 mm	4 Nos.
41	Micrometer outside 25 - 50 mm	2 Nos.
42	Micrometer depth gauge 0 – 200 mm	1 No.
43	Direct reading Vernier caliper B 300 (direct reading with dial)	1 No.
44	Vernier height gauge 300 mm	1 No.
45	Vernier bevel protractor with150 mm blade	1 No.
46	Bevel gauge 200 mm	1 No.
47	Telescopic gauge 13 mm to 300 mm	1 set
48	Compound dial gauge with stand (Metric)	1 No.
49	Dial test indicator with magnetic gauge type 1 grade A with magnetic base	1 No.
50	Screw pitch gauge for metric pitches (0.5 to 6mm)	2 sets
51	Radius gauge metric set (1- 6 mm)	1 set
52	Taper gauge M T No. 1,2,3,4, & 5	1 set
53	3 pin micrometer 10 – 25 mm	2 Nos.

GENERAL INSTALLATION

Sl No	Item	Qty
54	Lathe General purpose all geared (gap bed), height of centres 150 mm, bed length 1500 mm with 3 jaw & 4 jaw chuck, face plate, taper turning attachment steadies etc., and set of lathe tool holders.	4 Nos.
55	Pedestal grinder, double ended with 170mm wheels (one fine and one rough)	2 No.
56	Surface grinding machine wheel dia 180 mm (or near) reciprocating table, longitudinal table traverse 200 mm (or near) fitted with adjustable traverse stop, magnetic chuck 250 mm x 120 mm. With set of grinding wheels, diamond tool holders for dressing & set of spanner etc.,	2 No.
57	Cylindrical grinder with internal grinding attachment, center height – 130mm with standard accessories including 3 Jaw self centering chuck, 4 Jaw independent chuck with set of grinding wheels, balancing equipments, mandrels, centers, tailstock etc.,	2 Nos.
58	Lip grinder, drill grinder, fly press, arbor press	1 each

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