

**UPGRADATION OF ITI's into CENTER OF EXCELLENCE
(CoE)**

SECTOR / AREA : PRODUCTION AND MANUFACTURING)

**ADVANCED MODULE IN II YEAR
(FOR THE FIRST 6 MONTHS OF II YEAR)**

**TOOL AND DIE MAKER (DIES AND MOULDS)
(DURATION - 24 WEEKS)**

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(2 YEARS)**

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I) COURSE CONTENT

1	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
2	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
3	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
4	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

5	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
6	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
7	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 FOR THE MANUFACTURE OF MOULDS & DIES.HEAT TREATMENT-ITS EFFECT ON FUNCTIONING OF DIFFERENT PARTS-DIFFERENT METHOD OF HEAT TREATMENT etc.	PROJECT WORK - MANUFACTURE OF SINGLE CAVITY INJECTION MOULD
8	CONSTRUCTIONAL DETAILS OF A SINGLE INJECTION MOULD(HAND INJECTION MOULD). CONSTRUCTIONAL DETAILS OF A SINGLE CAVITY TWO PLATE INJECTION MOULD.	
9	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
10	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
11	CONSTRUCTIONAL DETAILS OF TWO CAVITY INJECTION MOULD WITH SIDE CORE/SIDE CAVITY.	

12	DIFFERENT METHODS USED IN MOULDING INTERNAL UNDERCUTS. FACTOR TO BE CONSIDERED WHILE DESIGNING MOULDS FOR COMPONENTS WITH THREADS. METHODS EMPLOYED IN THE REMOVAL OF INTERNALLY & EXTERNALLY THREADED COMPONENTS.	ASSEMBLY - TRYOUT & RECTIFICATION OF TWO CAVITY INJECTION MOULD
13	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
14	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	
15	CONSTRUCTION/DESIGN DETAILS OF INJECTION MOULD (PLATE SELECTION) MOULD ESTIMATION, PROCESS PLANNING FOR MANUFACTURE OF DIES AND MOULDS.	
16	CONSTRUCTION/DESIGN DETAILS OF INJECTION MOULD WITH SIDE CORE MOVEMENT BY DOG LEGGED CAM	ASSEMBLY - TRYOUT & RECTIFICATION OF SINGLE COMPRESSION MOULD/PLUNGER TYPE TRANSFER MOULD
17	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.
18	COMPRESSION MOULDING PROCESS. PROCEDURE OF COMPRESSION MOULDING PROCESS. IDENTIFICATION OF COMMON DEFECTS THAT OCCUR DURING COMPRESSION MOULDING.	
19	TRANSFER MOULDING PROCESS. PROCEDURE OF TRANSFER MOULDING PROCESS. IDENTIFICATION OF COMMON DEFECTS THAT OCCUR DURING TRANSFER MOULDING.	

20	COMPRESSION & TRANSFER MOULD CALCULATIONS . CONSTRUCTION -DESIGN DETAILS OF SIMPLE COMPRESSION & TRANSFER MOULD.	ASSEMBLY - TRYOUT & RECTIFICATION OF PRESSURE DIE CASTING DIE
21	INTRODUCTION TO BLOW MOULDING. THERMOFORMING,ROTATIONAL MOULDING,EXTRUSION PROCESS. INTRODUCTION TO BLOW MOULDING MACHINE, EXTRUSION MACHINE AND THEIR WORKING PRINCIPLE.	PROJECT WORK : SELF DESIGN & MANUFACTURING OF INJECTION / COMPRESSION/ DIE CASTING
22	DIE CASTING.HOT CHAMBER PROCESS & COLD CHAMBER PROCSS. BASIC DESIGN OF A DIE CASTING DIE.	
23	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.	
24	REVISION & TEST INDUSTRIAL VISIT (MINIMUM TWO)	ASSEMBLY - TRYOUT & RECTIFICATION OF SELF DESIGN & MANUFACTURING DIE

PROJECT WORK SHOULD BE BASED ON

1.SAFETY PRECAUTION

2.PROCESS PLANNING FOR MANUFACTURING DIES AND MOULDS.

3.QUALITY CHECKS

4.PROJECT (MOULD) ESTIMATION

**II) TOOLS, MACHINERY, EQUIPMENTS etc.
for a batch of 16 trainees**

Trainees Tool Kit.

Sr No.	Item	Qty
1	Steel Rule 30cm graduted both in English & Metric unit	17
2	Centre punch 100	17
3	Hammer B.p.05 kg	17
4	Combination plier 150 mm	17
5	Safety glasses	17
6	File flat bastard 300mm	17
7	File flat 2 nd cut 250 mm	17
8	Engineers screw driver	17
9	File flat smooth 200mm	17
GENERAL SHOP OUT FIT		
10	Surface plate 400 mm x 400 mm grade	1
11	Table for surface plate 900 x 900 x 1200 mm	1
12	Marking off table 1200 x 1200 x 900 mm	1
13	Scribing block universal 300 mm	2
14	Vee block 100/7-80-A	2
15	Try square 300 mm	2
16	Outside spring caliper 200 mm	2
17	Divider spring 200 mm	2
18	Inside spring caliper 200 mm	2
19	Straight edge steel 500 mm	1
20	Steel tape 2 meter in case	1
21	Steel rule 60 cm graduate both in English and Metric units	2
22	Spirit level 2V 250, 05 meter	1
23	Hammer B.P. 800 gms, with handle	12
24	Screw driver, heavy duty 300 mm with handle	4
25	Hammer lead 1 kg	2
26	Combination set 300 mm	1
27	Spindle blade screw driver 100 mm	4
28	Allen hexagonal keys 2.5 to 12	2
29	Spanner D.E.G.P. series 2 (7 pcs. Each)	6 sets
30	Adjustable spanner 300 mm	3
31	Angle plate size 200x100x200 mm	2
32	Angle plate adjustable 250 x 150 x 175	2
33	Solid parallels in pairs (different sizes)	12pairs
34	Milling cutters of different sizes, shapes etc. including end and drills	1set
35	Ivolute milling cutter 2 module	1set
36	Reduction sleeve MT (to suit the machine)	1set
37	Twist drill taper shank set 12 to 20 mm in step of 1 mm	1set
38	Drill chuck including keyless chuck	1set
39	Grinding wheel dresser (diamond)	1 no.
40	C Clamp as required	1set

41	Assorted carbide lathe tools with suitable tools with holders different shape & size	1 set
42	Oil can pressure feed 500 ml.	6
43	Oil stone 150 x 50 x 25 mm	2
44	File square 2 nd cut 250 mm	4
45	Hacksaw frame adjustable 250-300 mm with blades	2
46	Hand vice 50 mm jaw	2
47	Universal table angle plate	1
48	Centre drill 2,3,& 4	4 sets
49	Tap & Die set in box metric pitch	1 set
50	Hand vice 50mm	2 nos
51	Needle file set	1 no.
52	Reamer 6mm to 25 mm by 1mm	1 set
53	Scraper of different shapes	1 set
MEASURING INSTRUMENTS		
54	Micrometer outside 0-25 mm (1 DIGITAL)	4
55	Micrometer 25-50 mm	2
56	Micrometer outside 50-75 mm	1
57	Micrometer depth gauge 0-200 mm	1
58	Direct reading vernier caliper B300(Direct reading with dial)	1
59	Digital vernier caliper 300mm	
60	Vernier height gauge 250 mm (DIGITAL)	1
61	Vernier gear tooth caliper	1
62	Vernier bevel protractor with 150 mm blade	1
63	Bevel gauge 200 mm	1
64	Sine bar 200 mm	1
65	Compound dial gauge with stand (metric)	1
66	Dial test indicator with magnetic gauge type 1 grade A with magnetic base	1
67	Centre gauge 60	1
68	Slip gauge set (normal set) Metric	1 set
69	Flange micrometer size 0-25 mm	1 no.
70	Flange micrometer size 25-50 mm	1
71	Screw pitch gauge for metric pitches	1 set
72	Radius gauge metric set (1-6 mm)	1 set
73	Feeler gauge	1 set
74	Telescopic gauge 13 mm to 300 mm	1 set
75	Taper gauge mt no 1,2,3,4,&5	1 set
76	3 pin micrometer 10 -25 mm	2 nos
77	Limit plug gauges 5 mm to 25 mm by 2.5 mm range	1 set
78	Dial cylindrical bore gauge 35 to 60mm and 60mm to 150mm	1 set
79	Coordinate measuring machine	1 No.
80	Magnetic "V" Block	2 pairs
81	Lever dial Gauge with stand (Accuracy .005mm)	1 No.
82	Surface roughness Tester	1 No.

II.GENERAL MACHINERY & INSTALLATION

1	TOOL ROOM LATHE WITH 3 & 4 JAW CHUCK,FACE PLATE,DRIVING PLATE,TAPER TURNING ATTACHMENT,STEADIES & SET OF LATHE TOOLS & HOLDERS	02 NOS
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	02 NOS
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 ELECTRODE DIA. -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 & CO-ORDINATE 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