

Syllabus for the subject

of

**TRADE THEORY-I
&
TRADE PRACTICAL-I**

Under

CRAFT INSTRUCTOR TRAINING SCHEME (CITS)

**Trade: TOOL & DIE MAKER (PRESS TOOLS, JIG &
FIXTURES)**

&

TOOL & DIE MAKER (DIES & MOULD)

Re-Designed in

- 2014 -

By

**Government of India
Ministry of Labour & Employment
Directorate General of Employment & Training**

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A.RATIONALE

Success & Sustainability of any Training System depends upon, given other things, availability of good quality instructors. An Instructor should possess good trade skills to impart skill training.

Ability to understand and interpret the course content is imperative to ensure proper delivery. It is the domain Skills and Knowledge which enable comprehending the prescribed contents and subsequent lesson/demonstration planning for effective delivery. Thus it is imperative for any trade instructor to have adequate domain skills so that same can be transferred.

To deliver effectively, both knowledge and skills, in depth know how are very much needed. At the same time the main objective of Instructor training programme is enabling instructors to demonstrate higher productivity and higher accuracy in performing a task/job.

Recognizing this importance more emphasis has been given to the Trade Practical & Trade Theory in all Engineering Trades in Craft Instructors Training Scheme (CITS) under NCVT.

B. GENERAL INFORMATION

1. **Name of the Course** : Craft Instructor Training
2. **Duration of Instructor Training** : 1 Year (Two semesters each of six months duration).
3. **Subjects covered in the Semesters** : Detailed in Section - C
4. **Name of the Subject** : **TRADE THEORY –I& TRADE PRACTICAL-I**
5. **Applicability** : **TOOL & DIE MAKER TRADE**
6. **Examination** : AITT to be held at the end of each semester.
7. **Space Norms** :
(a) One class room of minimum 30sq.m. area having Minimum width of 5 m. and with 6000 lumen.
(b) Workshop: 160 sq. meter having minimum width of 8 m. and with 60000 lumen
The electrical equipments of Class room should conform to minimum 3 star Building energy rating as per Bureau of Energy Efficiency (B.E.E.)
8. **Power Norms** :
(a) 1 KW for Class room
(b) 25 KW for Workshop.
9. **Unit strength(Batch Size)** : 20
10. **Entry qualification** :
Diploma/Degree in Mechanical/Production Engineering from AICTE recognized Board / University.
OR
NTC/ NAC in the Tool & Die Maker (Press Tool, Jigs & Fixture)/ TDM (Dies & Moulds) trade.
11. **Trainers' Qualification** :
Diploma or Degree in Mechanical / Production Engineering from AICTE recognized Board / University with five / two years experience respectively.
12. **Desirable** :
Passed National Craft Instructor Training course in Tool & Die Maker (Press Tool, Jigs & Fixture)/ TDM (Dies & Moulds) trade.

In case of two units, one trainer must be Degree in Engineering.

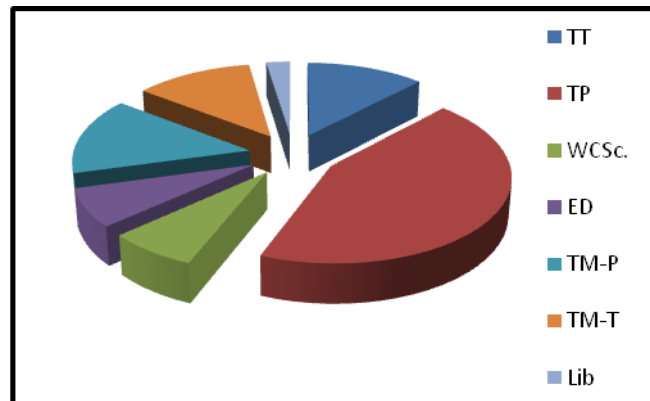
Note: Degree/Diploma candidate may directly appear for Semester-I exam without attending classes for lateral entry in semester-II.

C. SEMESTER WISE ALLOTMENT OF TIME & MARKS AMONG THE SUBJECTS FOR CITS

	SUBJECTS	Hrs. / Week	% of time allotted	Marks	Sessional	Full Marks	Pass Marks		
							Exam.	Sessional	Total
First semester	Trade Practical – 1	20	50	200	30	230	120	18	138
	Trade Theory - 1	6	15	100	20	120	60	12	72
	Workshop Cal. & Sc.	6	15	50	-	50	30	-	30
	Engineering Drawing	6	15	100	-	100	60	-	60
	Library	2	5	-	-				
	TOTAL for Sem. - I	40		450	50	500	270	30	300
Second semester	Trade Practical – 2	16	40	200	30	230	120	18	138
	Trade Theory - 2	4	10	100	20	120	60	12	72
	Training Methodology - Practical	12	30	200	30	230	120	18	138
	Training Methodology - Theory + IT	6+2	20	100	20	120	60	12	72
	TOTAL	40		600	100	700	360	60	420
	GRAND TOTAL	80		1050	150	1200	630	90	720

Hourly Distribution

TOTAL: 1200 marks for 2 semesters Pass marks: 720



Subject	Time in %	Marks in %
Trade Practical	45	38
Trade Theory	12.5	20
Total for Trade	57.5	58
Training Methodology (Practical)	15	19
Training Methodology (Theory) + IT	12.5	10
Total for Training Methodology & IT	27.5	29
Engineering Drawing	7.5	12
Workshop Cal. & Sc.	7.5	4
Library	2.5	-

D. TOPIC WISE DISTRIBUTION OF TIME & MARKS
TRADE: TOOL & DIE-MAKER
CRAFT INSTRUCTOR TRAINING SCHEME
SEMESTER-I

Note: During the discussion of any machine tools, related precautions and safety measures should be discussed.

Trade Theory				Trade Practical		
Sl. No.	Topics	Hours	Marks	Topics	Hours	Marks
1	Precision measuring instruments	10	08	Fitting and Drilling	70	40
2	Engineering Material	03	02	Grinding of cutting fluids	45	16
3	Limits, fits & tolerances	10	08	Lathe operation	60	25
4	Tool & cutter grinding	10	08	Milling	70	40
5	Lathe and its operation	14	09	Surface and cylindrical grinding	45	16
6	Cutting fluid	04	02	Heat treatment & material testing	45	16
7	Lubricants	03	02	CAD	60	30
8	Milling machine & its operation	14	10	Hydraulics & Pneumatics	45	16
9	Gear cutting	14	10			
10	Surface grinding	14	10			
11	Heat treatment	08	06			
12	Material testing	06	05			
13	CAD	14	12			
14	Hydraulics & Pneumatics	08	08			
	TOTAL	132	100	TOTAL	440	200
	THEORY 1 ---22 WEEKS X 06 HRS/WEEK=132hrs			PRACTICAL 1 ---22 WEEKS X 20 HRS/WEEK=440hrs		

E. DETAIL SYLLABUS FOR THE TRADE: TOOL & DIE MAKER
(PRESS TOOLS, JIG & FIXTURES)
&
(DIES & MOULD)
UNDER CRAFT INSTRUCTOR TRAINING SCHEME
SEMESTER-I

Tentative Week No.	Trade Practical	Trade Theory
1-2	<p>Occupational Safety & Health Importance of housekeeping & good shop floor practices. Health, Safety and Environment guidelines, legislations & regulations as applicable. Disposal procedure of waste materials like cotton waste, metal chips/burrs etc. Basic safety introduction, Personal protective Equipments(PPE):- Basic injury prevention, Basic first aid, Hazard identification and avoidance, safety signs for Danger, Warning, caution & personal safety message. Preventive measures for electrical accidents & steps to be taken in such accidents. Use of Fire extinguishers.</p> <p>Technical English: Prepare different types of documentation as per industrial need by different methods of recording information.</p> <p>Basic Life support training: Be able to perform DRSABCD: D: Check for Danger R: Check for a Response</p>	<p>Introduction of First aid. Operation of electrical mains. Introduction of PPEs. Response to emergencies e.g.; power failure, fire, and system failure</p> <p>Soft Skills: its importance and Job area after completion of training. Introduction to 5S concept & its application. Importance of 5S implementation throughout CITS course-workplace cleaning, machine cleaning, signage, proper storage of equipment etc.</p> <p>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.</p> <p>Basic Life support (BLS):- Basic Life Support (BLS) techniques for drowning, choking,</p>

	<p>S: Send for help A: Open the Airway B: Check for normal Breathing C: Perform CPR (Cardio Pulmonary Resuscitation) D: Attach Defibrillator / Monitor as soon as available.</p>	<p>electrocution, neck and spinal injury, including CPR (cardiopulmonary resuscitation).</p>
3	<p>Practice on Drilling through holes. Practice its allied operations, drilling on PCD with the accuracy of 0.06mm.</p>	<p>Engineering materials-Ferrous and non-ferrous material, properties of material. Limits, fits & Tolerance terminology as per Latest IS 919 Combination of hole and shaft for a particular fit, Geometrical accuracy and tolerances by machining process. Table for tolerance zones and limits.</p>
4	<p>Exercise on grinding single point cutting tool of lathe straight tool and multipoint cutting tool of End milling cutter with using tool and cutter grinder equipped with Swivel and Universal vice.</p>	<p>Tool and cutter Grinding Machine and classification, constructional features. Grinding Wheel –types& shapes-Specification-size</p>
5	<p>Grinding practice of single point cutting tool, cylindrical milling cutters side & face milling cutters on as per Latest IS 3019 using a tool & cutter grinder.</p>	<p>Description of single point cutting tool. Tool angles and its importance. Effects of tool setting and tool angles. Study of different angles of single point Lathe tool</p>
6	<p>Lathe-External operation –taper Turning</p>	<p>Lathe–types-classification – constructional features, accessories, operation, application and specification. Different cutting tool materials-Milling cutters</p>

7	Thread cutting and Eccentric Turning	Cutting tool Geometry and their function. Calculation of CS-RPM-feed-depth of cut and machining time. Cutting coolant-Types-Functions-Characteristics-Applications and its importance.
8	Lathe- Internal operations –Step Boring, taper turning-Thread cutting and matching	Classification of lubricants- Types-Functions-Characteristics-Applications and its importance. Classification of Tapers, Standard tapers and their, uses
9	Introduction to Auto Cadd-Practice on using simple drawing commands	Taper turning-types-applications- calculation Type of threads and their elements, applications.
10	Milling Exercise T-Slot –Dovetail male &female Milling and matching	Milling machine–classification – constructional features, accessories, operation, application and specification. cutting speed and feed calculation. Special milling attachments and their Applications

11	Using universal milling –Spur gear milling and Helical gear milling using form cutter with disc type	Gear cutting methods-application Gear tooth elements and related calculation Different types indexing methods and its calculations -
12	Surface grinding. -Flat and incline surface grinding	Surface grinding machine parameters and grinding allowance- Geometrical accuracy and tolerance by machining process
13	Cylindrical grinding- external-cylinder and taper for internal – bore and taper. Grinding wheel: dressing and balancing	Cylindrical grinding machine-Constructions –types -parts – functions and operations
14	Exercise on Heat treatment process such as annealing, normalizing, hardening, tempering, case hardening	Heat treatment purpose and its effect Change in the structure of steel during heating and cooling. 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.
15	Exercise on Rockwell hardness testing machines and Scale and table Micro hardness testing	Material testing, hardness, tensile and compressive strength, crack detection, non-destructive methods..
16	Practice on Auto – CAD – Latest version on co-ordinate systems Practice on using draw-modify commands Practice on dimension using layers	Introduction to computer and Introduction to Auto Cad- Coordinate system-obsolete-polar –relative
17	Making design and making draw of press tool components Creating template-Plotting-Printing	Familiarization with Draw-Modify Object snap tools and snap setting Dimensioning-layers-template and properties
18	Hydraulics, Pneumatics, actuators, electro- Hydraulics, Pneumatics, proportional valves Symbols as per CETOP/IS / ISO.	Identification of electro-hydraulic and electro pneumatic components by their schematic symbols. Circuit's construction with the use of Relays, Contactors, Electrical Timers, sensors, limits switches, types of actuators and solenoid valves.

19	Function and operation of single acting, double acting, Differential cylinders and motors, types of actuators.	Construction of single, double acting cylinder circuits–Direct & Indirect method, regenerative feed control, Load holding circuits (Hydraulic jack).
20	Function and use of single & double solenoid valves and pressure switches	Construction of Hammer/chisel circuit.
21	Function and use of different types of Directional controls, Pressure Controls, Flow controls, Check valve/Non-return valves.	Latching Circuits- Dominant ON & Dominant OFF circuits. Construction of electro pneumatic sequential circuit for Bending attachment $A+(B+C+)(B-C-)A-$
22	Introduction to proportional valves Fundamental circuits most often used in Industrial and mobile hydraulic system	Construction of electro hydraulic sequential circuit for press fit components. Sequence circuit $(A+B+B-A-)$
23	Industrial visit & Submission of Report	
24 - 26	Revision & Trade Test	

F. List of Tools and Equipments

For a batch of 20 trainees

Trade: - TOOL & DIE MAKER (PRESS TOOLS, JIG & FIXTURES)

&

TOOL & DIE MAKER (DIES & MOULDS)

Under CITS

SEMESTER-I

Sl. No.	DESCRIPTION OF TOOLS	QUANTITY FOR INSTRUCTOR	QUANTITY FOR BATCH OF 20
1.	Steel rule 250 mm British and metric combined as per IS 1481	1No	20 nos.
2.	Engineer's square 150 mm with knife edge as per IS 2103	1No	20 nos.
3.	Hacksaw frame adjustable with pistol grip for 200-300 mm blade	1No	20 nos.
4.	Hammer ball peen 0.5kg with handle	1No	5 Nos.
5.	Chisel cold flat 18 x 150 mm	1No	5 Nos.
6.	Hammer cross peen 0.1kg with handle	1No	5 Nos.
7.	Centre punch 100 mm	1No	10 Nos.
8.	Prick punch 150 mm	1No	10 Nos.
9.	File flat bastard 350 mm	1No	20 Nos.
10.	File flat 2 nd cut 250 mm	1No	20 Nos.
11.	File flat safe edge 200 mm	1No	20 Nos.
12.	File square smooth 200 mm	1No	20 Nos.
13.	Needle file assorted (20 Nos)150 mm	1No	10 Nos.
14.	File card	1No	20 Nos.
15.	Screw Driver 200mm	1 No	20 Nos.
16.	Vernier Caliper 200 mm as per IS 3651	1 No	4 Nos.
17.	Out side Micro Meter (0 to 25mm) as per IS 2967	1 No	4 Nos.
18.	D.E. Spanner 6mm to 32 mm as per IS 2028	1 Set	1 Set
19.	Allan Key 3 mm to 12 mm	1 Set	2 Sets
20.	Out side Micro Meter (25 to 50mm) as per IS 2967	1 No	4 Nos.

Tools measuring instruments and general shop out fit

SL. No.	DESCRIPTION OF TOOLS	QUANTITY
1.	Caliper inside spring type 150 mm	4 Nos.
2.	Caliper outside spring type 150 mm	4Nos.
3.	Divider spring type 150 mm	4 Nos.
4.	Odd leg caliper firm joint 150mm	4 Nos.
5.	Screw driver 200 mm	5 Nos.
6.	Centre gauge	4 Nos.
7.	Oil cane 250 ML.	5 Nos.
8.	File half round bastard 300 mm	5 Nos.
9.	File half round smooth 250 mm	5 Nos.
10.	File three square bastard 250 mm	5 Nos.
11.	File three square smooth 200 mm	5 Nos.
12.	File round bastard 250 mm	5 Nos.
13.	Knife edge file 150 mm	5 Nos.
14.	Scribing block universal 300 mm	5 Nos.
15.	Granite surface plate grade 0 630 mm x 630 mm x 100mm	2 Nos.
16.	Tap extractor 3 mm to 12 mm x 1.5 mm	2 sets
17.	Screw extractor sizes 1 to 8	2 sets
18.	Taps and dies (metric) 3 mm to 12 mm complete set in a box	4 sets
19.	Drill twist st. shank dia. 3 to 12.0 mm in steps of 0.5 mm	3 sets
20.	Taper shank drills 10 to 20 mm in steps of 1 mm	2 sets
21.	Letter punch 3 mm set	2 sets
22.	Number punch 3 mm set	2 sets
23.	Drill chuck 12 mm, capacity	2 Nos.
24.	Centre drills 1,2,3,4	20 each
25.	Parallel hand reamer 5 mm, 6,8,10mm in steps of 1 mm	4 sets
26.	Hand taper pin reamer 5mm,6mm,8mm,10mm (set of 4Nos)	2 sets
27.	Side and face milling cutter Ø125 x 12 mm width Ø 27 mm bore	4 Nos.
28.	Side & face milling cutter Ø 100mm x 10 mm width,Ø 27 mm bore	4 Nos.

29.	Cylindrical milling cutter Ø 63 mm x 100 mm length Ø 27 mm bore	4 Nos.
30.	Single angle cutter Ø 63 mm x 18 mm width Ø 27 mm bore – 55°	4 Nos.
31.	Equal angle cutter Ø 63mm x 18 mm width Ø 27 bore – 90°	4 Nos.
32.	Slab end mill cutter dia 80 mm x 40 mm width x dia 22 bore	4 Nos.
33.	Shell end mill dia 100 mm x 50 mm width x dia 32 bore	4 Nos.
34.	Involute Gear cutter 2 module (Three nos. in a set)	1 set
35.	Face cutter dia 100 mm x 25 mm width x dia 32 bore	4 Nos.
36.	Parallel shank end mill dia 5, dia 6, dia 8, dia 10 and dia 12 mm	4 No each
37.	T-slot cutter with parallel shank – cutter dia 17.5 x 8 mm width x dia. Of shank 8 mm	5 Nos.
38.	Slitting cutter dia 100 mm x 2 mm width x 27 mm bore	4 Nos.
39.	Ball end mill dia 3 mm, dia 6 mm, dia 8 mm, dia 10 mm and dia 12 mm.	4 Nos. each
40.	Tool makers clamp 50 mm, 75 mm, 100 mm and 150 mm	8 Nos. each
41.	‘C’ clamp 75 mm, 100 mm, 150 mm and 200 mm	4 Nos. each
42.	HSS tool bits 4mm, 6mm, 8mm square 100 mm length	20 Nos. each
43.	Tool holders – straight, LH and RH to suit 4,6 & 8mm Sq. - tool size	8 each
44.	Parting tool holders to suit the size of the lathe	4 Nos. each
45.	Parting tool blades 3 mm and 4 mm Thick HSS	6 each
46.	Boring bars to accommodate 4 mm, 6 mm and 8 mm HSS tool bits	6 each
47.	Knurling tool – revolving type(Straight & Diamond)	2 Nos. each
48.	Tool makers buttons – dia 10mm and dia 12mm	6 each
49.	Tool holders for shaper– straight, LH and RH to suit the machine available.	6 each
50.	Oil stone assorted (10 mm square, dia 10 mm and 10 mm side triangular) 100 mm length	4 each
51.	Star dresser	6 Nos.
52.	Diamond dresser with holder	6 Nos.
53.	Work bench 340 cm x 120cm x 75 cm with 150 mm vice	4 Nos. (each bench fitted with 4vices)
54.	8 Locker Steel cup board for trainees 9 Pigon cup Board)	3 Nos.
55.	Steel cupboard 6’ or more	2 Nos.
56.	Metal rock 180 cm x 60 cm x 45 cm	2Nos.

57.	Fire extinguisher	4 Nos.
58.	Fire buckets with stand	4 Nos.
59.	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) as per IS 3179	2 Sets each
60.	Screw pitch gauge – range 0.4 – 7 mm metric 60 degree (21 leaves)	2 sets
61.	Radius gauge 1-3 mm by 0.25 mm and 3,5-7 mm by 0.5 mm (34 leaves)	2 sets
62.	Digital Vernier height gauge – range 300 mm vernier scale-0.02 mm	1 No
63.	Digital Vernier height - range 500 mm vernier scale – 0.02 mm	2 Nos.
64.	Dial vernier caliper 0-200 mm, graduation – 0.02 mm	2 Nos.
65.	Vernier caliper – range 300 mm vernier scale – 0.02 mm as per IS 3651	2 Nos.
66.	Universal bevel protractor – blade range 150 and 300 mm, dial 1 degree, vernier 5' with head, acute angle attachment as per IS 4239	2 Nos.
67.	Digital Outside micro meter 0 – 25 mm (0.01mm accuracy)	1 No
68.	Combination square sets – 300mm blade with square head, centre head, protractor head	2 sets
69.	Telescoping gauge range 8-150 mm(6 pieces/sets)	1 set
70.	Sine bar 150 mm with stopper plate as per IS 5359	2 Nos.
71.	Gauge Blocks Workshop Grade – 87 Pieces Per Set	2 sets
72.	Centre square – size 400 x 250 mm blade	2 sets
73.	V – block – approx.32 x 32 x 41 mm with clamping capacity of 25 mm with clamps as per IS 2949	1 pair
74.	V – block – approx.65 x 65 x 80 mm with clamping capacity of 50 mm with clamps as per IS 2949	1 pair
75.	Magnetic V-block 100 x 100 x 125 mm	1 pair
76.	Angle plate – adjustable 250 x 250 x 300 mm	2 Nos.
77.	Magnetic stand with magnetic base 60 x 47.5 mm and with universal swivel clamp, dial holding rod (150 mm) scriber	2 Nos.
78.	Dial test indicator – lever type – range 0-0.8 mm – graduation 0.001 mm, reading 0-40-0 with accessories. as per IS 11498	2 Nos.
79.	Dial test indicator – plunger type – range 0-10 mm – graduation 0.001 mm, reading 0-100 with revolution counter. as per IS 2092	2 Nos.
80.	Bore gauge with dial indicator (1 mm range 0-0.01 mm graduation)-range of bore gauge 18-25mm	2 sets
81.	Straight edge – single beveled – size 150 mm and 250 mm	1 each

82.	Parallel blocks 15 mm and 25 mm in pairs as per IS 4241	4 sets
83.	Height master range 300 mm, graduation 0.001 mm with suitable measuring and spacing block	1 No
84.	Digital Dial calipers	2 Nos.
85.	Rotary table to suit vertical milling m/c table slot	1 No each
86.	Slip gauges – sets – 112 pieces- grade-‘00’ accuracy as per IS 2984	1 set
87.	Master try square 150 mm	1 No.
88.	Needle files	20 sets
89.	Hammer – nylon and copper	2 Nos. each
90.	Scrapers – Flat, Triangular, half round	2 Nos. each
91.	Adjustable spanner 12”	2 No’s
92.	Prismatic Angle gauges as per IS 6231	1 set
93.	Gear tooth vernier caliper	2 Nos.
94.	File guard	20 Nos.
95.	Three point internal micro meter range 18 to 25mm with accuracy of 0.005 mm	1 set
96.	Two point self centering bore dial gauge with accuracy of 0.001 mm	1 No
97.	Spirit level 0.02/1000 mm	1 No
98.	Grease gun	2 Nos.
99.	Wheel balancing unit with stand Size 150 mm x 150 mm x 250 height	1 No
100.	Electric hand drill ¼”	1 No
101.	Electric hand grinder – AG2	1 No
102.	Personnel computer with latest configuration, Table, UPS and printer	2 Nos.
103.	Work bench 4x3 feet with suitable drawer	4 nos.
104.	Equipment for conducting BLS (Basic Life Support) training. (Optional)	1 set

GENERAL MACHINERY

Sl. No.	Name of the machine	Specification	Quantity
1.	SS and SC centre lathe (all geared) with having minimum specification as:	Centre height 150 mm and centre distance 1000 mm along with 4 jaw and 3 jaw chucks, auto feed system, safety guard, motorized coolant system and lighting arrangement. Revolving centre 1 No Quick change tool post with 5 Nos. of tool holders along with other standard accessories like face plate, set of carriers, taper turning attachment.	4 No's
2.	Horizontal Milling Machine with minimum specification as:(with DRO)	Table Length x width 1200 x 300 mm having motorized up & down movement along with auto feed arrangement and 150mm Universal vice.	2 No's
3.	Vertical Milling Machine with minimum specification as: (with DRO)	Table Length x width 1200 x 300 mm having motorized up & down movement along with auto feed arrangement in X-Y direction along with 150mm universal vice.	2 No's
4.	Universal Milling machine with minimum specification as:	Table Length x width 1200 x 300 mm having motorized up & down movement along with auto feed arrangement and with following attachments such as: a. Vertical head b. Slotting attachment c. Rack cutting attachment d. Rotary table e. Dividing head f. Adaptors, arbors and collects etc. for holding straight shank drills and cutters from 3 mm to 25 mm.	2 No's
5.	Pedestal grinding	Dia. Of wheel – 200 mm with standard accessories	2 No's
6.	Surface grinding machine hydraulic, horizontal spindle reciprocating table manual and auto cross feed, adjustable traverse stop, auto reverse cross movement, power raise and fall of wheel head,	Wheel speed – 2800 rpm Table size - 650 x 150 mm Fine down feed - 0.001 mm Accessories: wheel guards, coolant system with baffle tank and motor, magnetic chuck 300x150mm, wheel balancing mandrel, additional wheel flange with mandrel, wheel balancing stand, wheel truing device, spare grinding wheel for general purpose grinding and standard accessories	2 No's
7.	Grinding machine hydraulic external cylindrical, universal type with internal grinding attachment fully motorized and standard	Centre height - 150mm Distance between centers- 800 mm Least in-feed - 0.0025 mm Accessories:	1 No

	accessories.	Face plates and driving dog carriers, 3 jaw self-centering chuck, 4-jaw independent chuck, tailstock, fixed steady, adjustable steady, wheel dressers for external and internal grinding wheels, straight carriers for holding different diameter shafts, coolant tank assembly with coolant filtration and circulation system, carbide tipped centers (half/full), wheel guards, front guard, (each machine supplied with assorted grinding wheels for general purpose work of internal and external grinding)	
8.	Tool and cutter grinding machine universal, tilting wheel head and power raise and fall of wheel head attachment, and standard accessories.	Distance between centre -760 mm, Accessories: Grinding flanges 50 mm & 75 mm, Wheel guards with long and short holders, Grinding wheel arbors with flanges, 100 mm long x 75 mm flange dia., Universal work head with indexing mechanism suitable for 24 divisions, Sleeves Morse No. 5/4, 5/3, 5/2, and ISA – 50/40, collet holder with set of collets for holding end mill cutters, RH and LH tail stock with centre, Clearance angle setting device with carriers, Centre height setting gauge, Universal tooth rest assembly with fixed tooth support and universal tooth support, Different shapes of tooth rest fingers, Wheel truing attachment, Clamping arbor for tools with ISA taper, Mandrel 16 mm dia., Mandrel 22 mm dia., Mandrel 27 mm dia. set of silicon carbide (green) grinding wheels, Universal vice, Lighting equipment, Inspection mandrel, Diamond dressing tool with holder, Assorted grinding wheels for all tool room work, and Standard hand tools	1 No
9.	Hardness tester Rockwell M/C	Scale for HRA, HRS, and HRC provided. With std. accessories	1 No
10.	Drilling machine, box column type upright	25 mm capacity with other standard accessories	2 No's
11.	Sensitive drilling m/c 12mm	Capacity 20 mm with other standard and required optional accessories	1 No
12.	Muffle furnace	300 x 300 x 450 mm for 1100 to 1200 degree C with standard and required optional accessories	2 No's
13.	Quenching tank with Agitation	600 x 600 x 600 mm	2 No's
14.	Bench drilling machine	Capacity 12 mm –std with std accessories	2 No's

Recommendations:

- ✓ The specifications of general machineries are given for guidance only; the user can procure the nearest specification with minor deviations as per the availability in the market.
- ✓ For Hydraulics, Pneumatics, and jig boring practical trainings, the training institute may make a Tie up with local reputed industry / Institute as per NCVT norms if not available or procured by the Institute
- ✓ The Tools & Equipments and general machineries shall be of **branded make only**
- ✓ Only pre-machined job/part shall be provided to the trainees for Final trade test
- ✓ The Trade practical on manufacturing Press Tools Jigs and Fixtures shall be executed by group (not more than 5 trainees) As project work.

Syllabus for the subject

of

**TRADE THEORY-II
&
TRADE PRACTICAL-II**

Under

CRAFT INSTRUCTOR TRAINING SCHEME (CITS)

**Trade: TOOL & DIE MAKER (PRESS TOOLS, JIG &
FIXTURES)**

&

TOOL & DIE MAKER (DIES & MOULD)

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 - (a) One class room of minimum 30sq.m. area having Minimum width of 5 m. and with 6000 lumen
 - (b) Workshop: 160 sq. meter having minimum width of 8 m. and with 60000 lumen
The electrical equipments of Class room should conform to minimum 3 star Building energy rating as per Bureau of Energy Efficiency (B.E.E.)
 - (c) Computer lab: 30 sq. m. area*
- 8. Power Norms** :
 - (a) 1 KW for Class room
 - (b) 25 KW for Workshop.
- 9. Unit strength(Batch Size)** : 20
- 10. Entry qualification** : Candidate passed semester-I under CITS or completed Semester-I.
- 11. Trainers' Qualification** : Diploma or Degree in Mechanical / Production Engineering from AICTE recognized Board / University with five / two years experience respectively.
- 12. Desirable** : Passed National Craft Instructor Training course in Tool & Die Maker (Press Tool, Jigs & Fixture)/ TDM (Dies & Moulds) trade.

In case of two units, one trainer must be Degree in Engineering.

Note: *Not required if existing computer lab is available.

H. TOPIC WISE DISTRIBUTION OF MARKS & HOURS
TRADE: TOOL & DIE-MAKER
CRAFT INSTRUCTOR TRAINING SCHEME
SEMESTER-II

Note: During the discussion of any machine tools, related precautions and safety measures should be discussed.

Trade Theory				Trade Practical		
Sl. No.	Topics	Hours	Marks	Topics	Hours	Marks
1	Jig & Fixtures	12	08	Manufacturing of Jig	15	10
2	CNC systems	15	16	Manufacturing o Fixture	10	6
3	EDM (Spark erosions)	12	10	CNC Machine centre	50	32
4	CNC wire cut EDM	10	09	Die sinking EDM	25	16
5	CMM	7	08	Wire cutting EDM	25	16
6	Quality control and inspection, 5 S, TPM & TQM	8	06	CNC Programme for Dies in CNC wire cutting EDM	25	16
7	Press tool calculation	20	40	Measurement by using CMM	10	4
8	Basic machine tool maintenance	4	03	Manufacture of blanking tools	15	10
9				Manufacture of progressive tools	25	16
10				Manufacture of combination and compound tools	35	16
11				Manufacturing of deep drawing tool	35	16
12				Manufacture of bending tool	35	16
13				Measurement of surface roughness	15	10
14				Double shooting and maintenance of Jig & Fixture and press tools	32	16
	Total	88	100		352	200
	THEORY II ---22 WEEKS X 04 HRS/WEEK=88 hrs			PRACTICAL II ---22 WEEKS X 16 HRS/WEEK=352hrs		

I. DETAIL SYLLABUS FOR THE TRADE: TOOL & DIE MAKER
(PRESS TOOLS, JIG & FIXTURES)
&
(DIES & MOULD)
UNDER CRAFT INSTRUCTOR TRAINING SCHEME
SEMESTER-II

Tentative Week No.	Trade Practical	Trade Theory
1	Manufacture of Box Jig and Angle plate jig by group as a project	Introduction to jigs and fixtures –Definition, basic elements, advantages and applications in batch production and mass production.
2	Manufacture of “V” Block angle grinding Fixtures and profile milling fixture by group as a project	Design features of jigs and fixtures Economy and cost of jig and fixture Planes and movements and arresting degrees of freedom. Locating principle and types of locators Clamping principles and types of clamps Drill bushes- types, size accuracy, material and, and manufacturing methods Types of drill jigs, parts and functions Types of Milling fixtures, parts and functions Welding fixtures – Construction principles, parts and function
3	Practice on CNC machining centre –Basic operations – Offset measurement – Part program – Editing and Proving	Introduction to CNC machining center- CNC system- Elements of CNC machine- Hardware & Software- Safety feature – Axes designation- offset measurement
4	Machining of simple components-Facing-Profile-Hexagon- Centering- Drilling- Tapping using CNC	Types of Co-ordinate system-Preparatory cods (G-Codes) and M –codes – Cutting part program(Main & Sub) – Do’s and Don’t – routine maintenance – Trouble shooting
5&6	Manufacture of electrodes and Preparation of die sinking EDM for machining and producing a	Principles of EDM - Advantages and applications of EDM – Spark erosion terminology – machine tool operating

	square, rectangle, hexagon, Round, blind die cavities, through cavities and different profiles	system – dielectric fluid – dielectric system – methods of flushing Electrode – material - application - manufacturing methods – methods of holding electrodes and alignment – determining electrode size and spark gap Work preparation and setting EDM parameters Trouble shooting and maintenance
7	Programming for simple and complicated profile using CAM software, simulation and offloading to machine.	Principles of CNC Wire cut EDM - Advantages and applications
8	Preparation of CNC wire cut EDM for machining – wire feeding – job setting and aligning- edge finding and centre finding – wire verticality setting	Machine tool, power supply, dielectric supply and part programming Work preparation, work material, wire electrode, job mounting, and job reference point Water Dielectric- characteristics, dielectric strength and flushing.
9&10	CNC programming and machining of different profile of Punches	Technology guidelines – machining parameters and guideline charts Important notes on Wire cut EDM –Temperature control, proper flushing, rough machining, finish machining, and wire offset Technology guidelines for rough cut, trim cut and taper cut Guidelines for achieving optimal machining accuracies Unstable machining causes and remedies Troubles during machining, causes and remedies Maintenance and application Tips
11&12	CNC programming and machining different shapes of Die holes with land and taper on CNC wire cut EDM Practice on measurement using CMM	optical comparator, and CMM – Introduction, working principles, parts and functions, construction, application and types of operations

13	Manufacture of simple Blanking & piercing Tool by Group as project	Introduction on Quality control, Inspection of tool and gauges, Product inspection, awareness on ISO and importance Different tooling and applications, Methods of Press tool Press –Tool nomenclature.
14	Measurement of surface roughness by CLA(Centre line average)	Shearing theory– cutting and non cutting operations Cutting clearance, Land and angular clearance. Calculation of cutting force Introduction to surface roughness-instruments and its measuring principle.
15 & 16	Manufacture of Progressive tool for producing a Cycle chain link by group as a project	Stock material, strip layout and Economic factor Cutting force calculation punch and die – Types and materials Strippers types and functions Constructions of progressive tool
17	Manufacture of Following Press tools by a group as project Combination tool & Compound tool	Stoppers types and functions Pilot locations and sizes, Side cutters Working principle of Ejector and shedder Compound tool, and combination tool-function-construction Side cam tool –function-advantages-working principles
18	Manufacture of Draw tool as a Project	Deep draw tool function and calculation Introduction to Press, parts, functions, Classification of presses, and specification
19&20	Trial out On Fly press and power press the Produced components such as V, U, Cycle link ,Cup ,Washer and Cycle bell cup	Selection of press- Shut height and day light clearance Safety precaution on press work Strip feeding, Die cushion

21	Manufacture of simple V and U bending tool by group as a project	Fine blanking –Application, working principle, clearance tool life, punch and die radius. Tool estimation.
22	Trouble shooting-Rectifications –Maintenance of Jig& fixture and press tool	Introduction of TPM and TQM. Basic machine tool maintenance and its importance
23	Industrial visit & Submission of Report	
24 - 26	Revision & Trade Test	

J. List of Tools & Equipment

Trade – TOOL & DIE MAKER
Under CITS
For a batch of 20 Trainees
Semester-II

1 Trainee's tool kit

SL NO	DESCRIPTION OF TOOLS	QUANTITY FOR INSTRUCTOR	QUANTITY FOR BATCH OF 20
1.	Steel rule 250 mm British and metric combined as per IS 1481	1No	20 Nos.
2.	Engineer's square 150 mm with knife edge as per IS 2103	1No	20 Nos.
3.	Hacksaw frame adjustable with pistol grip for 200-300 mm blade	1No	5 Nos.
4.	Hammer cross peen 0.5kg with handle	1No	5 Nos.
5.	Chisel cold flat 18 x 150 mm	1No	5 Nos.
6.	Hammer cross peen 0.7kg with handle	1No	5 Nos.
7.	Centre punch 100 mm	1No	20 Nos.
8.	Prick punch 150 mm	1No	20 Nos.
9.	File flat bastard 350 mm	1No	20 Nos.
10.	File flat 2 nd cut 250 mm	1No	20 Nos.
11.	File flat safe edge 200 mm	1No	20 Nos.
12.	File square smooth 200 mm	1No	10 Nos.
13.	Needle file assorted (20 Nos)150 mm	1No	20 Nos.
14.	File card	1No	20 Nos.
15.	Screw Driver 200mm	1 No	20 Nos.
16.	Vernier Caliper 200 mm as per IS 3651	1 No	4 Nos.
17.	Out side Micro Meter (0 to 25mm) as per IS 2967	1 No	4 Nos.
18.	D.E. Spanner 6mm to 32 mm as per IS 2028	1 Set	1 Set
19.	Allan Key 3 mm to 12 mm	1 Set	1 Set
20.	Out side Micro Meter (25 to 50mm) as per IS 2967	1 No	4 Nos.

2. Tools measuring instruments and general shop out fit

Sl. No	DESCRIPTION	QUANTITY
21.	Screw driver 200 mm	5 Nos.
22.	Centre gauge	4 Nos.
23.	Oil cane 250 ML.	4 Nos.
24.	File half round bastard 300 mm	5 Nos.
25.	File half round smooth 250 mm	5 Nos.
26.	File three square bastard 250 mm	5 Nos.
27.	File three square smooth 200 mm	5 Nos.
28.	File round bastard 250 mm	5 Nos.
29.	Knife edge file 150 mm	5 Nos.
30.	Scribing block universal 300 mm	5 Nos.
31.	Granite surface plate grade 0 630 mm x 630 mm x 100mm with between centre and adjustable stand to the IS 7327	2 Nos.
32.	Tap extractor 3 mm to 12 mm x 1.5 mm	2 sets
33.	Screw extractor sizes 1 to 8	2 sets
34.	Taps and dies (metric) 3 mm to 12 mm complete set in a box	4 sets
35.	Drill twist st. shank dia. 3 to 12 mm in steps of 0.5 mm	3 sets
36.	Taper shank drills 10 to 20 mm in steps of 1 mm	2 sets
37.	Number punch 3 mm set	2 sets
38.	Drill chuck 12 mm, capacity	2 Nos.
39.	Allen key metric 3 to 12 mm set	5 sets
40.	Centre drills 3,4	5 each
41.	Parallel hand reamer 5,6,8 & 10mm in steps of 1 mm	4 sets
42.	Hand taper pin reamer 5mm,6mm,8mm,10mm and 12mm (set of 4Nos)	2 sets
43.	Side and face milling cutter Ø125 x 12 mm width Ø 27 mm bore	4 Nos.
44.	Side & face milling cutter Ø 100mm x 10 mm width, Ø 27 mm bore	4 Nos.
45.	Cylindrical milling cutter Ø 63 mm x 100 mm length Ø 27 mm bore	4 Nos.
46.	Single angle cutter Ø 63 mm x 18 mm width Ø 27 mm bore – 70 °	4 Nos.
47.	Equal angle cutter Ø 63mm x 18 mm width Ø 22 bore – 90 °	4 Nos.
48.	Slab milling cutter dia 80 mm x 40 mm width x dia 22 bore	4 Nos.

49.	Parallel shank end mill dia 6, dia 8, dia 10 and dia 12 mm	4 Nos.each
50.	T-slot cutter with parallel shank – cutter dia 17.5 x 8 mm width x dia. Of shank 8 mm	5 Nos.
51.	Ball end mill dia 3 mm, dia 6 mm, dia 8 mm, dia 10 mm and dia 12 mm.	2 Nos. each
52.	Tool makers clamp 50 mm, 75 mm, 100 mm and 150 mm	4 Nos.each
53.	HSS tool bits 4mm, 6mm, 8mm square 100 mm length	20 Nos. each
54.	Tool holders – straight, LH and RH to suit 4,6,8 mmsq. Bit HSS size of lathe	8 each
55.	Parting tool holders to suit the size of the lathe	4 Nos.each
56.	Parting tool blades 3 mm and 4 mm thick HSS	4 each
57.	Boring bars to accommodate 4 mm, 6 mm and 8 mm HSS tool bits	4 each
58.	Knurling tool (Straight Diamond)	2 Nos. each
59.	Tool makers buttons – dia 10mm and dia 12mm	6 each
60.	Tool holders for shaper– straight, LH and RH to suit the machine available.	4 each
61.	Oil stone assorted (10 mm square, dia 10 mm and 10 mm side triangular) 100 mm length	4 each
62.	Star dresser	2 Nos.
63.	Diamond dresser with holder	2 Nos.
64.	Work bench 340 cm x 120cm x 75 cm with 150 mm vice	4 Nos. (each bench fitted with 4vices)
65.	8 lockers Steel cup board for trainees (pigon cupboard)	3 Nos.
66.	Steel cupboard 6' or more	2 Nos.
67.	Metal rock 180 cm x 60 cm x 45 cm	2 Nos.
68.	Fire extinguisher	4 Nos.
69.	Fire buckets with stand	4 Nos.
70.	Feeler gauge 0.05 mm to 0.3 mm by 0.05 & 0.4 mm to 1 mm by 0.1 mm (13 LEAVES) as per IS 3179	2 Sets
71.	Screw pitch gauge – range 0.4 – 7 mm metric 60 degree (21 leaves)	2 sets
72.	Radius gauge 1-3 mm by 0.25 mm and 3,5-7 mm by 0.5 mm (34 leaves)	2 sets
73.	Digital Vernier height gauge – range 300 mm vernier scale-0.02 mm	1 No
74.	Dial Vernier caliper 0-200 mm, graduation – 0.02 mm	2 Nos
75.	Vernier caliper – range 300 mm vernier scale – 0.02 mm as per IS 3651	2 Nos.
76.	Universal bevel protractor – blade range 150 and 300 mm, dial 1 degree, vernier 5' with head, acute angle attachment as per IS 4239	1 No
77.	Digital Outside micro meter 0 – 25 mm (0.01mm accuracy)	2 Nos.

78.	Combination square sets – 300mm blade with square head, centre head, protractor head	2 sets
79.	Telescoping gauge range 8-150 mm(6 pieces/sets)	1 set
80.	Sine bar 150 mm with stopper plate as per IS 5359	2 Nos
81.	Gauge Blocks Workshop Grade – 87 Pieces Per Set	2 sets
82.	Centre square – size 400 x 250 mm blade	2 sets
83.	V – block – approx.32 x 32 x 41 mm with clamping capacity of 25 mm with clamps as per IS 2949	2 pairs
84.	Angle plate – adjustable 250 x 250 x 300 mm	2 Nos
85.	Stand with magnetic base 60 x 47.5 mm and with universal swivel clamp, dial holding rod (150 mm) scriber	2 Nos.
86.	Dial test indicator – lever type – range 0-0.8 mm – graduation 0.001 mm, reading 0-40-0 with accessories. as per IS 11498	2Nos
87.	Dial test indicator – plunger type – range0-10 mm – graduation 0.001 mm, reading 0-100 with revolution counter. as per IS 2092	2 Nos.
88.	Bore gauge with dial indicator (1 mm range 0-0.01 mm graduation)-range of bore gauge 18-25mm	2 sets
89.	Straight edge – single beveled – size 150 mm and 250 mm	1 each
90.	Parallel blocks 15 mm and 25 mm in pairs as per IS 4241	4 sets
91.	Slip gauges – sets – 112 pieces- grade-‘00’ accuracy as per IS 2984	1 sets
92.	Master try square 150 mm	1 No.
93.	Hammer – nylon and coppers	8 Nos. each
94.	Scrapers – Flat, Triangular, half round	2 Nos.
95.	Drill drift (To be manufacture in the section)	2 Nos.
96.	Adjustable spanner 12”	2 Nos.
97.	Prismatic Angle gauges as per IS 6231	1 set
98.	Gear tooth Vernier caliper	2 Nos.
99.	File guard	20 Nos.
100.	Three point internal micro meter range 18 to 25mm with accuracy of 0.005 mm	2 sets
101.	Two point self centering bore dial gauge with accuracy of 0.001 mm	1 No
102.	Spirit level 0.02/1000 mm	1 No
103.	Grease gun	3 Nos.
104.	Wheel balancing unit with stand Size 150 mm x 150 mm x 250 height	1 No
105.	Electric hand drill ¼”	1 No
106.	Work bench 4x3 feet with suitable drawer	4 nos.

107.	Micro boring bar Dia 12 to 42 mm BT 40 with suitable inserts	2 Nos
108.	Tap holder Bt 40 ER 25 with standard length	2 Nos
109.	Laptop with latest configuration	2 nos.
110.	Auto cad 10 licences software	1 set
111.	Personnel computer with latest configuration, Table, UPS and printer	10 Nos.
112.	Surface roughness meter	02

GENERAL MACHINERY

Sl. No.	Name of the machine	Specification	Quantity
1.	SS and SC centre lathe (all geared) with having minimum specification as:	Centre height 150 mm and centre distance 1000 mm along with 4 jaw and 3 jaw chucks, auto feed system, safety guard, motorized coolant system and lighting arrangement. Revolving centre 1 No Quick change tool post with 5 Nos. of tool holders along with other standard accessories like face plate, set of carriers, taper turning attachment.	4 Nos.
2.	Horizontal Milling Machine with minimum specification as:(with DRO)	Table Length x width 1200 x 300 mm having motorized up & down movement along with auto feed arrangement and 150mm Universal vice.	2 Nos.
3.	Vertical Milling Machine with minimum specification as: (with DRO)	Table Length x width 1200 x 300 mm having motorized up & down movement along with auto feed arrangement in X-Y direction along with 150mm universal vice.	2 Nos.
4.	Universal Milling machine with minimum specification as:	Table Length x width 1200 x 300 mm having motorized up & down movement along with auto feed arrangement and with following attachments such as: <ul style="list-style-type: none"> a. Vertical head b. Slotting attachment c. Rack cutting attachment d. Rotary table e. Dividing head f. Adaptors, arbors and collects etc. for holding straight shank drills and cutters from 3 mm to 25 mm. 	2 Nos.
5.	Pedestal grinding	Dia. Of wheel – 200 mm with standard accessories	2 Nos.
6.	Surface grinding machine hydraulic, horizontal spindle reciprocating table manual and auto cross feed, adjustable traverse stop, auto reverse cross movement, power raise and fall of wheel head,	Wheel speed – 2800 rpm Table size - 650 x 150 mm Fine down feed - 0.001 mm Accessories: wheel guards, coolant system with baffle tank and motor, magnetic chuck 300x150mm, wheel balancing mandrel, additional wheel flange with mandrel, wheel balancing stand, wheel truing device, spare grinding wheel for general purpose grinding and standard accessories	2 Nos.
7.	Grinding machine hydraulic external cylindrical, universal type with internal grinding	Centre height - 150mm Distance between centers- 800 mm Least in-feed - 0.0025 mm	1 No

	attachment fully motorized and standard accessories.	Accessories: Face plates and driving dog carriers, 3 jaw self-centering chuck, 4-jaw independent chuck, tailstock, fixed steady, adjustable steady, wheel dressers for external and internal grinding wheels, straight carriers for holding different diameter shafts, coolant tank assembly with coolant filtration and circulation system, carbide tipped centers (half/full), wheel guards, front guard, (each machine supplied with assorted grinding wheels for general purpose work of internal and external grinding)	
8.	Double body fly press	10 tonne capacity	2 nos.
9.	Hardness tester Rockwell M/C	Scale for HRA, HRS, and HRC provided. With std. accessories	1 No
10.	Optical Comparator m/c	Basic model with other standard and required optional accessories	1 No
11.	Drilling machine, box column type upright	25 mm capacity with other standard accessories	2 Nos.
12.	EDM (spark erosion) with DRO	Work Tank : 600 x 400 x 280 mm Table traverse – X x Y x Z : 220 x 150 x 150 mm Work piece weight -100 Kgs Work piece height – 150 mm Electrode weight – 25 Kgs Least count of vernier -0.005 mm Working current -20Amps Metal removal rate –Cu to Steel : 150 mm ³ /min Electrode wear - < 0.1% Surface finish obtainable -0.8 μ Ra Dielectric capacity -150 lits. (approx.)	1 No
13.	CNC wire cut EDM with Precision LM guide ways for all axes with standard and essential accessories	Table size – 350 X 550 mm Cutting speed : 70 mm ² /min Wire dia. – 0.25 mm Surface finish obtainable : 1.2 μ Ra or better Taper cutting angle : ± 10°/ 50 mm Work piece height – 200 mm Work piece weight- 300 kg Main table traverse- (X, Y) – 250 x 350 mm Auxiliary table traverse –(u, v)- 30 x 30 mm wire spool capacity- 5 kg Axis control – Suitable for machining die holes with land and taper Interpolation – Linear & Circular Least input increment – 0.001 mm	1 No

		Connected load – 4 KVA (Approx). Dielectric fluid – Deionizer water	
14.	CNC Vertical milling m/c	CNC Vertical milling m/c with minimum specification as: Table size: 500 x 350mm Travel X-axis x Y-axis x Z-axis: 350 x 300 x 300mm Auto Tool Changer: 12 stations. Spindle power: 3.7kW (continuous rating) with popular control system like Fanuc/Sinumeric along with motorized coolant system. BT 40 pull set Voltage stabilizer with other standard and required optional accessories Computer & UPS with laser printer (latest version) with all accessories (Auto CAD and CAM software)	2 Nos
15.	Power press m/c	5 tonne capacity standard and required optional accessories	1 No
16.	Sensitive drilling m/c 12mm	Capacity 20 mm with other standard and required optional accessories	1 No
17.	Muffle furnace	300 x 300 x 450 mm for 1100 to 1200 degree C with standard and required optional accessories	1 No
18.	Quenching tank with Agitation	600 x 600 x 600 mm	21Nos.
19.	Bench drilling machine	Capacity 12 mm –std with std accessories	1 No
20.	Personal computers	PCs with MS-Windows, networked on LAN.	11 nos.
21.	Computer Table & Chairs		11 nos. & 20 Nos.
22.	Multimedia teach ware/ courseware for CNC technology and interactive CNC part programming software for turning, milling & grinding with virtual machine operation and simulation using popular operation control system such as Fanuc, Sinumeric, etc. (Web-based or licensed based) (10 trainees + 1 faculty)	Compatible to CNC cylindrical grinding machine	11 users

Recommendations:

1. The specifications of general machineries mentioned are generic type and for guidance only. The user can procure the nearest specification with minor deviation as per the availability in the market.
2. The Tools & Equipments and general machineries shall be of **branded make only**
3. Only pre- machined job/part shall be provided to the trainees for Final trade test
4. The Trade practical on manufacturing Press Tools Jigs and Fixtures shall be executed by group (not more than 5 trainees) As project work

K. FURNITURE, ACCESSORIES AND AUDIO VISUAL AIDS FOR THE SEMESTER-I & II (COMMON FOR ALL ENGG. TRADES)

Sl. No.	Item	Qty
01	Class Room Chairs (armless) / Dual desk may also be allowed	20 /10nos.
02	Class Room Tables (3ft X 2ft) / Dual desk may also be allowed	20 /10 nos.
03	Chair for Trainer (armed) movable	01 no.
04	Table for Trainer (4 ½ ft X 2 ½ ft) with Drawer and cupboard	01 no.
05	LCD / LED Projector	01 no.
06	Multimedia Computer System with all accessories with UPS (.5 KVA)	01 set
07	Computer Table	01 no.
08	White Board (6ft X 4 ft.)	01 no.
09	LCD Projector Screen	01 no.
10	Air Conditioner 1.5Ton (OPTIONAL)	02 nos.
11	Wall Clock	01 no.
12	Wall charts, Transparencies and DVDs related to the trade	As required
13.	Laser Printer with scanner	01 no.
14.	Steel Cupboard with 8 pigeon lockers	3 nos.
15.	Work bench for fitters with two vices of 100mm	2 nos.
16.	Steel cupboard 180x90x45cm	2 nos.
17.	Steel cupboard 120x60x45cm	2 nos.
18.	Multi drawer tool rack trolley with minimum 4 drawers and 20 tool capacity	04 nos.
19.	First aid box.	1 no.

L.LIST OF TRADE COMMITTEE MEMBERS

Sl. No.	Name & Designation Sh /Mr. / Ms.	Organization	Mentor Council Designation
Members of Sector Mentor council			
1.	A. D. Shahane, Vice-President, (Corporate Trg.)	Larsen & Turbo Ltd., Mumbai:400001	Chairman
2.	Dr. P.K.Jain, Professor	IIT, Roorkee, Roorkee-247667, Uttarakhand	Member
3.	N. Ramakrishnan, Professor	IIT Gandhinagar, Gujarat-382424	Member
4.	Dr. P.V.Rao, Professor	IIT Delhi, New Delhi-110016	Member
5.	Dr. Debdas Roy, Asstt. Professor	NIFFT, Hatia, Ranchi-834003, Jharkhand	Member
6.	Dr. Anil Kumar Singh, Professor	NIFFT, Hatia, Ranchi-834003, Jharkhand	Member
7.	Dr. P.P.Bandyopadhyay Professor	IIT Kharagpur, Kharagpur- 721302, West Bengal	Member
8.	Dr. P.K.Ray, Professor	IIT Kharagpur, Kharagpur- 721302, West Bengal	Member
9.	S. S. Maity, MD	Central Tool Room & Training Centre (CTTC), Bhubaneswar	Member
10.	Dr. Ramesh Babu N, Professor	IIT Madras, Chennai	Member
11.	R.K. Sridharan, Manager/HRDC	Bharat Heavy Electricals Ltd, Ranipet, Tamil Nadu	Member
12.	N. Krishna Murthy Principal Scientific Officer	CQA(Heavy Vehicles), DGQA, Chennai, Tamil Nadu	Member
13.	Sunil Khodke Training Manager	Bobst India Pvt. Ltd., Pune	Member
14.	Ajay Dhuri	TATA Motors, Pune	Member
15.	Uday Apte	TATA Motors, Pune	Member
16.	H B Jagadeesh, Sr. Manager	HMT, Bengaluru	Member
17.	K Venugopal Director & COO	NTTF, Peenya, Bangalore	Member
18.	B.A.Damahe, Principal L&T Institute of Technology	L&T Institute of Technology, Mumbai	Member
19.	Lakshmanan. R Senior Manager	BOSCH Ltd., Bangalore	Member
20.	R C Agnihotri Principal	Indo- Swiss Training Centre Chandigarh, 160030	Member
Mentor			
21.	Sunil Kumar Gupta (Director)	DGET HQ, New Delhi.	Mentor

Members of Core Group			
22.	N. Nath. (ADT)	CSTARI, Kolkata	Co-ordinator
23.	H.Charles (TO)	NIMI, Chennai.	Member
24.	Sukhdev Singh (JDT)	ATI Kanpur	Team Leader
25.	Ravi Pandey (V.I)	ATI Kanpur	Member
26.	A.K. Nasakar (T.O)	ATI Kolkata	Member
27.	Samir Sarkar (T.O)	ATI Kolkata	Member
28.	J. Ram Eswara Rao (T.O)	RDAT Hyderabad	Member
29.	T.G. Kadam (T.O)	ATI Mumbai	Member
30.	K. Mahendar (DDT)	ATI Chennai	Member
31.	Shrikant S Sonnavane (T.O)	ATI Mumbai	Member
32.	K. Nagasrinivas (DDT)	ATI Hyderabad	Member
33.	G.N. Eswarappa (DDT)	FTI Bangalore	Member
34.	G. Govindan, Sr. Draughtsman	ATI Chennai	Member
35.	M.N.Renukaradhya, Dy.Director/Principal Grade I.,	Govt. ITI, Tumkur Road, Banglore, Karnataka	Member
36.	B.V.Venkatesh Reddy. JTO	Govt. ITI, Tumkur Road, Banglore, Karnataka	Member
37.	N.M.Kajale, Principal,	Govt. ITI Velhe, Distt: Pune, Maharashtra	Member
38.	Subrata Polley, Instructor	ITI Howrah Homes, West Bengal	Member
39.	VINOD KUMAR.R Sr.Instructor	Govt.ITI Dhanuvachapuram Trivendrum, Dist., Kerala	Member
40.	M. Anbalagan, B.E., Assistant Training Officer	Govt. ITI Coimbatore, Tamil Nadu	Member
41.	K. Lakshmi Narayanan, T.O.	DET, Tamil Nadu	Member
Other industry representatives			
42.	Venugopal Parvatikar	Skill Sonics, Bangalore	Member
43.	Venkata Dasari	Skill Sonics, Bangalore	Member
44.	Srihari, D	CADEM Tech. Pvt. Ltd., Bangalore	Member
45.	Dasarathi.G.V.	CADEM Tech. Pvt. Ltd., Bangalore	Member
46.	L.R.S.Mani	Ohm Shakti Industries, Bangalore	Member