

Syllabus for the subject

of

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

Under

**CRAFT INSTRUCTOR TRAINING SCHEME (CITS)**

**Trade: Machinist Grinder**

**Re-Designed in**

**- 2014 -**

**By**

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

## CONTENTS

SECTION	DESCRIPTION	PAGE NO.
<b>A.</b>	<b>Rationale</b>	3
<b>B.</b>	<b>General Information for Semester-I</b>	4
<b>C.</b>	<b>Semester wise Allotment of Time &amp; Marks among the Subjects</b>	5
<b>D.</b>	<b>Topic Wise Distribution of Time &amp; Marks Semester I</b>	6
<b>E.</b>	<b>Details of Syllabus for Semester-I</b>	7-13
<b>F.</b>	<b>List of Tools &amp; Equipments Semester I</b>	14-20
<b>G.</b>	<b>General Information for Semester-II</b>	22
<b>H.</b>	<b>Topic Wise Distribution of Time &amp; Marks Semester-II</b>	23
<b>I.</b>	<b>Details of Syllabus for Semester-II</b>	24-27
<b>J.</b>	<b>List of Tools &amp; Equipments Semester II</b>	28-32
<b>K.</b>	<b>Furniture, Accessories And Audio Visual Aids</b>	33
<b>L.</b>	<b>List of Expert Members</b>	34-35

## **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** : **Machinist Grinder**
6. **Examination** : AITT to be held at the end of each semester.
7. **Space Norms** : (a) One class room of minimum 30sq.m. area (@ 1.5 Sq.Mt. per Trainee having Minimum width of 5 m. and with 6000 lumen  
(b) Workshop: 220 sq. meters having minimum width of 8 m. and with 75000 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) 18 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 Machinist Grinder trade
11. **Trainers' Qualification** : Diploma or Degree in Mechanical / Production Engineering from AICTE recognized Board / University with five / two year's experience respectively.
12. **Desirable** : Passed National Craft Instructor Training course in Machinist Grinder trade.  
  
In case of two units, one trainer must be Degree in Engineering.

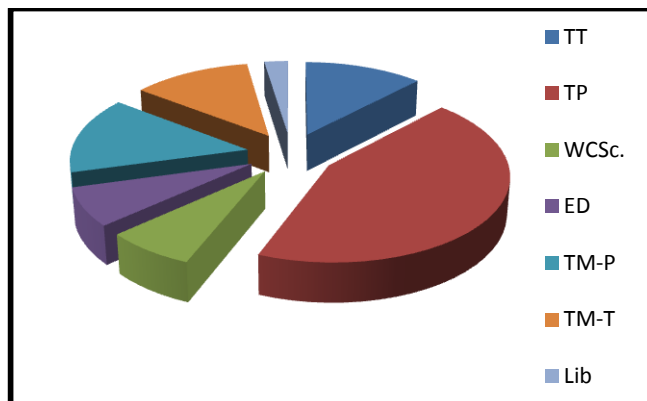
**Note: Degree/Diploma candidate may directly appear for Semester-I exam without attending classes for lateral entry in semester-II.**

### 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	-	-				
	<b>TOTAL for Sem. - I</b>	<b>40</b>		<b>450</b>	<b>50</b>	<b>500</b>	<b>270</b>	<b>30</b>	<b>300</b>
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
	<b>TOTAL</b>	<b>40</b>		<b>600</b>	<b>100</b>	<b>700</b>	<b>360</b>	<b>60</b>	<b>420</b>
	<b>GRAND TOTAL</b>	<b>80</b>		<b>1050</b>	<b>150</b>	<b>1200</b>	<b>630</b>	<b>90</b>	<b>720</b>

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
<b>Total for Trade</b>	<b>57.5</b>	<b>58</b>
Training Methodology (Practical)	15	19
Training Methodology (Theory) + IT	12.5	10
<b>Total for Training Methodology &amp; IT</b>	<b>27.5</b>	<b>29</b>
Engineering Drawing	7.5	12
Workshop Cal. & Sc.	7.5	4
Library	2.5	-

**D. TOPIC WISE DISTRIBUTION OF TIME & MARKS**  
**TRADE: MACHINIST GRINDER**  
**CRAFT INSTRUCTOR TRAINING SCHEME**  
**SEMESTER-I**

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

<b>Trade Theory</b>				<b>Trade Practical</b>		
<b>Sl. No.</b>	<b>Topics</b>	<b>Hours</b>	<b>Marks</b>	<b>Topics</b>	<b>Hours</b>	<b>Marks</b>
1	Safety	12	05	Drilling Machine & Tapping	20	20
2	Drilling Machine & Tapping	12	10	Surface Grinding	180	70
3	Surface Grinding	24	10	Turning	40	10
4	Turning	18	10	Cylindrical Grinding	100	70
5	Heat Treatment	05	05	Dressing & Truing	20	10
6	Grinding Wheel	16	20	Tool & Cutter Grinding	80	20
7	Cylindrical Grinding	18	10			
8	Limit, Fit & Tolerance	05	10			
9	Coolant & Lubricant	06	05			
10	Tool & Cutter Grinding	16	15			
	<b>TOTAL</b>	<b>132</b>	<b>100</b>	<b>TOTAL</b>	<b>440</b>	<b>200</b>
	<b>THEORY 1 ---22 WEEKS X 06 HRS/WEEK=132hrs</b>			<b>PRACTICAL 1 ---22 WEEKS X 20 HRS/WEEK=440hrs</b>		

**E. DETAIL SYLLABUS FOR THE TRADE: MACHINIST GRINDER**  
**UNDER CRAFT INSTRUCTOR TRAINING SCHEME**  
**SEMESTER-I**

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

Tentative Week No.	Trade Practical	Trade Theory
1	<p><b>Occupational Safety &amp; Health</b>  <b>Importance of housekeeping &amp; good shop floor practices.</b>            Health, Safety and Environment guidelines, legislations &amp; 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 &amp; personal safety message.            Preventive measures for electrical accidents &amp; steps to be taken in such accidents.            Use of Fire extinguishers.</p> <p><b>Technical English:</b>            Prepare different types of documentation as per industrial need by different methods of recording information.</p> <p><b>Basic Life support training:</b>            Be able to perform DRSABCD:            D: Check for Danger            R: Check for a Response            S: Send for help            A: Open the Airway</p>	<p>Introduction of First aid. Operation of electrical mains. Introduction of PPEs. Response to emergencies e.g.; power failure, fire, and system failure  <b>Soft Skills:</b> its importance and Job area after completion of training.  <b>Introduction to 5S</b> concept &amp; its application. Importance of 5S implementation throughout CITS course-workplace cleaning, machine cleaning, signage, proper storage of equipment etc.</p> <p><b>Importance of Technical English</b> 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><b>Basic Life support (BLS):-</b></p> <p>Basic Life Support (BLS) techniques for drowning, choking, electrocution, neck and spinal injury, including CPR (cardiopulmonary resuscitation).</p>

	<p>B: Check for normal Breathing  C: Perform CPR (Cardio Pulmonary Resuscitation)  D: Attach Defibrillator / Monitor as soon as available.</p>	
2	<p>Grinding of HSS single point boring tool, forming tools, threading tool on a pedestal grinder and measuring the angles  Grinding of different size drills on a Pedestal grinder and measuring the angles using bevel protractor and std. templates</p>	<p>Revision to measuring and checking instruments viz. vernier caliper, vernier height gauge, external micrometers, vernier micrometers, inside micrometer, three pin micrometer, groove micrometer, depth vernier, bevel protractor, dial test indicators, slip gauge, sin bar, 2D height master, etc. their care and maintenance</p>
3	<p>Surface grinding Cubes and Cuboids using precision tri bloc and angle plates to – size accuracy h5, flatness 0.010mm, parallelism 0.010mm.and squareness 0.010mm. (machine accuracy to be ensured)</p>	<p>Principles of grinding process. Surface grinding machines – horizontal spindle reciprocating table grinding machine and horizontal spindle rotary table grinding machines – vertical spindle reciprocating table grinding machines and vertical spindle rotary table grinding machines - construction and applications.  Work holding devices for surface grinding – magnetic chucks, precision grinding vice, magnetic vice, universal vice, sine table, compound sine table, magnetic sine table, sine vice, angle plates, L-angles, adjustable angle plate, plain ‘V’ - block, magnetic ‘V’ block, clamps, Vacuum chuck and industrial adhesive tape. De magnetizing after grinding. Surface grinding parameters-wheel speed, work traverse speed, cross feed and down feed. Surface grinding allowance.</p>



4	<p>Marking the job for drilling, hand reaming, machine reaming, hand tapping, machine tapping, counter boring and counter sinking using engineer steel rule and vernier height gauge</p> <p>Drilling, hand reaming, machine reaming, hand tapping, counter boring and counter sinking on drilling machine</p>	<p>Glazing, loading and gumming of grinding wheels and how to correct them. Difference between truing and dressing and different types of truing and dressing tools and Selection criteria of diamond dressing tools as per latest IS: 2794. Surface grinding defects causes and remedy</p> <p>Drilling machines – types, constructional features, applications and operations. Calculation of tap drill size, cutting speeds and feeds. Conversion of cutting speeds in to RPM</p> <p>Types of centre drilling on work pieces, selection criteria of center drill sizes and center grinding.</p>
5	<p>Truing a shaft using four jaw independent chuck on a centre lathe</p> <p>Facing, centre drilling, step turning, shoulder drilling, taper turning by compound side method, boring, grooving, chamfering and die passing on lathe - size accuracy +/- 0.05 mm</p>	<p>Lathe – types, constructional features, applications, tool holding &amp; work holding devices and operations. Cutting speed, feed and depth of cut. Conversion of cutting speed in to RPM.</p> <p>Turning operations such as centre drilling, step turning, shoulder drilling, taper turning by compound side method, boring, grooving, chamfering and die passing on lathe</p> <p>Specification and selection criteria of centre drill according to weight and diameter of job</p>
6	<p>Turning a plain shaft in-between center – size accuracy +/- 0.05 mm</p> <p>Taper turning a shaft using tailstock offset method</p> <p>Cutting internal and external metric ‘V’ threads on a lathe</p>	<p>Tapers – elements, classification and uses. Taper turning methods and calculation for taper turning on a lathe</p> <p>Elements of metric threads and calculation for cutting metric thread on a Lathe.</p> <p>Ferrous and nonferrous materials and mechanical properties, Heat treatment of metals and its importance. Various methods of heat treatment such as stress relieving, hardening, tempering, annealing and normalizing.</p>
7	<p>Balancing a grinding wheel, mounting and truing the wheel on a surface grinding machine</p> <p>Mounting a magnetic table on a surface grinding machine, pre-grinding and checking the geometrical parallaxism using dial test indicators</p>	<p>Grinding wheels – Types of abrasives, manufacturing process of abrasives, bond and bonding process, grit, grade and Structure.</p> <p>Grinding wheels shapes, sizes and applications..</p> <p>Methods of specifying grinding wheels as per latest IS-551.</p> <p>Selection of grinding wheels for grinding wheels as per latest IS</p>

		1249
8	<p>Milling and surface grinding a parallel block using precision tri blocks and angle plate – size accuracy – +/- 0.005mm, flatness 0.005 mm, parallelism 0.005mm, squareness 0.005mm</p> <p>Maintenance of grinding machines – cleaning, greasing, oiling etc.</p>	<p>Balancing truing and dressing of grinding wheels.</p> <p>Angle truing attachment – description and use</p> <p>Dismounting and mounting procedure of grinding wheels.</p> <p>Surface grinding parameters and grinding allowance</p> <p>Checking geometrical accuracy of horizontal spindle surface grinding machine as per latest IS 2743</p>
9	<p>Grinding taper surface using of sine vice and sine table</p> <p>Milling and Grinding Vee - block with close accuracy as per dimensions of latest IS – 2949</p> <p>Surface Grinding tapered surfaces (compound angles) using adjustable angle plate and universal vice</p> <p>Alignment of wheel head, work head and tail stock on cylindrical grinding machine</p>	<p>Necessity of coolant for surface grinding, types of coolants, coolant recirculation system, necessity of filtration, filtration methods, coolant oil mixing ratio and method of mixing soluble oil. Dry and wet grinding. Dust extractors for dry grinding</p> <p>Limits and fits as per latest IS-919.</p> <p>International tolerance grades(IT) obtainable by various machining process</p> <p>Geometric tolerances as per IS 8000 (Part I &amp; II)</p> <p>Geometrical accuracies obtainable by various machining process</p>
10	<p>Grinding a plain mandrel on universal grinding machine - size accuracy grade Js5, roundness +/- 0.010 mm, cylindricity +/- 0.010 mm and checking circularity and roundness and cylindricity</p>	<p>Cylindrical grinding machines –constructional features- Plain entre type cylindrical grinding machine, universal cylindrical grinding machine, Plunge centre type cylindrical grinding machine and chucking type cylindrical grinding machines – description, parts and function and operations possible on these machines.</p> <p>Checking geometrical accuracy of an universal cylindrical grinding machine a per latest IS 2368</p> <p>Importance of coolant for cylindrical grinding, coolant filtration and recirculating system.</p>

11	Machine setting for automatic in-feed for grinding parallel cylindrical grinding on universal grinding machine Step grinding a shaft on universal cylindrical grinding machine to close limits – js6 and checking with micrometer and Ring gauge	Internal cylindrical grinding machines – Chucking and planetary types and operations possible on these machine. Work holding and work supporting devices for cylindrical grinding machines – Carriers, drive plates, 3- jaw self-centering chucks, 4- jaw independent chuck, collect chucks, full center, half center, mandrels etc.
12	Grinding parallel diameters and shoulders on universal cylindrical grinding machine and checking with micrometer and Ring gauge Plunge grinding steps and shoulders on universal grinding machine	Cylindrical grinding parameter – wheel speed, work speed, work traverse feed, cross feed and infeed for roughing and finish grinding operations. Cylindrical grinding allowances. Conversion of wheel speed and work speed into RPM. Inspection of work piece prior to cylindrical grinding.
13	Turning and grinding a bush bearing using mandrel outside diameter accuracy js5, roundness 0.010 mm, cylindricity 0.010 mm, - parallelism between face 0.010mm. Class of fit H5/js5 Grinding internal steep tapers by swiveling work head on universal grinding machine	Work holding devices for internal grinding – 4 jaw independent chucks, collets, face plate fixture and magnetic chucks. Method of grinding parallel bore and taper bore on an universal grinding machine Selection criteria of grinding spindle (quill) and grinding wheels for internal bore grinding. Mounting an internal grinding wheel on spindle
14	Grinding internal groves on universal grinding machine Inspection of bush bearing using Plug gauge, Telescopic gauge, internal micrometers, bore dial gauge and three pin micrometer,	Rough dressing and finish dressing internal grinding wheel. Dressing front face of internal grinding wheel Methods of checking internal bore – plug gauge, bore dial gauge, telescopic gauge, inside micrometer, three pin micrometer and pneumatic gauge
15	Grinding a plain Go and No- Go plug gauge with accuracy as per latest IS: 3484. Grinding a Morse taper sleeve – inside and outside (MT-6/MT5)	Description of Tool and cutter grinding machine- constructional features Application of tool and cutter grinding machine applications and uses Attachment and accessories of tool and cutter grinding machines centering gauge and applications
16	Inspection of external and internal tapers using sine bar, plug	Wheel truing attachment, clearance angle setting gauge, universal

	gauges. Re-sharpening single point cutting tool on tool and cutter grinding machine using universal vice – Tool geometry as per latest IS-3019	work head, small end mill grinding attachment, face mill grinding attachment, cylindrical grinding attachment, internal grinding attachment, long reamer grinding attachment, radius grinding attachment, surface grinding attachment (universal vice), hob grinding attachment and magnetic chucks. Importance of using coolant while grinding carbide cutting tools.
17	Grinding outside diameter of reamers Grinding of carbide tipped tools as per tool geometry of latest IS 2163 and IS 6075 on tool and cutter grinder using attachment.	Types of profile sharpened milling cutters – light duty plain milling cutters, heavy duty plain milling cutters, straight teeth side and face cutters, helical teeth side and face cutter, staggered teeth side and face cutter, end mills, shell end mills, slot drills, metal slitting saws, single angle cutters, double angle cutters, T-slot cutters, woodruff key seat cutter, dovetail cutter and fly cutters. Types of form relieved milling cutters—concave cutter, convex cutter, corner rounding cutter, involute gear cutters, and drill fluting cutters. Recommended tool geometry of milling cutters for face milling, end milling and side/slot milling operations.
18	Re-sharpening radial clearance angle on side and face cutter on tool and cutter grinder by tilting the wheel head. Re-sharpening of radial clearance angle of slotting cutter by offsetting the milling cutter using cup wheel	Principles of re-sharpening clearance angles on milling cutter. Determination of primary and secondary clearance angle and land width according to material to be milled and diameter of cutters. Importance of maintaining land width according to diameter of cutters. Shapes of grinding wheels used for tool and cutter grinder. Advantages of using cup wheel for re-sharpening milling cutter over disc wheel
19	Re-sharpening of radial clearance angle of side and face cutter by offsetting disc wheel Re-sharpening of radial clearance angle of side and face cutter by using clearance angle setting gauge	Abrasive sticks for dressing cup and saucer wheel. Calculation of offset for grinding of radial clearance angle by offset method -(i) by using cup wheel (ii) by using disc wheel Procedure of grinding of radial clearance angle for helical plain milling cutter (slab milling cutter) Procedure of grinding of radial clearance angle on staggered teeth

		side and face cutter
20	Re-sharpening of radial clearance angle on helical plain Milling cutter (slab milling cutter) Re-sharpening radial clearance angle of staggered teeth side and face cutter Re-sharpening slitting saw	Diamond and CBN grinding wheels and their applications. Specifying Diamond and CBN wheels as per latest IS 3264. Inspection of ground job by NDT magnetic particle testing and Die penetrant testing. Description and use of universal work head of Tool and Grinding Cutter machine and methods of indexing
21	Re-sharpening radial clearance angle of end mills and shell end mills Re-sharpening axial clearance angle of side and face cutter using universal work head	Procedure of re-sharpening axial clearance angle of end mills and shell end mills Procedure of grinding a slot drill. Tool geometry of Broaches and re-sharpening methods Snap gauges, sine bar, slip gauges, roundness measuring machine and their description and use
22	Re-sharpening single angle cutters LH and RH Re-sharpening double angle cutters Grinding a slot drill Re- sharpening of form relieved cutters viz. concave / convex / corner rounding / involute gear cutters using attachment.	Special type of grinding machines- Thread grinding machines, Jig grinding machines, Crank shafts grinding machine and Cam shaft grinding machines, single lip cutter grinding machine and centers grinding machine, Double disc grinding machines, Roll grinding machines, Optical projection profile grinders, NC and CNC grinding machines their working principles, brief description and applications
23	<b>Industrial visit &amp; Submission of Report</b>	
24- 26	<b>Revision &amp; Trade Test</b>	

**F. List of Tools & Equipments**  
**Trade - Machinist (Grinder)**  
**Under CITS**  
**For a Batch of 20 Trainees**  
**Semester-I**

Sl. No.	Name of the tool	Quantity for Trainer	Quantity for Trainees
<b><u>TRAINEES TOOL KIT</u></b>			
1	Steel rule 150 mm (graduated both English and Metric) as per IS 1481	1 no.	20 nos.
2	Try square Engineers 150 mm as per IS 2103	1 no.	20 nos.
3	Hammer ball peen with handle 0.50 Kg	1 no.	20 nos.
4	Scriber 150 MM x 3mm	1 no.	20 nos.
5	Vernier caliper 200 mm, inside and outside (graduated in inches and millimeters) least count 0.020 mm as per IS 3651	1 no.	20 nos.
6	Micro meter outside 0 – 25 mm with least count 0.010 as per IS 2967	1 no.	20 nos.
7	Micro meter outside 25 – 50 mm least count 0.010 as per IS 2967	1 no.	20 nos.
8	Goggles (fiber plastic cup) safety glasses (interchangeable glasses)	1 no.	20 nos.
9	D.E Spanner 6 to 28 mm as per IS 2028	1set	20 sets
10	Allen key 5 to 12 mm	1set	20 sets
11	Hand file flat smooth 10”	1 no.	20 nos.
<b>TOOLS MEASURING INSTRUMENTS AND GENERAL SHOP OUT FIT</b>			
1	Hammer Copper 0.50 kg	1 no.	2 nos.
2	Scribing Block with adjustable Vertical spindle 225 mm	1 no.	2 nos.
3	Precision tri block 2” x 4” x 6” with 23 tapped holes with strap clamps and screws		2 pairs
4	Angle plate (L type)150x150x 40 mm		2 nos.
5	Angle plate adjustable (graduated in degrees),150 mm x 150 mm x150 mm		2 nos.
6	Vee Blocks 150x100x100 mm (fitted with C-clamps, (hardened and ground) as per IS 2949		2 Pair
7	Vee Blocks (grooved and fitted with C-clamps) (Hardened and ground) 75x75x50 mm as per IS 2949		2 Pair
8	Parallel blocks of 6 mm, 8mm, 10 mm 12 mm, 16mm,20mm and 25mm with length 125 mm as per IS 4241		2 pair each
9	Vernier caliper digital 200 mm, inside and outside (graduated in inches and millimeters) least count 0.01 mm		2 nos.
10	Vernier caliper, outside 300 mm (graduated in inches and millimeters) least count 0.020 mm to IS 3651		2 nos.
11	C-Clamps 50 mm, 100 mm and 150 mm		2 Each
12	Oilcan, drip delivery ¼ point capacity		2 nos.
13	Vernier Height Gauge (as per IS – 2921) (Metric and English graduated) 300 mm, least count 0.02 mm with holder for lever type dial test indicators and carbide tipped scribers		2 nos.
14	Bevel protractor, least count 5 minutes as per IS - 4239		2 nos.
15	Drill chuck 12 mm capacity (Taper shank suitable to drilling machine)		2 nos.
16	Key less drill chuck 12 mm capacity		2 nos.

17	Diamond, Wheel Dressing (single stone mounted)	4 nos.
18	File Flat Rough 300 mm	4 nos.
19	File Flat 250 mm Second Cut	4 nos.
20	Files, Hand Flat, 250 mm smooth	4 nos.
21	Files, 150 mm Half round smooth	4 nos.
22	Files, round Dead smooth 200 mm	4 nos.
23	Files, Triangular, dead smooth 200 mm	2 nos.
24	Feeler Gauge Metric Set as per IS 3179	1 set
25	Gauge, Radius (Inside and Outside) (Metric)	2 sets
26	Gauge, Slip (Metric),122 Nos., set, grade -1,Tungsten Carbide as per IS 2984	2 Set
27	Gauge, Telescopic 12 to 150 mm	1 Set
28	Gauge, Morse Taper, Plug Nos. 1,2,3,4	1 each
29	Gauge, Morse Taper, Ring Nos. 1,2,3,4	1 each
30	Limit plug gauge 5mm – 25 mm incremental by 2.5 mm (GO & NO GO ends) as per IS 3484	1 set
31	Ring gauge 5 mm – 25 mm incremental by 2.5 mm ( GO & NO GO ends ) as per IS 2251	1 set
32	Glass, Magnifying 250x25x75 mm dia. with handle	1 no.
33	Hacksaw frame 200 to 300 mm adjustable	2 nos.
34	Keys, Allen 14 mm	2 nos.
35	Keys, Allen 3 to 12 mm, by 1.5mm	1 Set
36	Keys, Allen 16mm	2 nos.
37	Spirit Level, size 200 mm, block type, sensitivity 0.02 mm/m as per IS - 5706	1 no.
38	Micrometer outside digital 0 to 25 mm, least count 0.001 mm	2 nos.
39	Micrometer outside digital 25 to 50 mm, least count 0.001 mm	2 nos.
40	Micrometer outside digital 50 to 75 mm , least count 0.010 mm	1 no.
41	Micrometer outside 75 to 100 mm and , least count 0.010 mm as per IS 2967	1 no.
42	Internal Micrometer 35 to 150 mm with extension Rods	1 no.
43	Inside micrometer, caliper type range 25 to 50 mm, least count 0.010 mm	1 no.
44	Three pin micrometer range 25 to 35mm, least count 0.010 mm	1 no.
45	Drill gauge for checking 118° point angle and clearance angles	1 no.
46	Oil stone Carborandum, Coarse on one side and fine on the other side 200x50x25mm	2 nos.
47	Oil Stone Carborandum, Coarse on one side and fine on other side 100x12 mm triangular	2 nos.
48	Oil Stone Carborandum, Coarse round 12 mm dia.	2 nos.
49	Square, Try, Engineer's 400L x 250 W x 10T as per IS 2103	1 no.
50	Straight Edge Engineer's 500L x 150 H x12T as per IS 2220	1 no.
51	Screw Driver 200 mm blade	2 nos.
52	Screw Driver 300 mm blade, heavy duty	2 nos.
53	Spanner metric 32 mm	2 nos.
54	Rings spanner 3 to 22mm all sizes	2 sets
55	Adjustable spanner 300 mm	1 no.

56	Sine bar 200 mm roller type with stopper as per IS 5359	2 nos.
57	Tachometer non contact type (9999 RPM)	1 no.
58	Table Chuck 75 mm Jaw Swivel Base 200 mm dia.	1 no.
59	Table Chuck 3 Jaw with tilting arrangement and graduated in degrees	1 no.
60	Vices, machine with 200 mm jaw opening	1 no.
61	Vice Universal for surface Grinding Machine 4" to set 3 compound angles simultaneously	1 no.
62	Wheel Dressers, Steel Type (Huntington) (Large)	2nos.
63	Wheel Dressers, Steel (Huntington type Small)	2 nos.
64	Demagnetizer unit	1 no.
65	Centre Punch 150 x 6 mm dia.	4 nos.
66	Number punch	1 set
67	Letter punch	1 set
68	Granite Surface Plate, grade 0, 630 x 630 x 100mm with adjustable stand as per IS 7327	2 nos.
69	Granite marking Table 1000x630 x 150mm,grade 1 with adjustable stand as per IS 7327	2 nos.
70	Hand Drilling machine, electric, 12 mm	1 no.
71	Taps and Dies set complete in box (Metric) with tap wrenches and die stocks	1 set
72	Drill Twist (Metric) 3 mm to 12 mm, in step of 0.5 mm	2 Set
73	Drill, Twist, taper shank, 16 mm	4 nos.
74	Drill, Twist, taper shank, 19.5 mm	2 nos.
75	Drill Twist (Metric) 29.5 mm	2 nos.
76	Hand reamer 8 mm	4 nos.
77	Hand reamer 10 mm	4 nos.
78	Machine reamer 20mm	4 nos.
79	Machine reamer 30mm	4 nos.
80	Counter boring tool 10 mm	2 nos.
81	Counter sinking tool 16 mm	2 nos.
82	Set of Morse Sockets (0-1,1-2 , 2-3,and 3-4)	2 sets
83	Combination Drill type 'A' body diameter 10 mm	5 nos.
84	Screw Pitch Gauge metric	2 sets
85	Working Benches 340 x 120 x 75 Cms. with 4 bench vices 150 mm jaw	2 nos.
86	Fire Extinguisher	1 no.
87	Fire Buckets with stand	4 nos.
88	Trainees locker with keys (to accommodate 20 lockers)	1 no.
89	Metal Rack 180 x 150 x 45 cms.	1 no.
90	Stools	As required
91	Ceramic class room board size 2mx1m	1 no.
92	Magnifying Glass with surface illuminator	1 no.
93	Adjustable Wrench 250 mm size	1 no.
94	Hammer (Nylon face) 30 mm	4 nos.
95	Grease Gun	1 no.
96	Oil gun	1 no.
97	Magnetic V-Block, 90° size 100 mm x 75 mm x 75 mm	2 sets
98	Magnetic stand with holding stem for Dial Indicators 75 x 75 x 100 mm	2 nos.
99	Magnetic Stand Flexible type base 60 mm x 47.5 mm Magnetic Power 75 kg ON-OFF Lever control	1 no.
100	Dial Test Indicator-Lever type-long point type-0.8 mm range graduation 0.01 mm as per IS 11498	2 nos.



101	Dial Test Indicator-Lever type-long point type-0.8 mm range graduation 0.002 mm as per IS 11498	2 nos.
102	Dial Test Indicator-Lever type-long point type-0.8 mm range graduation 0.001 mm as per IS 11498	2 nos.
103	Plunger type dial, least count 0.01mm, range 10mm as per IS 2092	1 no.
104	Plunger type dial, least count 0.001mm, range 1mm	1 no.
105	Bore dial gauge range 10 to 18 mm	1 no.
106	Bore dial gauge range 18 to 30 mm	1 no.
107	Bore dial gauge range 30 to 50 mm	1 no.
108	Bore dial gauge range 50 to 150 mm	1 no.
109	Digital three pin inside micrometer range 12 to 20 mm	1 no.
110	Granite surface plate, grade 0, size 1000 x 630 mm with between centre attachment	1 no.
111	Glass Show case for display of jobs 450 mm x 600 mm x 850 mm	1 no.
112	Digital height gauge 0 to 300 mm, L.C 0.001 mm, carbide tipped scriber.	1 no.
113	Trainees work table	1 no.
114	Face mask	12 nos.
115	Apron leather	12 nos.
116	Silicon carbide dressing stick coarse	02 nos.
117	Silicon carbide dressing stick fine	02 nos.
118	Shell end mill cutter HSS 63x40x27 mm	4 nos.
119	Shell end mill cutter HSS 80x45x27 mm	4 nos.
120	End mill cutters, HSS, parallel shank, diameters 6 mm, 8 mm, 10 mm, 12 mm, 16mm, 20 mm, 25 mm, 28 mm, 30 mm	4 each
121	Slot drills, HSS, straight shank, straight fluted 10mm, 12mm, 16mm	2 each
122	Two fluted end mill, straight fluted 10 mm, 12, mm, 16 mm	1 each
123	Cylindrical cutter (Slab milling cutter) 63 x 70 x 27 mm	4 nos.
124	Silicon carbide dressing stick coarse	02 nos.
125	Face milling cutter 80 mm diameter, height 50 mm, bore size 27 mm, cutting edge angle 90°, No. of inserts 4 to 6 with suitable inserts.	1 no.
126	Face milling cutter 80 mm diameter, height 50 mm, bore size 27 mm, cutting edge angle 45°, No. of inserts 4 to 6 with suitable inserts.	1 no.
127	Side and face cutter, HSS straight teeth, Type – B, size 80x10x27mm	4 nos.
128	Side and face cutter, HSS staggered teeth, Type – A 80x10x27 mm	4 nos.
129	Single angle cutter, RH, 63x18x27 mm 60°	4 nos.
130	Single angle cutter, LH 63x18x27mm 60°	4 nos.
131	Double angle cutter, 50x16x27 MM, 60°	4 nos.
132	Equal angle cutter, 80x16x27mm, 45°	4 nos.
133	Equal angle cutter, 80x20x27mm, 60°	4 nos.
134	Equal angle cutter, 80x20x27mm, 90°	4 nos.
135	Metal slitting saw 100 mm OD, 6 mm thick, 27 mm bore	4 nos.
136	HSS tool bits 6"x1/2"	2 dozen
137	Straight turning tool, carbide tipped (ISO 1), designation 2020 as per IS-2163	2 nos.
138	Cranked turning and facing tool, carbide tipped (ISO 2), designation 2020 as per IS-2163	2 nos.
139	Cranked finishing tool, carbide tipped (ISO 3), designation 2012 to IS-2163 as per IS-2163	2 nos.
140	Broad turning tool, carbide tipped. (ISO 4), designation 2012 as per IS-2163	2 nos.
141	Cranked facing tool, carbide tipped. (ISO 5), designation 2020 as per S-2163	2 nos.
142	Cranked turning tool, carbide tipped. (ISO 6), designation 2020 as per IS-2163	2 nos.
143	Parting off tool, carbide tipped. (ISO 7), designation 2012 as per IS-2163	2 nos.
144	Pointed turning tool, carbide tipped. (ISO 8), designation 2012 as per IS-2163	2 nos.

145	Straight planning tool p1 carbide tipped, shank size 32x20 mm as per IS- 6075	2 nos.
146	Cranked planning tool p2, carbide tipped, size 32x20 mm as per IS 6075	2 nos.
147	Broad planning tool p3 carbide tipped, size 32x20 mm as per IS- 6075	2 nos.
148	Cranked finishing tool p4 carbide tipped size 32x20 mm as per IS-6075	2 nos.
149	Broad finishing tool p5, carbide tipped, size 32x20 mm as per IS-6075	2 nos.
150	Carbide corner cutting tool p6 carbide tipped, to size 32x20 mm as per IS-6075	2 nos.
151	Grooving tool p7 carbide tipped, size 32x20 as per IS-6075	2 nos.
152	Side way planning tool p8 carbide tipped, size 32x20 mm as per IS 6075	2 nos.
153	Boring tool (ISO 8) – carbide tipped, size designation 2020 as per IS-2163	2 nos.
154	Involute gear cutters 2.5 mm module, 27 mm bore dia. 20 <sup>0</sup> pressure angle	1 set
155	Concave Cutter 3.5mm Circle Radius x 63mm Cutter dia. x 16mm width x 22mm bore	2 nos.
156	Convex cutter Convex Cutter 5mm radius,63 mm OD,10 width, 22mm bore dia.	2 nos.
157	Corner rounding cutter 27 mm bore dia.	2 nos.
158	Angle plate adjustable(graduated in degrees) 150 mm x 150 mm x 150 mm	2 nos.
159	Sine vice 235L x 76W x 100H,opening 110 mm (C.D- 200)	1 no.
160	Sine table 250L x 150W x 65 H as per IS 5939-	1 no.
161	First aid kit	1 no.
162	Class room chairs with writing pad	As required
163	Equipment for conducting BLS (Basic Life Support) training. (Optional)	1 set

**GENERAL MACHINERY**

<b>Sl. No</b>	<b>Name of the machine</b>	<b>Broad Specification</b>	<b>Quantity</b>
1	SS and SC centre lathe (all geared) with having minimum specification as: centre height 150 mm and centre distance 1000 mm along with auto feed system, safety guard, motorized coolant system and lighting arrangement.	Spindle speed range 40 to 2000 rpm Longitudinal feed – 0.04 to 2 mm/rev Cross feed range – 0.02 to 1 mm/rev Metric thread range - 0.5 to 28 Inch thread range – 56 to 1 tpi Module thread range 0.25 to 14 tail stock, Ordinary centre 1 No Revolving centre 1 No Quick change tool post with 5 Nos. of tool holders 4 jaw independent chuck 250 mm dia. with back plate. 3 jaw self-centering chuck with back plate, Set of carriers.	2 nos.
2	Drilling Machine pillar type 0- 25 mm capacity with drill chuck & key.	Spindle rpm -150 to 1200 Accessories: Drill vice 150 mm jaw opening	2 nos.
3	Vertical Milling Machine with minimum specification as: Table Length x width 1200 x 300 mm having motorized up & down movement along with auto feed arrangement in X-Y direction along with DRO facility.	Size No.1 Universal milling head, swivel angle = 45 ° each side Accessories: Swivel base machine vice 150 mm jaw opening, Stub arbors 16 mm, 22 mm & 27 mm and C- type collet adaptor with set of collets for all standard size of end mills up to 30 mm dia.	2 nos.
4	Grinding machine hydraulic external cylindrical, universal type with internal grinding attachment fully motorized and standard accessories.	Centre height - 150mm Distance between centers- 800 mm Least in-feed - 0.0025 mm 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)	2 nos.
5	Additional accessories for Universal cylindrical grinding machines.	Testing mandrel, Extra wheel flange with balancing blocks, wheel balancing mandrel, wheel balancing stand, Micromatic shoulder grinding device for precise grinding of shoulders	1 each
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	2 nos.

		balancing mandrel, additional wheel flange with mandrel, wheel balancing stand, wheel truing device, spare grinding wheel for general purpose grinding and standard accessories	
7	Surface grinding machine, single column vertical spindle, reciprocating table with standard accessories.	Table size 400x 200 mm Accessories: , magnetic chuck 250x120mm, Wheel guard, coolant system with baffle tank and motor	1 no.
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	2 nos.
9	Additional accessories for Tool and cutter grinding machines	Gear milling cutter grinding attachment with bushes, Attachment for grinding carbide tipped cutting tools, Radius grinding attachment for grinding face mills and inserted tooth cutters of 200 mm dia. and radius grinding of flat tools	1 each
10	Pedestal Grinder Double End type. Wheel 300x40x50.8mm Wheel centre distance 650 mm approx. Power of motor 1HP.	Grinder fitted with coarse and medium grain size grinding wheels.	2 nos.
11	Power Saw Machine Stroke length 160 mm	No of speed stroke 3 Range of speed stroke 80-100-125 Blade size 525x45x2.25 Power of motor 1.5 kw	1 no.

- ✓ Note: 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.

Syllabus for the subject

of

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

Under

**CRAFT INSTRUCTOR TRAINING SCHEME (CITS)**

**Trade: Machinist Grinder**

Re-Designed in

- 2014 -

By

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

## **G. 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 –II & TRADE PRACTICAL-II**
- 5. Applicability** : **Machinist Grinder**
- 6. Examination** : AITT to be held at the end of each semester.
- 7. Space Norms** : (a) One class room of minimum 30sq.m. area (@ 1.5 Sq. Mt. per Trainee) having Minimum width of 5 m. and with 6000 lumen  
(b) Workshop : 220 sq. meters having minimum width of 8 m. and with 75000 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) 18 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 year's experience respectively.
- 12. Desirable** : Passed National Craft Instructor Training course in Machinist Grinder 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: MACHINIST GRINDER**  
**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	Surface Quality	06	08	Centreless Grinding	40	10
2	Centreless Grinding	08	06	Surface Grinding	60	40
3	Surface Grinding	16	18	C.N.C	50	15
4	Gauges	06	05	Cylindrical Grinding	100	50
5	Quality Control	08	05	Honing & Lapping	12	20
6	C.N.C	16	10	Tool & Cutter Grinding	90	65
7	Cylindrical Grinding	10	18			
8	Honing & Lapping	04	05			
9	Maintenance	04	10			
10	Tool & Cutter Grinding	10	15			
	<b>Total</b>	<b>88</b>	<b>100</b>		<b>352</b>	<b>200</b>
	<b>THEORY II ---22 WEEKS X 04 HRS/WEEK=88 hrs</b>			<b>PRACTICAL II ---22 WEEKS X 16 HRS/WEEK=352hrs</b>		

**I. DETAIL SYLLABUS FOR THE TRADE: MACHINIST GRINDER**  
**UNDER CRAFT INSTRUCTOR TRAINING SCHEME**  
**SEMESTER-II**

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

Tentative Week No.	TRADE PRACTICAL	TRADE THEORY
01	Re- sharpening gear hobbing cutter on tool and cutter grinding machine using hob grinding attachment Corner chamfering on end mill and Shell end mill using universal work head	Surface roughness - primary texture, secondary texture (waviness) and lay Surface finish obtainable by various machining process
02	Re-sharpening of relief angle on Reamer Cylindrical grinding on eccentric job with suitable fixtures. Dry and wet grinding on metals such as cast iron, brass, bronze, aluminum and different classes of steel. Measurement of surface roughness using comparator.	Evaluation of surface roundness –Roughness average Ra, Centre Line Average CLA, ten point height irregularities (Rz), Root mean square method and sampling length surface roughness measuring instrument - Description and use
03	Centreless grinding - through feed grinding different diameter hardened pins	External Centreless grinding machine -- working principles, constructional features, parts and functions. Advantage of Centre less grinding over cylindrical grinding and limitations. External Centreless grinding machine operations – through feed grinding; in feed grinding, end feed grinding, infeed and through feed grinding.
04	Centreless grinding - infeed grinding different diameter hardened pins	Centreless grinding procedures- truing of grinding wheel and regulating wheel, machine setting procedure for centreless



		grinding, grinding parameters maintenance and trouble shooting Internal centreless grinding machines - methods of holding job and process of grinding and selection of grinding wheel.
05	Shoulder grinding practice on cylindrical grinder. close to limits h5 Slot and shoulders grinding practice on surface grinding machine using magnetic vice to close limit H5	Use of surface finish symbol as per latest IS – 3073 Method of indicating surface texture on Technical drawing as per latest IS 10719 Thread grinding- procedure for holding job, method of grinding threads and threads calculation, various types of thread grinding wheels and their selection, types of dressers and process of dressing, selection of coolants
06	Inspection of ground jobs by Dye Penetrant method Grinding a GO and NO GO Snap gauge to close limit Grinding GO and NO GO ring gauges on ring gauge and checking with air gauge.	Gauge tolerance and wear allowance for plug Cylindrical grinding defects, their causes and remedies- out of round, out of parallel, taper on end, irregular marks, spiral scratches, burnt surface, chatters - short close, evenly spaced, long and regularly spaced, marks in phase with vibration of floor, random marks; random waves etc.
07	Grinding long cylindrical job using closed and open steady rest to close limit h6	Importance of quality and quality concepts Awareness on ISO – 9001-2008 quality system.
08	Grinding thin plates, to close limit h6. Cylindrical Grinding practice on parallel and taper pins using chucks and collets. Grinding internal stepped bore. Grinding a taper by compound setting on cylindrical grinder.	Methods of grinding gashes on fluted cutters Methods of polishing and buffing. Description and use of special type measuring instruments- comparators and profile projectors.
09	Truing the cylindrical grinding wheel for form grinding concave and convex profiles using radius truing attachment. Plunge cylindrical grinding practice for grinding concave and convex profile	Application and use advanced measuring instrument – such as Marposh in process gauge for measuring internal and external diameters, Digital height gauge and digital micrometer Creep feed grinding machine- working principle, constructional feature and advantages over conventional surface grinding machines and limitations

10	Cylindrical grinding steep taper by swiveling work head, internal and external Plunge grinding steep taper by swiveling wheel head Surface grinding thin nonferrous metals by holding work by industrial adhesive tape	CNC cylindrical grinding machines- working principles, features of CNC system and elements of CNC machines, two axes fundamentals concept of CNC programming, with basic G codes and M codes, wheel truing system, programming for plain and step grinding
11	Familiarization for operating CNC control system for working on CNC cylindrical grinding machine Machine set up and machining plain cylinders on CNC cylindrical grinding machine	CNC cylindrical grinding machine, operator control panels CNC Programming basics for wheel speed, work speed, work traverse speed and infeed.
12	Machining stepped diameters on CNC cylindrical grinding machine Plunge grinding on CNC cylindrical grinding machine	CNC Cylindrical grinding machine maintenance and trouble shooting
13	Machining shoulders on CNC cylindrical grinding machine Machining external tapers on CNC cylindrical grinding machine	Practice on CNC Programming for cylindrical grinding
14	Machining external parallel diameters on CNC cylindrical grinding machine	Methods of preserving ground components Checking of circularity and roundness on cylindrical components
15	Hand honing of small bushes ( 27 mm ID) Re-sharpening of Taps by grinding Practice of Manual Lapping on flat surfaces	Honing process –working principles, applications, equipment, selection of honing stones and honing procedures. Lapping process- working principles, methods of lapping applications, equipment, selection of abrasive powders and carriers and lapping procedures.
16	Machine lapping of Flat surfaces on lapping machine Measurement of flatness by optical flat with monochromatic light	Lapping of external cylindrical surface by using adjustable ring lap. Lapping of bore using a lapping mandrel
17	Cylindrical grinding of Press tool punches to a tolerance +/- 0.005 mm	Maintenance and trouble shooting of Surface grinding machine Maintenance and trouble shooting of Cylindrical grinding machine Maintenance and trouble shooting of Tool and cutter grinding machine

18	Surface grinding compound angles using magnetic sine table Radius truing of surface grinding wheel using radius truing attachment and grinding curved profiles	Introduction to TPM, TQM, JIT etc.
19	Angular truing of surface grinding wheel using angle truing attachment and grinding angular profiles	Drill point grinder – Description, parts and functions and applications Router milling cutters- types, tool geometry, applications and re-sharpening methods
20	Grinding point angles of different diameter drills on Drill point grinder attachment	Cost estimation of grinding operation – raw material cost, labor cost, overhead cost and profit Automatic re-sharpening machine for larger diameter slit saw
21	Re-sharpening Gear shaper cutters on tool and cutter grinder Grinding different diameter die sinking single lip cutters on Single lip cutter grinder	Single lip cutter grinder- Description, parts and functions and applications Ball nose and bull nose cutters - types, tool geometry and applications Super finishing process- description and working principles of super finishing machine- size accuracy, geometrical accuracy and surface finish obtainable by super finishing process - difference between honing and super finishing, forms and shapes which can be super finished, super finishing oil properties and filtration method, super finishing allowance and centreless super finishing machines.
22	Job evaluation practice using various instruments	Modern new development in the trade
23	<b>Industrial visit &amp; Submission of Report</b>	
24-26	<b>Revision &amp; Trade Test</b>	

**NOTE: - Exposure to Industry/Institute for CNC, EDM, ECM etc.**

**J. List of Tools & Equipment**  
**Trade: MACHINIST (GRINDER)**  
**Under Craft Instructors Training Scheme**  
**For a Batch of 20 Trainees**  
**Semester-II**

Sl. No.	Name of the tool	Quantity For Trainer	Quantity For Trainees
	TRAINEES TOOL KIT		
1	Steel rule 150 mm (graduated both English and Metric) as per IS 1481	1 no.	20 nos.
2	Try square Engineers 150 mm as per IS 2103	1 no.	20 nos.
3	Hammer ball peen with handle 0.50 Kg	1 no.	20 nos.
4	Scriber 150 MM x 3mm	1 no.	20 nos.
5	Combination plier 150 mm	1 no.	20 nos.
6	Vernier caliper 200 mm, inside and outside (graduated in inches and millimeters) least count 0.020 mm as per IS 3651	1 no.	20 nos.
7	Micro meter outside 0 – 25 mm with least count 0.010 as per IS 2967	1 no.	20 nos.
8	Micro meter outside 25 – 50 mm least count 0.010 as per IS 2967	1 no.	20 nos.
9	Goggles (fiber plastic cup) safety glasses (interchangeable glasses)	1 no.	20 nos.
10	D.E Spanner 6 to 28 mm as per IS 2028	1set	20 sets
11	Allen key 5 to 12 mm	1set	20 sets
12	Hand file flat smooth 10"	1 no.	20 nos.
<b><u>TOOLS MEASURING INSTRUMENTS AND GENERAL SHOP OUT FIT</u></b>			
1	Hammer Copper 0.50 kg		2 nos.
	Precision tri block 2" x 4" x 6" with 23 tapped holes with strap clamps and screws		2 nos.
3	Angle plate 150x150x 40 mm		1 no.
4	Vernier caliper digital 200 mm, inside and outside (graduated in inches and millimeters) least count 0.01 mm		2 nos.
5	Vernier caliper, outside 300 mm (graduated in inches and millimeters) least count 0.020 mm		2 nos.
6	Oilcan, Pressure delivery ¼ point capacity		1 no.
7	Vernier Height Gauge (as per IS – 2921) (Metric and English graduated) 300 mm, least count 0.02 mm with holder for lever type dial test indicators and carbide tipped scribes		1 no.
8	Bevel protractor, least count 5 minutes		2 nos.
9	Diamond, Wheel Dressing (single stone mounted)		4 nos.
10	Files, Hand Flat, 200 mm smooth		4 nos.
11	Files, Hand Flat, 250 mm smooth		4 nos.
12	Files, 150 mm Half round smooth		4 nos.
13	Files, round Dead smooth 200 mm		4 nos.
14	Files, Triangular, dead smooth 200 mm and 150 mm		2 each
15	Files, Triangular Dead smooth 150 mm		4 nos.
16	Surface roughness comparator blocks		1 Set
17	Hacksaw frame 200 to 300 mm adjustable		2 nos.
18	Keys, Allen 14 mm		2 nos.

19	Keys, Allen 3 to 12 mm, by 1.5mm	1 Set
20	Keys, Allen 16mm	2 nos.
21	Spirit Level, size 200 mm, block type, sensitivity 0.02 mm/m	1 no.
22	Micrometer outside digital 0 to 25 mm, vernier , least count 0.001 mm	2 nos.
23	Micrometer outside digital 25 to 50 mm, vernier , least count 0.001 mm	2 nos.
24	Micrometer outside digital 50 to 75 mm , least count 0.010 mm	1 no.
25	Micrometer outside 75 to 100 mm and , least count 0.010 mm	1 no.
26	Drill gauge for checking 118° point angle and clearance angles	1 no.
27	Oil stone Carborandum, Coarse on one side and fine on the other side 200x50x25 mm	2 nos.
28	Oil Stone Carborandum, Coarse on one side and fine on other side 100x12 mm triangular	2 nos.
29	Oil Stone Carborandum, Coarse round 12 mm dia.	2 nos.
30	Straight Edge Engineer's 500L x 150 H x12T	1 no.
31	Screw Driver 200 mm blade	2 nos.
32	Screw Driver 300 mm blade, heavy duty	2 nos.
33	Spanner metric 32 mm	2 nos.
43	Rings spanner 3 to 22mm all sizes	2 sets
35	Adjustable spanner 300 mm	1 no.
36	Wheel Dressers, Steel Type (Huntington) (Large)	2 nos.
37	Radius Truing Attachment for surface grinding machine	1 no.
38	Wheel Dressers, Steel (Huntington type Small)	3 nos.
39	Angle Truing Attachment for surface grinding machine	1 no.
40	Centre Punch 150 x 6 mm dia.	4 nos.
41	Number punch	1 set
42	Letter punch	1 set
43	File Flat Rough 300 mm	4 nos.
44	File Flat 250 mm Second Cut	4 nos.
45	Granite Surface Plate, grade 0, 630 x 630 x 100mm with adjustable stand	2 nos.
46	Granite marking Table 1000x630 x 150mm, grade 1 with adjustable stand	2 nos.
47	Hand Drilling machine, electric, 12 mm	1 no.
48	Machine tap 10 mm, 12 mm 14 mm, and 16 mm	2 each
49	Drill Twist (Metric) 3 mm to 12 mm, in step of 0.5 mm	1 Set
50	Drill, Twist, taper shank, 16 mm	5 nos.
51	Drill, Twist, taper shank, 19.5 mm	2 nos.
52	Machine reamer 20mm	5 nos.
53	Machine reamer 30mm	5 nos.
54	Working Benches 340 x 120 x 75 Cms. with 4 bench vices 150 mm jaw	2 nos.
55	Fire Extinguisher	1 no.
56	Fire Buckets with stand	4 nos.

57	Trainees locker with keys (to accommodate 20 lockers)	1 no.
58	Metal Rack 180 x 150 x 45 cms.	1 no.
59	Stools	As required
60	Ceramic class room board size 2mx1m	1 no.
61	Magnifying Glass with surface illuminator	1 no.
62	Adjustable Wrench 250 mm size	1 no.
63	Hammer (Nylon face) 30 mm	4 nos.
64	Copper mallet 25 mm dia.	2 nos.
65	Grease Gun	1 no.
66	Oil gun	1 no.
67	Magnetic stand with holding stem for Dial Indicators 75 x 75 x 100 mm	2 Nos
68	Dial Test Indicator-Lever type-long point type-0.8 mm range graduation 0.01 mm	2 nos.
69	Dial Test Indicator-Lever type-long point type-0.8 mm range graduation 0.002 mm	2 nos.
70	Dial Test Indicator-Lever type-long point type-0.8 mm range graduation 0.001 mm	2 nos.
71	Lapping plate cast iron 300 mm diameter x 80 mm height with serrations (with lapping paste 320 mesh size 500 grams)	1 no.
72	Glass Show case for display of jobs 450 mm x 600 mm x 850 mm	1 no.
73	Trainees work table	1 no.
74	Face mask,	12 nos.
75	Apron leather	12 nos.
76	Silicon carbide dressing stick coarse	02 nos.
77	Silicon carbide dressing stick fine	02 nos.
78	Shell end mill cutter HSS 50x36x22 mm	5 nos.
79	Shell end mill cutter HSS 63x40x27 mm	5 nos.
80	Shell end mill cutter HSS 80x45x27 mm	5 nos.
81	Gear hobbing cutter 2.5 mm module	2 nos.
82	Gear shaper cutter module 2mm	2 nos.
84	Magnetic Sine table to size 250L x 150W x 105W x105H, inclination 0 to 45°	1 no.
83	HSS tool bits 150 mm long 6 to 12 mm dia. in steps of 1 mm	1 set
85	Magnetic Vice 160 x 225 x 90, jaw holding area 150 x 75 mm	1 no.
86	Industrial adhesive tape	As required
87	C-clamps 50 mm,100mm,and 150mm	2 each
88	Compound sine table size, 250L x 150W x 96H	1 no.
89	Optical flat with monochromatic light	1 no.
90	Surface roughness comparator	1 no.
91	Dye penetrant testing kit	1 set
92	Computer & Laptop with latest configuration, UPS, Laser jet Printer, LCD Projector (for class room application)	1 each
93	First aid kit	1 no.
94	Class room chairs with writing pad	As required

<b>GENERAL MACHINERY</b>			
Sl. No	Name of the machine	Broad Specification	Quantity
1	Grinding machine hydraulic external cylindrical, universal type with internal grinding attachment fully motorized and standard accessories.	Centre height - 150mm Distance between centers- 800 mm Least in-feed - 0.0025 mm Accessories: Face plates and driving dog carriers, 3 jaw self-centering chuck, 4-jaw independent chuck, Adaptor sleeve and draw bar for collets dia. 5 to 25 mm, Set of collets 10 Nos. 16 to 25 mm in step of 1 mm, tailstock, fixed steady, adjustable steady, wheel dressers for external and internal grinding wheels, 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)	2 nos.
2	Additional accessories for Universal cylindrical grinding machines	Testing mandrel, radius truing attachment concave and convex, Micrometric shoulder grinding device for precise grinding of shoulders, Extra wheel flange with balancing blocks, wheel balancing mandrel, wheel balancing stand	1 each
3	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, spare grinding wheel for general purpose grinding and standard accessories	2 nos.
4	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., RH and LH tail stock with centre, 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, 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, Lighting equipment, Inspection mandrel, Diamond dressing tool with holder, Assorted grinding wheels for all tool room work, and Standard hand tools	2 nos.
5	Additional accessories for Tool and cutter grinding machines	Rough reamer/core drill relief grinding attachment suitable up to 50mm dia. and 6 deg. back angle with accessories, Twist drill sharpening attachment	1 each

		min./max. Dia. twist drill 5/25 mm, Spiral milling cutter and hob grinding attachment,	
6	Centreless grinding machine	Grinding dia. 1.5 to 63 mm, grinding length through feed without any attachment 200 mm, grinding length for infeed grinding 95 mm, grinding wheel size (OD X ID X WIDTH) 350 X 127 X 100 mm, grinding wheel speed 11,900 rpm for new wheel and 12 200 rpm for worn out wheel, regulating wheel size (OD X ID X WIDTH) 250 X 127 X 100 mm, regulating wheel speed 20 to 300 rpm, swivel range for regulating wheel for taper grinding + 4° - 2°, swivel range for regulating wheel for through feed grinding + 4° - 2°, Max. movement of regulating wheel head 0.003 mm, grinding wheel head power 7.4 KW, regulating wheel head power 0.75 KW with standard accessories	1 no.
7	CNC Cylindrical grinder with minimum specification as:	Centre height -130 mm , distance between centre 300 to 500 mm, weight of component 30 Kgs. (min.), grinding length 200 to 300 mm, Swing diameter 200 to 250 mm, wheel surface speed 33 m/sec., table speed 10 m/min. Spindle power 3.7 kW (Continuous rating) with popular Control system like – FANUC/SINUMERIC and with standard and essential accessories.	1 no.
8	Pedestal grinder fitted with coarse and medium grain size grinding wheels	Grinding wheel dia. 250 mm	2 nos.
9	Small type hand honing machine with motors and brackets suitable	For honing 27 mm bore and different types of honing stones and accessories	1 no.
10	Flat lapping machine	300 mm dia. bench model	1 no.
11	Single lip cutter grinder with standard accessories	Cutter shank dia. -12 mm with std. Collet, Radius ground - 20 mm, Relief angle ground - 45 degree, cutter head std. - 12 index, grinding cup wheel size 100 dia. X 50 width x 20 thick mm, spindle speed 4500 rpm.	1 no.
12	Power hack saw	For Cutting with 24” x 1 1/2” hack saw blade	1 no.
13	Personal computers	PCs with MS-Windows, networked on LAN.	11 nos.
14	Table & Chair for computers		11 nos. & 20 nos.
15	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, Siemens, etc. (Web-based or licensed based) (10 trainees + 1 faculty)	Compatible to CNC cylindrical grinding machine	11 users

✓ Note: 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.

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

<b>Sl. No.</b>	<b>Items</b>	<b>Qnt.</b>
01	Class Room Chairs (armless) / Dual desk may also be allowed	20 /10 nos.
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

## L. LIST OF TRADE COMMITTEE MEMBERS

Sl. No.	Name & Designation Sh/Mr/Ms.	Organization	Mentor Council Designation
<b>Members of Sector Mentor council</b>			
1.	A. D. Shahane, Vice-President, (Corporate Trg.)	Larsen & Tourbo 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, Bengaluru	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., Bengaluru	Member
20.	R C Agnihotri Principal	Indo- Swiss Training Centre Chandigarh, 160030	Member
<b>Mentor</b>			
21.	Sunil Kumar Gupta (Director)	DGET HQ, New Delhi.	Mentor
<b>Members of Core Group</b>			
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, Bangalore, Karnataka	Member
36.	B.V.Venkatesh Reddy. JTO	Govt. ITI, Tumkur Road, Bangalore, 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
<b>Other industry representatives</b>			
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