

Syllabus for the subject

of

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

Under

CRAFT INSTRUCTOR TRAINING SCHEME (CITS)

**Trade: Machinist
&
Operator Advance Machine Tool**

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** : **Machinist & Operator Advance Machine Tool 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: 240 sq. meter 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) 20 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/ Operator Adv. Machine Tool 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 Machinist/ Operator Adv. Machine Tool trade.
In case of two units, one trainer must be Degree in Engineering.

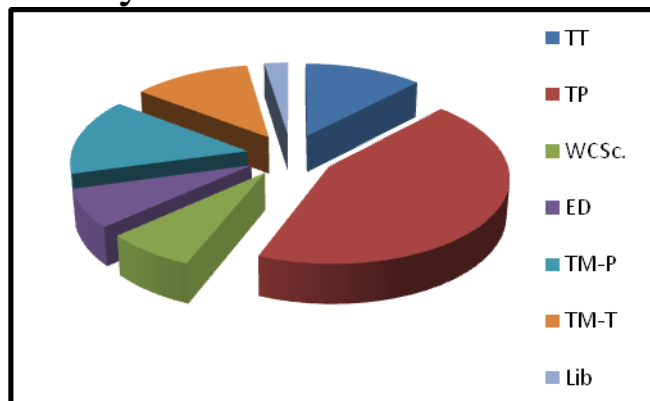
Note: Degree/Diploma candidate may directly appear for Semester-I exam without attending classes for lateral entry in semester-II.

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: MACHINIST & OPERATOR ADVANCE MACHINE TOOL
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	Safety	12	03	Drilling Machine & Tapping	40	20
2	Tools	16	10	Shaping	120	30
3	Limit, Fit & Tolerance	10	10	Slotting	80	10
4	Cutting tool & its life	12	08	Lathe	80	40
5	Drilling Machine & Tapping	10	06	Milling	100	70
6	Shaping	18	15	Indexing	20	30
7	Slotting	12	06			
8	Lathe	16	15			
9	Milling	16	17			
10	Indexing	10	10			
11	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: MACHINIST & OPERATOR ADVANCE
MACHINE TOOL
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 Theory	Trade Practical
1-2	<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.</p> <p>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):-</p> <p>Basic Life Support (BLS) techniques for drowning, choking, electrocution, neck and spinal injury, including CPR (cardiopulmonary resuscitation).</p>	<p>Occupational Safety & Health</p> <p>Importance of housekeeping & good shop floor practices.</p> <p>Health, Safety and Environment guidelines, legislations & regulations as applicable. Disposal procedure of waste materials like cotton waste, metal chips/burrs etc. Basic safety introduction,</p> <p>Personal protective Equipments(PPE):-</p> <p>Basic injury prevention, Basic first aid, Hazard identification and avoidance, safety signs for Danger, Warning, caution & personal safety message.</p> <p>Preventive measures for electrical accidents & steps to be taken in such accidents.</p> <p>Use of Fire extinguishers.</p> <p>Technical English:</p> <p>Prepare different types of documentation as per industrial need by different methods of recording information.</p> <p>Basic Life support training:</p> <p>Be able to perform DRSABCD: -</p> <p>D: Check for Danger</p> <p>R: Check for a Response</p> <p>S: Send for help</p> <p>A: Open the Airway</p> <p>B: Check for normal Breathing</p> <p>C: Perform CPR (Cardio Pulmonary Resuscitation)</p> <p>D: Attach Defibrillator / Monitor as soon as available.</p>

	<p>Introduction of Basic Hand Tools and Cutting Tools. Linear measurement: - a) Line standard b) End standard. Precision Measuring Instruments like Vernier Calliper, Micrometers height Gauge etc with their parts, principle, reading, application, least count, application of Dial Test Indicator, care and maintenance</p>	<p>Demonstration on different types of machines and safety related to each machines. Filing job including flatness, Squareness and parallelness. Material identification. Care and maintenance of measuring tools like Vernier calipers, steel rule, try square, vernier micrometer, height gauge , combination set etc. Handling measuring instruments, checking of zero error, finding of least count.</p>
3	<p>Concept of interchange ability , Elements of interchangeable system Types of fit – clearance, transition, interference, selective assembly- definition & function, Hole basis system, shaft basis system.</p>	<p>Demo and practice on Pedestal grinders. Safety, selection, use of grinding wheels. Practical job on precision fitting machining, grinding. Demo and Practice on twist drill bit Grinding.</p>
4	<p>Surface Finish and Symbols. Power Transmission – Classification, types, elements, individual vs. group drive. Related to various machine tools.</p>	<p>Raw material cutting as per size in Power Hacksaw machine. Internal and External thread making with the use of Tap and Die. Use of Hand Reamer and machine reamer.</p>
5	<p>Cutting tools materials-HCS,HSS, Tungsten carbide, coated carbide, ceramics – Properties and uses – Cutting tool life – Equation for cutting tool life – Factors affecting on cutting tool life. Tool failure reasons, Cutting tool classifications, nomenclature of a single point cutting tool, tool angles and its influence. Machinability, classification in Cutting tool.</p>	<p>Demo and Practice on various chip formation process on shaper operations like - Flat surface, Angular surface, Slot, Formed surface etc.</p>
6	<p>Orthogonal and oblique cutting, cutting force, cutting power, Concept of chip formation, types of chips. Built-up edge formation. Coolant used in metal cutting and its applications</p>	<p>Tool angle measurement, regrinding of cutting tool for orthogonal and oblique cutting. Use of the above tool for practicals.</p>
7	<p>Drilling Machine- Specifications and types Constructions – pillar drill and radial drill. Different operation in drilling machine Drill – nomenclature, types Reamers – types, nomenclature Tap drill size, calculation Cutting speed, feed, depth of cut, drilling time, calculations.</p>	<p>Practice on Drilling, Counter sinking, Counter boring. Use of hand reamer and machine reamer.</p>

8	Work holding devices – drill jig, vice, V-block, direct clamping on table. Different types of tool holding devices	Practice on Drilling, Counter sinking, Counter boring
9	Shaper Machine: Construction, types and parts. Specification of Shaper and applications. Crank slotted link mechanism (adjustment of length of stroke & position of stroke). Quick Return Mechanism.	Shaping Contours with Form Tools Shaping a ‘V’ Block. Cutting Keyways in a bush (internal) T-
10	Introduction to Hydraulic drives, need and applications. Hydraulic shaper -Working principle, construction & quick return mechanism.	Demo and practice on Shaping machine.
11	Planning m/c- Specifications, construction & types. Quick return mechanism a) Open & Cross belt b) Variable speed.	Demo and practice on Planning.
12	Cutting speed, feed, depth of cut & machining time calculation in Shaper & Planer Types of Cutting tool. Job holdings devices – Fixture, Vice, Directly over table. Difference between Planner & Shaper.	Planning a Flat Surface, slot cutting, angle cutting on Planner machine.
13	Slotting Machine: Specifications, types. Construction & applications. Different types of Tools used Work and Tool Holding devices.	Exercises of cutting Key Ways Machining of Regular Polygon. Spline fitting on slotting.
14	LATHE MACHINE: Working principle, types & construction Different parts and their functions Drives – cone pulley, back gear, all geared drive Attachment and accessories Different mechanisms – apron mechanism, feed mechanism	Different operation on lathe
15	Tool setting in correct centre height – effects of rake & clearance angle Different operation on lathe Taper turning methods, working principle and calculations. Thread cutting – Different types, Gear Calculation, Tool Setting,	Taper turning by different methods to an accuracy of 0.04 mm

	Checking the thread,	
16	Definition and calculation of Cutting speed, feed, depth of cut & machining time of lathe.	Eccentric turning to an accuracy of 0.04 mm
17	CAPSTAN AND TURRET LATHE NEED AND APPLICATION OF CAPSTAN & TURRET LATHE. Comparison between capstan and turret lathe.	Thread cutting in Lathe Machine – gear calculation, tool setting, measurement of thread sections, arrangement in cutting,.
18	Job holding devices – chucks, collets, bar feeding mechanism. Tool holding devices – roller steady box, knee tool holder & self-opening die.	Industrial Visit
19	MILLING MACHINE Milling Machine construction, different types, parts and specification. Different accessories and attachments for Milling Machine. Difference between plain milling & universal milling. Cutter holding device, Work holding Devices.	Demo and Practice on Milling Operations. Plain milling, Step milling to an accuracy of 0.04 mm,
20	Milling processes- Peripheral milling, Up & Down milling, Different type of Milling operations - Face milling, End milling, Straddle milling, Plain milling, Side milling, Angular milling, Gang milling, End milling etc.	Slot milling, angular milling
21	Milling cutters- Types, elements, negative rake cutter (purpose). Cutting speed, feed, depth of cut & machining time calculations.	Demo and Practice on Milling Operations. T – slot and Dovetail milling.
22	Indexing- Purpose, types, description & working principle, gear cutting with indexing head and calculation.	Demo and Practice on Indexing Head. Clutch milling operation.
23	Industrial visit & Submission of Report	
24 - 26	Revision & Trade Test	

F. List of Tools & Equipment

Trade – MACHINIST

Under CITS

For a batch of 20 Trainees

Semester-I

Hand Tools		
SL.NO.	DECRPTION	Qty. Per Unit
1.	Steel Rule 30cm. graduated both in Metric units.	4 nos.
2.	Divider 150mm	4 nos.
3.	Centre Punch	4 nos.
4.	Hammer Ball Pane 0.5Kg	10 nos.
5.	Combination Plier 150mm	05 nos.
6.	Safety glasses	10 nos.
7.	File flat Bastard 300mm	10 nos.
8.	File flat 2 nd Cut 250mm	10 nos.
9.	Engineers Screw Driver	10 nos.
10.	File flat smooth 200mm	10 nos.
11.	Cold chisel flat 25x200mm	10 nos.
12.	Surface Plate 600x600X80mm grade 1	1 no.
13.	Marking Table 1200X1200x900mm high	1 no.
14.	Scribing Block Universal 300mm	04 nos.
15.	Vee Block 100/7-80-A	2 nos.
16.	Try Square 300mm	08 nos.
17.	Straight Edge Steel 500mm	1 no.
18.	Steel Tape 2 meter in Case	1 no.
19.	Soft Hammer 250 grms with Handle	04 nos.
20.	Sprit level 25cm.	1 no.
21.	Hammer B.P 450Gms with handle	08 nos.
22.	Screw Driver, heavy duty 300mm with handle	4 nos.
23.	Hammer lead 1 kg.	2 nos.
24.	Combination Set 300mm	1 Set
25.	Screw driver 100mm.	4 nos.
26.	Allen hexagonal Keys 2.5 to 12mm	4 Sets
27.	Spanner Double Ended metric	6 sets
28.	Adjustable Spanner 300mm	2 nos.
29.	Reduction Sleeve Morse 1-1,3-1,4-1,4-2,5- 1,5-2,6-1.	2 sets
30.	Angle Plate Size 200x100x200mm	2 nos.
31.	Angle Plate Adjustable 250x150x175mm	2 nos.
32.	Solid parallels in pair (different size) in metric	20 nos.
33.	Oil cane pressure feed 500mg.	6 nos.
34.	Oil stone 150x50x25mm	2 nos.
35.	Number drill H.S.S (Parallels shank) 1-80Nos	1 set
36.	Drill (Parallel Shank)1.00mm to 10.00mm with 0.1mm difference	2 sets
37.	Twist Drills 10.00mm to 12.5mm.with 0.5mm difference	2 sets

38.	Drill Chuck 0 to20 with taper shank	4 nos.
39.	Centre Drill A1 to 5	2 sets
40.	Grinding wheel dresser (diamond)	6 nos.
41.	Grinding wheel dresser Hunting Type	2 nos.
42.	Clamp "C"100mm	2 nos.
43.	Clamp "C"200mm	2 nos.
44.	Tap & Die set in box metric pitch	1 Set
45.	File Flat 2Nd cut 250mm	6 nos.
46.	File Flat smooth 200mm	6 nos.
47.	File H/R 2Nd cut 250mm	6 nos.
48.	File Triangular smooth 200mm	6 nos.
49.	Needle File set	6 nos.
50.	File Square 2ND cut 250mm.	6 nos.
51.	Reamer 6mm to 25mm by 1 mm step	4 sets
52.	Reamer Adjustable 10mm to 15mm by 0.75mm step	4 sets
53.	Hacksaw frame Adjustable 250-300mm with blades.	10 nos.
54.	Machine Vice 100mm jaw swivel base.	4 nos.
55.	Machine Vice 200mm swivel base.	4 nos.
56.	Machine Vice 160mm swivel base.	4 nos.
57.	Hand Vice 50mm jaw.	2 nos.
58.	Universal machine vice 160mm	4 nos.
59.	Universal table angle plate	1 no.
60.	Taper shank twist drill set 13mm to30mm, to suit radial drilling machine	2 sets
61.	Shaper tool holder turret type	10 nos.
62.	Knurling tools (set of 3) straight and diamond	4 Set
63.	Plier cutting 200mm	4 nos.
64.	Magnifying- Glass 75mm	2 nos.
65.	Carbide Tipped Tools of different sizes and shapes (through away tips)	10 Sets
66.	Hand hammer 1kg. with handle	2 nos.
67.	Equipment for conducting BLS (Basic Life Support) training. (Optional)*	1 set

* Not required if training is done by external faculty with their equipment.

Measuring Tools:

Sl. No.	Description	Qty.
1.	Micrometer outside 0-25mm	2 nos.
2.	Micrometer outside 25-50mm	2 nos.
3.	Micrometer outside 50-75mm	2 nos.
4.	Digital Micrometer outside 0-25mm	2 nos.
5.	Digital Micrometer outside 25-50mm	2 nos.
6.	Digital Micrometer outside 50-75mm	2 nos.
7.	Digital Vernier Caliper 200mm	6 nos.
8.	Micrometer depth gauge 0-200mm	2 nos.
9.	Dial Vernier caliper 300mm	2 nos.
10.	Vernier height gauge 250mm	2 nos.
11.	Vernier bevel protractor with 150mm blade	2 Sets
12.	Bevel gauge 200mm	2 nos.
13.	Telescopic gauge 13mm to 300mm	1 set
14.	Sine Bar 200mm	2 nos.
15.	Inside Micrometer 25-50mm	2 nos.
16.	Inside Micrometer 50-150mm	2 nos.
17.	Dial Test Indicator with magnetic base.	2 nos.
18.	Centre gauge 60	1 no.
19.	Slip gauge set (normal set) metric set of 116pcs.	2 Sets
20.	Screw pitch gauge for metric pitches (25-6)	2 Sets
21.	Radius gauge metric set (1-6)	2 Sets
22.	Plug gauges 5mm to 25mm by 2.5mm step	2 Sets
23.	Ring gauges 5mm to 25mm by 2.5mm step(GO & NO GO)	2 Sets
24.	Sleeve M.T. No 1,2,3,4 & 5.	2sets
25.	Feeler Gauge	2 nos.
26.	Snap Gauge 5mm to 25mm by 2.5mm step	1 no.
27.	Vernier Caliper 200mm	02 nos.

Milling Cutters:

SI No.	Description	Qty.
1.	Cylindrical cutter 63x100x27mm	04 nos.
2	Cylindrical cutter 75x80x27mm	04 nos.
3	Side and face cutter 100x8x27mm	04 nos.
4.	Side and face cutter 150x10x27mm	04 nos.
5.	Side and face cutter 150x15x27mm	04 nos.
6.	Side and face cutter 200x20x27mm	04 nos.
7.	Equal angle cutter 45/100x28x27mm	04 nos.
8.	Equal angle cutter 60/100x28x27mm	04 nos.
9	Equal angle cutter 90/100x28x27mm	04 nos.
10	Equal angle cutter 45/75x12x27mm	04 nos.
11.	Equal angle cutter 45/100x18x27mm	04 nos.
12.	"T" Slot Cutter Dia-18,Width-8,shank-12mm	04 nos.
13.	"T" Slot Cutter Dia-21,Width-9,shank-12mm	04 nos.
14.	"T" Slot Cutter Dia-25,Width-11,shank-16mm	04 nos.
15.	"T" Slot Cutter Dia.-32,Width.-14,shank-16mm	04 nos.
16	Single angle cutter 63x18x27x45 R.H	04 nos.
17	Single angle cutter 63x18x45 L.Hx27mm	04 nos.
18	Single angle cutter 63x18x60 R.Hx27mm	04 nos.
19	Single angle cutter 63x18x60 L.Hx27mm	04 nos.
20	Double Unequal Angular cutter 40x16x27mmx48x12 L.H	04 nos.
21	Double Unequal Angular cutter 40x16x27mmx53x12 R.H	04 nos.
22	End Mill Cutter H.S.S,(6mm to 18mm) 12 nos. in a set	04 sets
23	Concave cutter H.S.S 75X18X27mm	04 nos.
24.	Convex cutter H. S. S 75X18X27mm	04 nos.
25.	Corner Rounding Cutter 12x10x27mm	3 nos.
26.	Corner Rounding Cutter 36x15x27mm	3 nos.
27.	Single Corner Rounding Cutter 18x6x27mm	3 nos.
28.	Single Corner Rounding Cutter 40x30x27mm	3 nos.
29.	Slotting Cutter 100x30x27mm	3 nos.
30.	Slotting Cutter 75x12x27mm	3 nos.
31.	Slitting Saw cutter 150x2.5x27mm	5 nos.
32.	Slitting Saw cutter 150x3x27mm	5 nos.
33.	Slitting Saw cutter 100x4x27mm	5 nos.
34.	Dovetail milling cutter parallel shank6x16mmx45	5 nos.
35.	Dovetail milling cutter parallel shank6x22mmx45	5 nos.
36.	Dovetail milling cutter parallel shank6x25mmx45	5 nos.
37.	Dovetail milling cutter parallel shank6x16mmx60	5 nos.
38.	Dovetail milling cutter parallel shank6x22mmx60	5 nos.
39.	Dovetail milling cutter parallel shank6x25mmx60	5 nos.
40.	Shell & End mill cutter 40x32x27mm	5 nos.
41.	Shell & End mill cutter 50x36x27mm	5 nos.
42.	Face mill cutter with inserted 6x80x27mm bore	3 nos.
43.	Face mill cutter with inserted 6x63x27mm bore	3 nos.
44	Face mill cutter with inserted 6x100x27mm bore	3 nos.

LIST OF MACHINES & EQUIPMENTS FOR THE TRADE MACHINIST

Sl. No.	Description of Equipments	Qty. in Nos.
1.	Shaping machine 450mm stroke (motorized) with all attachments.	2 nos.
2.	Shaping machine 315mm stroke (hydraulic) with all attachments	2 nos.
3.	Double column planer 1500x1000x1000(motorized) with all attachments.	1 no.
4.	Slotter 180mm (motorized) with all attachments.	2 nos.
5.	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.	3 nos.
6.	Drilling Machine pillar type 0- 20mm capacity with drill chuck & key.	1 no.
7.	Radial Drill 1200mm area motorized with tapping attachment	1 no.
8.	Pedestal Grinder Double End type.	2 nos.
9.	Power Saw Machine	1 no.
10.	<p>Universal Milling machine with minimum specification as:</p> <p>Table Length x width 1200 x 300 mm having motorized up & down movement along with auto feed arrangement and with following attachments such as:</p> <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 no.
11.	Horizontal 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 150mm Universal vice.	3 nos.
12.	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 150mm universal vice.	3 nos.

Syllabus for the subject

of

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

Under

CRAFT INSTRUCTOR TRAINING SCHEME (CITS)

**Trade: Machinist
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Operator Advance Machine Tool**

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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 & Operator Advance Machine Tool Trade**
6. **Examination** : AITT to be held at the end of each semester.
7. **Space Norms** :
(a) One class room minimum 30sq.m. area @1.5 Sq Mt.
Per Trainee having Minimum width of 5 m. and with 6000 lumen.
(b) Workshop: 240 sq. meter 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) 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 Machinist/ Operator Adv. Machine Tool 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: MECHNIST & OPERATOR ADVANCE MACHINE TOOL
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	Maintenance & Documentation	6	06	Milling	100	85
2	Jig & Fixture	6	10	Grinding	50	20
3	Grinding	12	15	Honning & Lapping	12	05
4	Heat Treatment	6	08	Jig boring	20	05
5	Broaching	4	04	Broaching	10	05
6	Cutting tool	4	04	Gear Cutting	100	60
7	Gear & Cam Cutting	14	25	C.N.C	60	20
8	Conventional Energy	4	03			
9	Non- Conventional Machine	6	05			
10	Quality Control	6	05			
11	C.N.C	20	15			
	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: MACHINIST & OPERATOR ADVANCE MACHINE
TOOL
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 Theory	Trade Practicals
1	Introduction to General Maintenance, objective, classification (Routine, Breakdown, preventive, emergency etc.) Maintenance planning , planning activities ,routine card, critical path scheduling , planned maintenance cycle, spare part planning, standard time for maintenance work.	Simple Maintenance jobs on the machines used in Machinist Section.
2	ISO tool nomenclature, tool holders, inserts for tool holders for different operation like plain turning, threading, grooving, parting-off. Use of collets, adopters, boring bars & precision boring bars. Different types of milling cutters such as face cutter, side & face cutter, angular milling cutter form cutters & insert used on it. Concept of wiper insert in face cutters.	Simple Maintenance jobs on the machines used in Machinist Section. Demo/practice on fitting of different types of milling cutters on different arbores, tool holders and fitting of inserts on cutter/tool holders.
3	JIGS & FIXTURE Definition, Purpose, Difference between Jigs & Fixture Locating principle, locating elements, Clamping elements, types of clamp Different types of Jigs and Fixture.	Demo and Practice on Vertical Milling Machine.
4	Jig boring - concept, application and its operation. Development in cutting tool material and effects of alloying elements in cutting tools. Introduction to powder metallurgy & its application and uses.	Demo on jig boring Machine using audio visual aids.

5	Grinding Machine – Types, Construction, Operations and parts. Specification of a grinding wheel.	Demo on Surface Grinding. Balancing & Mounting a grinding wheel, Dressing & Truing. Dry run and its importance. Practice on Surface Grinding
6	Factors selecting a grinding wheel, inspection of grinding wheel, Balancing & Mounting a grinding wheel Glazing & Loading of wheels. Care & Maintenance of grinding wheel. Dressing & Truing	Practice on cylindrical Grinding
7	Honing & Lapping – Principle & Use. Concept of heat treatment of steel & purpose of heat treatment. Iron –carbon diagram	Honing & Lapping practice.
8	Heat treatment, its objective. Different types of heat treatment process like Annealing, normalising, hardening, tempering of steel. purposes & uses of each process Study of Surface hardening – Carburising- Nitriding- cyaniding – Flame hardening- Induction hardening principle, purpose & uses.	Tool and Cutter grinding practice – Plain milling cutter, Side & Face milling cutter, Angular cutter Visit to heat treatment Industry.
9.	Broaching Machine: Construction, types, parts, operation and specifications. Advantage & disadvantage of using a Broaching machine. Broaching tool – Elements, free hand sketch of a Broach tool.	Demo/Practice on broaching machine
10	Different methods of Gear Manufacturing process, study and application of dividing head for gear cutting using milling machine.	Spur Gear milling and Rack cutting with simple dividing head and milling machine.

11	Types of gear- important terms and definition related to spur gear (pitch, pitch circle, addendum, dedendum, module etc.), velocity ratio, simple gear train, compound gear train, power transmitted by gears, Calculation on spur gear train. Mass production of gear – Gear shaper, Gear Hobber.	Helical Gear Cutting. Bevel Gear cutting,
12	Limit gauge, Sine bar, slip gauge-Introduction, construction, types & uses.	Demo/Practice on Gear Shaper and Gear hobber.
13	Cam – types, application in modern machines, its special advantages, manufacturing processes, calculation for milling different cams.	Machining different types of cams.
14	Bearing, Comparator gauge- Introduction, construction, types & uses.	Machining worm and worm wheel.
15	a. Introduction to conventional and non-conventional Sources of energy. b. Differentiates between conventional energy and Non-conventional energy. c. Advantages and disadvantages of non-Conventional energy. d. Solar energy	Countershaft Turning Precision Cylindrical Grinding practice
16-17	Non Conventional Machining Difference between conventional & non conventional machining. Different types like - a)EDM b) USM c) ECM d) LBM, and their Application	Demo on EDM using audio visual aids.

18	<p>Inspection and Quality Control Inspection, Need and types of inspection. Quality control and quality assurance Meaning and need for quality control Statistical quality control Q.C. curves. Concept of TQM Machine capability studies Surface protection method.</p> <p>Co-ordinate Measuring Machine (CMM) and its function.</p>	<p>An assembly job preparation combining different machining operations. Demo on CMM operation using audio visual aids.</p>
19	<p>NUMERICAL CONTROL MACHINE TOOL Introduction , N.C. & C.N.C. M/c Comparison between N.C. & C.N.C. M/c Advantages of C.N.C. M/c Construction and different parts & CNC machine.</p>	<p>Identifications of different parts & different drives, accessories, tools of CNC machine.</p>
20	<p>Different types of control system used in CNC Machines Flow Chart for manufacturing Components in CNC Machine</p>	<p>Part-programming and practice on simulation software.</p>
21-22	<p>Fundamental of manual part programming : Axis identification , Coordinate system, M/c zero , job zero, Reference Zero , G-Codes & M-Codes, Work Offset, Tool Offset. Feed function, Spindle Speed Function, Simple part program.</p>	<p>Programming for face milling and drilling application and setting of job on CNC machine, tool selection and setting. Editing the Program on the machine and manufacturing of Components.</p>
23	Industrial visit & Submission of Report	
24-26	Revision & Trade Test	

J. List of Tools & Equipment

TRADE: MACHINIST & OPERATOR ADVANCE MACHINE TOOL

Under Craft Instructors Training Scheme

For a batch of 20 Trainees

Semester-II

Hand Tools		
SL.NO.	DESCRIPTION	Qty. Per Unit
1.	Steel Rule 30cm. graduated both in Metric units.	4 nos.
2.	Divider 150mm	4 nos.
3.	Centre Punch	4 nos.
4.	Hammer Ball Pane 0.5Kg	10 nos.
5.	Combination Plier 150mm	05 nos.
6.	Safety glasses	10 nos.
7.	File flat Bastard 300mm	10 nos.
8.	File flat 2 nd Cut 250mm	10 nos.
9.	Engineers Screw Driver	10 nos.
10.	File flat smooth 200mm	10 nos.
11.	Cold chisel flat 25x200mm	10 nos.
12.	Surface Plate 400x400mm grade 1	1 no.
13.	Surface Plate 900x900mm grade 1	1 no.
14.	Marking Table 1200X1200x900mm high	1 no.
15.	Scribing Block Universal 300mm	04 nos.
16.	Vee Block 100/7-80-A	2 nos.
17.	Try Square 300mm	08 nos.
18.	Straight Edge Steel 500mm	1 no.
19.	Steel Tape 2 meter in Case	1 no.
20.	Soft Hammer 250 grms with Handle	04 nos.
21.	Sprit level 25cm.	1 no.
22.	Hammer B.P 450Gms with handle	08 nos.
23.	Screw Driver, heavy duty 300mm with handle	4 nos.
24.	Hammer lead 1kg.	2 nos.
25.	Combination Set 300mm	1 Set
26.	Screw driver 100mm.	4 nos.
27.	Allen hexagonal Keys 2.5 to 12mm	4 Sets
28.	Spanner Double Ended metric	6 sets
29.	Adjustable Spanner 300mm	2 nos.
30.	Reduction Sleeve Morse 1-1,3-1,4-1,4-2,5-1,5-2,6-1.	2 sets
31.	Angle Plate Size 200x100x200mm	2 nos.
32.	Angle Plate Adjustable 250x150x175mm	2 nos.
33.	Solid parallels in pair (different size) in metric	20 nos.
34.	Oil cane pressure feed 500mg.	6 nos.
35.	Oil stone 150x50x25mm	2 nos.
36.	Number drill H.S.S (Parallels shank) 1-80Nos	1 set

37.	Drill (Parallel Shank)1.00mm to 10.00mm with 0.1mm difference	2 sets
38.	Twist Drills 10.00mm to 12.5mm.with 0.5mm difference	2 sets
39.	Drill Chuck 0 to20 with taper shank	4 nos.
40.	Centre Drill A1 to 5	2 sets
41.	Grinding wheel dresser (diamond)	6 nos.
42.	Grinding wheel dresser Hunting Type	2 nos.
43.	Clamp "C"100mm	2 nos.
44.	Clamp "C"200mm	2 nos.
45.	Tap & Die set in box metric pitch	1 Set
46.	File Flat 2Nd cut 250mm	6 nos.
47.	File Flat smooth 200mm	6 nos.
48.	File H/R 2Nd cut 250mm	6 nos.
49.	File Triangular smooth 200mm	6 nos.
50.	Needle File set	6 nos.
51.	File Square 2ND cut 250mm.	6 nos.
52.	Reamer 6mm to 25mm by 1mm step	4 sets
53.	Reamer Adjustable 10mm to 15mm by 0.75mm step	4 sets
54.	Hacksaw frame Adjustable 250-300mm with blades.	10 nos.
55.	Machine Vice 100mm jaw swivel base.	4 nos.
56.	Machine Vice 200mm swivel base.	4 nos.
57.	Machine Vice 160mm swivel base.	4 nos.
58.	Hand Vice 50mm jaw.	2 nos.
59.	Universal machine vice 160mm	4 nos.
60.	Universal table angle plate	1 no.
61.	Taper shank twist drill set 13mm to30mm, to suit radial drilling machine	2 sets
62.	Shaper tool holder turret type	10 nos.
63.	Knurling tools (set of 3) straight and diamond	4 Set
64.	Plier cutting 200mm	4 nos.
65.	Magnif ing- Glass 75mm	2 nos.
66.	Carbide Tipped Tools of different sizes and shapes (through away tips)	10 Sets
67.	Hand hammer 1kg. with handle	2 nos.

Milling Cutters:

Sl No.	Description	Qty.
1.	Cylindrical cutter 63x100x27mm	04 nos.
2	Cylindrical cutter 75x80x27mm	04 nos.
3	Side and face cutter 100x8x27mm	04 nos.
4.	Side and face cutter 150x10x27mm	04 nos.
5.	Side and face cutter 150x15x27mm	04 nos.
6.	Side and face cutter 200x20x27mm	04 nos.
7.	Equal angle cutter 45/100x28x27mm	04 nos.
8.	Equal angle cutter 60/100x28x27mm	04 nos.
9	Equal angle cutter 90/100x28x27mm	04 nos.
10	Equal angle cutter 45/75x12x27mm	04 nos.
11.	Equal angle cutter 45/100x18x27mm	04 nos.
12.	"T" Slot Cutter Dia-18,Width-8,shank-12mm	04 nos.
13.	"T" Slot Cutter Dia-21,Width-9,shank-12mm	04 nos.
14.	"T" Slot Cutter Dia-25,Width-11,shank-16mm	04 nos.
15.	"T" Slot Cutter Dia.-32,Width.-14,shank-16mm	04 nos.
16	Single angle cutter 63x18x27x45 R.H	04 nos.
17	Single angle cutter 63x18x45 L.Hx27mm	04 nos.
18	Single angle cutter 63x18x60 R.Hx27mm	04 nos.
19	Single angle cutter 63x18x60 L.Hx27mm	04 nos.
20	Double Unequal Angular cutter 40x16x27mmx48x12 L.H	04 nos.
21	Double Unequal Angular cutter 40x16x27mmx53x12 R.H	04 nos.
22	End Mill Cutter H.S.S,(6mm to 18mm) 12 nos. in a set	04 sets
23	Concave cutter H.S.S 75X18X27mm	04 nos.
24.	Convex cutter H. S. S 75X18X27mm	04 nos.
25.	Corner Rounding Cutter 12x10x27mm	3 nos.
26.	Corner Rounding Cutter 36x15x27mm	3 nos.
27.	Single Corner Rounding Cutter 18x6x27mm	3 nos.
28.	Single Corner Rounding Cutter 40x30x27mm	3 nos.
29.	Slotting Cutter 100x30x27mm	3 nos.
30.	Slotting Cutter 75x12x27mm	3 nos.
31.	Slitting Saw cutter 150x2.5x27mm	5 nos.
32.	Slitting Saw cutter 150x3x27mm	5 nos.
33.	Slitting Saw cutter 100x4x27mm	5 nos.
34.	Dovetail milling cutter parallel shank6x16mmx45	5 nos.
35.	Dovetail milling cutter parallel shank6x22mmx45	5 nos.
36.	Dovetail milling cutter parallel shank6x25mmx45	5 nos.
37.	Dovetail milling cutter parallel shank6x16mmx60	5 nos.
38.	Dovetail milling cutter parallel shank6x22mmx60	5 nos.
39.	Dovetail milling cutter parallel shank6x25mmx60	5 nos.
40.	Shell & End mill cutter 40x32x27mm	5 nos.
41.	Shell & End mill cutter 50x36x27mm	5 nos.
42.	Face mill cutter with inserted 6x80x27mm bore dia. Make-wedia, sandvik	3 nos.
43.	Face mill cutter with inserted 6x63x27mm bore dia.	3 nos.

44	Face mill cutter with inserted 6x100x27mm bore dia.	3 nos.
45	Involutes gear module 2 module PA 14½°	1 Set
46	Involutes gear module 2.5 module PA 14½°	1Set
47	Involutes gear module 3 module PA 14½°	1 Set

Measuring Tools:

Sl No.	Description	Qty.
1	Micrometer outside 0-25mm	2 nos.
2	Micrometer outside 25-50mm	2 nos.
3	Micrometer outside 50-75mm	2 nos.
4	Digital Micrometer outside 0-25mm	2 nos.
5	Digital Micrometer outside 25-50mm	2 nos.
6	Digital Micrometer outside 50-75mm	2 nos.
7	Digital Vernier Caliper 200mm	6 nos.
8	Micrometer depth gauge 0-200mm	2 nos.
9	Dial Vernier caliper 300mm	2 nos.
10	Vernier height gauge 250mm	2 nos.
11	Vernier gear tooth caliper	2 nos.
12	Vernier bevel protractor with 150mm blade	1 Set
13	Bevel gauge 200mm	2 nos.
14	Telescopic gauge 13mm to 300mm	2sets
15	Sine Bar 200mm	2 nos.
16	Inside Micrometer 25-50mm	2 nos.
17	Inside Micrometer 50-150mm	2 nos.
18	Dial Test Indicator with magnetic base .	2 nos.
19	Centre gauge 60	1 no.
20	Slip gauge set (normal set) metric set of 116pcs.	2 Sets
21	Screw pitch gauge for metric pitches (25-6)	2 Sets
22	Radius gauge metric set (1-6)	2 Sets
23	Plug gauges 5mm to 25mm by 2.5mm step	2 Sets
24	Ring gauges 5mm to 25mm by 2.5mm step(GO & NO GO)	2 Sets
25	Sleeve M.T. No 1,2,3,4 & 5.	2sets
26	Feeler Gauge	2 nos.
27	Snap Gauge 5mm to 25mm by 2.5mm step	1 no.
28	Vernier Caliper 200mm	02 nos.

LIST OF MACHINES, EQUIPMENTS & FURNITURES FOR THE TRADE
MACHINIST

Sl No.	Description of Equipments	Qty. in Nos.
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.	3 nos.
2.	Tools & cutters grinder 250mm to 450mm between centre— fully motorized work head supplied with tool rest of different types table clamps and other attachment.	1 no.
3.	Drilling Machine pillar type 0- 20mm capacity with drill chuck & key.	1 no.
4.	Radial Drill 1200mm area motorized with tapping attachment	1 no.
5.	Pedestal Grinder Double End type with 178 mm wheels (one fine and one rough wheel).	2 nos.
6.	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.
7.	Horizontal 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 150mm Universal vice.	3 nos.
8.	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 150mm universal vice.	3 nos.
9.	Surface Grinding Machine with minimum specification as: Grinding machine plain surface, wheel dia. 175 mm (or near) with reciprocating table having longitudinal table traverse <u>200</u> mm (or near) fully automatic and fitted with adjustable traverse stops, machine to be fully motorized and fitted with ace guards and pumps, tank and pump fittings and also to be supplied with magnetic chuck 250 x 112 mm. Diamond tool holder, set of spanners, grease gun, oil-can and spare grinding wheel for general purpose grinding.	2 nos.
10.	Cylindrical Grinder with minimum specification as:	1 no.

	Grinding machine external cylindrical fully motorized and supplied with face plates and driving dogs, 3-jaw self centering chuck 4- jaw independent chuck tail stock assorted centers, stud pumps tank all guards and pipe fittings spanners and grease gun (each machine to be supplied with assorted grinding wheels and tool grinding machine for general purpose work with internal grinding attachment) to accommodate 750mm job with centre height 150mm and wheel diameter x width = 300 x 25mm.	
11.	CNC Machining Centre with minimum specification as: Table size:500x250mm Travel X-axis x Y-axis x Z-axis: 300 x 250 x 250mm Auto Tool Changer: 8 nos. Spindle power: 3.7kW (continuous rating) preferably with popular control system like Fanuc/Sinumeric along with motorized coolant system.	1 no.
12.	CNC milling tools to suit above machine: to accommodate face cutter, shell end mill cutter, taper shank and parallel shank drills/cutters, Reamers. taps with suitable tool holders.	2 sets each along with cutters & inserts.
13.	CNC turn Centre with minimum specification as: Chuck size:135mm Between centre distance: 250mm Travel in X: 100mm Travel in Z: 200mm No. of tool stations: 8 station turret Spindle power: 3.7kW (continuous rating) preferably with popular control system like Fanuc/Sinumeric along with motorized coolant system.	1 no.
14.	Tool holders to suit the CNC machine for Turning, Threading (external & internal), Grooving(external & internal), Parting off operations, Drilling, Boring, Under cutting (with 20 inserts for each operation)	2 each
15.	Power Saw Machine – hydraulic feet system – 400 mm blade size	1 no.
16.	Co-ordinate Measuring Machine (Optional)	1 no
17.	EDM (Optional)	1 no
18.	Gear Shaper	1 no.
19.	Gear Hobber	1 no.
20.	Jig Boring (Optional)	1 no.
21.	Multimedia teach ware/ courseware for CNC technology and interactive CNC part programming software for turning & milling 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)	11 users.
22.	PCs with MS-Windows-7 or latest to run above simulation software, networked on LAN.	11 nos.

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

Sl. No.	Items	Qnt.
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	01no.
06	Multimedia Computer System with all accessories with UPS (.5 KVA)	01set
07	Computer Table	01no.
08	White Board (6ft X 4 ft.)	01no.
09	LCD Projector Screen	01no.
10	Air Conditioner 1.5Ton (OPTIONAL)	02nos.
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, 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
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., Bengaluru	Member
45.	Dasarathi.G.V.	CADEM Tech. Pvt. Ltd., Bengaluru	Member
46.	L.R.S.Mani	Ohm Shakti Industries, Bengaluru	Member