

**SYLLABUS OF SEMESTER SYSTEM
FOR THE TRADE OF**

MACHINIST

SEMESTER PATTERN

Under

**Craftsmen Training Scheme (CTS)
(Two years/Four Semesters)**

**Revised in
2014**

**By
Government of India
Ministry of Labour & Employment (DGE&T)**

GENERAL INFORMATION

1. **Name of the Trade** : **MACHINIST**
2. **N.C.O. Code No.** : 835.10
3. **Duration of Craftsmen Training** : Two years (Four semesters each of six months duration).
4. **Power norms** : 20 KW
5. **Space norms** : 130 Sq.mt
6. **Entry Qualification** : Passed 10th Class with Science and Mathematics under 10+2 system of Education or its equivalent
7. **Trainees per unit** : 12 (Supernumeraries/Ex-Trainee allowed: 4)
- 8a. **Qualification for Instructors** : Degree in Mechanical Engineering from recognized university with one year post qualification experience in the relevant field
- OR
- Diploma in Mechanical Engineering from recognized Board of Technical Education with two years post qualification experience in the relevant field
- OR
- NTC/NAC in the Trade of “Machinist” with 3 years post qualification experience in the relevant field.
- 8b. **Desirable qualification** : Preference will be given to a candidate with Craft Instructor Certificate (CIC) in Machinist/ Operator Advance Machine Tool Trades.

Note:

- (i) Out of two Instructors required for the unit of 2(1+1), one must have Degree/Diploma and other must have NTC/NAC qualifications.
- (ii) Instructor qualification for WCS and E.D, as per the training manual.

Distribution of training on Hourly basis:

Total hours /week	Trade practical	Trade theory	Work shop Cal. &Sc.	Engg. Drawing	Employability skills	Extra curricular activity
40Hrs.	25 Hrs.	6 Hrs.	2 Hrs.	3 Hrs.	2 Hrs.	2 Hrs.

COURSE INFORMATION

1. Introduction:

- This course is meant for the candidates who aspire to become a professional machinist.

2. Terminal Competency/Deliverables:

After successful completion of this course the trainee shall be able to perform the following skills with proper sequence:

1. The trainees work as a semi-skilled worker in industry.
2. The trainees can be able to work as basic fitter, can operate and able to perform various operation drilling, shaping, slotting, planer, lathe, milling, grinding
3. The trainees can be able to do simple programming & operate CNC machine.
4. Knowledge of Technical English term used in industry.

3. Employment opportunities:

On successful completion of this course, the candidates shall be gainfully employed in the following industries:

1. Production & Manufacturing industries.
2. Service industries like road transportation and Railways.
3. Ship building and repair
4. Infrastructure and defence organizations
5. In public sector industries like BHEL, BEML, NTPC, etc and private industries in India & abroad.
6. Self employment

4. Further learning pathways:

- On successful completion of the course trainees can pursue Apprenticeship training in the reputed Industries / Organizations.
- On successful completion of the course trainees can opt for Diploma course (Lateral entry).
- On successful completion of the course trainees can opt for CITS course.

SYLLABUS FOR THE TRADE OF MACHINIST

First Semester
(Semester Code no. MCN - 01)
Duration: Six Month

Week No.	Trade Practical	Trade Theory
1.	<p>Importance of trade training, List of tools & Machinery used in the trade. Health & Safety: Introduction to safety equipments and their uses. Introduction of first aid, operation of Electrical mains.</p> <p>Occupational Safety & Health Importance of housekeeping & good shop floor practices. Health, Safety and Environment guidelines, legislations & regulations as applicable. Disposal procedure of waste materials like cotton waste, metal chips/burrs etc. Basic safety introduction, Personal protective Equipments(PPE):- Basic injury prevention, Basic first aid, Hazard identification and avoidance, safety signs for Danger, Warning, caution & personal safety message. Preventive measures for electrical accidents & steps to be taken in such accidents. Use of Fire extinguishers.</p>	<p>Importance of safety and general precautions observed in the in the industry/shop floor. All necessary guidance to be provided to the new comers to become familiar with the working of Industrial Training Institute system including stores procedures. Soft Skills: its importance and Job area after completion of training. Introduction of First aid. Operation of electrical mains. Introduction of PPEs. Introduction to 5S concept & its application. Response to emergencies eg; power failure, fire, and system failure.</p>
2.	<p>Identification of tools & equipments as per desired specifications for marking & sawing(Hand tools , Fitting tools & Measuring tools) Selection of material as per application Visual inspection of raw material for rusting, scaling, corrosion etc., Marking out lines, gripping suitably in vice jaws, hack sawing to given dimensions, sawing different types of metals of different sections.</p>	<p>Hand tools and its importance, steel rule, Try square, chisel, surface gauge and care & maintenance, Hacksaw frame, blades.</p>
3.	<p>Chipping flat surfaces and grinding various angles to chisels, filing flat surface. Grooving with Hammer and chisel.</p>	<p>Classification and types of chisels, files & uses, vices - its constructions and uses. Hammers and its types. Related safety.</p>
4.	<p>Filing Flat surfaces, Uses of marking tools, Punch, Try square & basic measuring tools, caliper, steel rule.</p>	<p>Marking block, Steel rule, and calipers-different types and uses. Combination set-its components and uses.</p>
5.	<p>Filing flat surfaces, checking with steel rule and Try square. Hack sawing.</p>	<p>Hacksaw blade, Hacksaw frame and its types. Drill bits- parts, Types & uses.</p>
6&7	<p>Marking and Drilling holes on flat pieces. Tapping as per simple drawing.</p>	<p>Introduction to Hand Taps & Dies and their types, applications, care and maintenance. Familiar with tap and drill size, Thread Terminology.</p>
8.	<p>Filing Tee shape job.</p>	<p>Forging tools, its importance and types such as tongs, swage block, anvil etc.</p>
9.	<p>Filing flat type polygon.</p>	<p>Heat treatment process Annealing, Normalizing, Tempering, Hardening, case hardening and its importance. Use of vernier caliper and its parts, construction, principle &</p>

		reading, use & care.
10.	Fitting male and female square piece to close limit. Application of vernier caliper in making job.	Outside micrometer, its types and construction, parts, reading use, care and maintenance.
11.	Fitting male and female square piece to close limit. Application of vernier caliper in making job.	Study about Depth gauge, micrometers and dial test indicator - their parts and construction.
12.	Introduction to Shaping machine and its construction. Setting of strokes, tools, job on table machining of Rectangular block, steps, with the use of Basic tools. Safety points to be observed while working on a shaper. Setting of vice, setting of block on vice checking accuracy.	Introduction of shaper, types classification, General principles of power transmission on shaping mechanism. Shaping parts, construction use of parts, quick return mechanism ratio etc.
13.	Shaping Hexagonal, Rectangular block as per sketch checking with caliper & steel rule, angle protractor.	Various tools of shaping machine and their angles and importance of angles.
14.	Shaping "V" blocks with slides, measurement of 'V' groove with vernier bevel protractor, measurement of slots by vernier caliper with 0.02 mm accuracy.	Various methods of holding jobs, use of clamps, nuts & bolts V- blocks, angle plates shaping operations, their importance.
15.	Shaping Tee slots, shaping angular surfaces.	Tool head - its parts and application, function of each part of tool head.
16.	Cutting of external keyway on shaper.	Shaping tools and types. Speed, feed, depth of cut.
17.	Shaping concave & convex surface with use of tee slot tools, form tools.	Surface finish as per ISI system.
18.	General introduction to slotting. Safety points to be observed while working on a slotter.	Slotter-principle, construction, details, driving mechanism, quick return motion and speed ratio. Safety precaution comparative study with a shaping machine. Classification of slotting machine.
19.	Slotting a rectangular job checking and measuring with gauges & precision measuring instruments.	Job holding devices-vice, clamps, V-block, parallel block etc.
20.	Slotting square and hexagon internal and external. Slotting a double ended spanner.	Slotting tools different types of work tool angles comparison of tool shape with that of shaper
21.	Practice on slotting key ways on pulley-Internal and external slotting irregular shaped jobs having curved surfaces.	Use of tool with holder for internal operations. Precautions to be observed during slotting internal operations.
22.	Slotting internal operations. Slotting concave and convex surfaces.	Introduction to coolant & lubricant-difference between them, types and uses of each. Use of circular marks on the table for slotting curves.
23-25	Revision	
26	Examination	

SYLLABUS FOR THE TRADE OF MACHINIST

Second Semester

(Semester Code no. MCN - 02)

Duration: Six Month

Week No.	Trade Practical	Trade Theory
1	Introduction of planning machines, Adjustment of stroke, setting of tool, vice on planer table machining of rectangular block on planer. Safety points to be observed while working on a planer.	Introduction to Planing M/c. parts, types, constructions, details of Driving mechanism of planer, quick return motion etc.
2	Planing angular, Horizontal, vertical operations, planing Dovetail.	Tool head of planer its construction and various function of each part v- block, clamps, bolts, step block and other holding devices.
3	Planing of various key ways (open & blind). Types of operation, concave & convex surface i.e. goose neck clamp.	Cutting tools for Planer - their material and types. Templates, gauges, their fixtures and vices.
4	Planing V Block machining of planer gauge.	Hydraulic mechanism of planer their advantages, disadvantages.
5	Planing male & female dovetail, grinding of tools, checking with Vernier bevel protractor & roller methods.	Dovetail measurement external and internal by vernier bevel protractor. Checking of Dovetail by roller method.
6	Introduction to lathe. Holding of round job in an independent chuck and truing it. Holding the tool in a tool post, centering the job with the tool. Facing & drilling.	Introduction to lathe. Its types, engine lathe construction, detail function of parts size and specification. Safety points to be observed while working on a lathe.
7	Parallel turning between centers, parting off, chamfering using roughing, finishing and parting off tools.	Lathe tools their angles & uses. Driving mechanism, speed and feed mechanism & lathe accessories.
8	Holding the job in jaw chuck truing, centering facing. Step turning undercutting, knurling drilling and boring.	Chucks-different types of job holding devices on lathe and advantages of each type. Mounting and dismounting of chucks.
9	Taper turning by offset method checking of the taper with precision instruments. Taper turning by swiveling compound rest, setting the compound rest to correct degree, checking the tool height, clamping the saddle for no longitudinal movement, checking up with precision instruments.	Taper introduction, types and uses. Calculations of tapers. Measurement of taper by sine bar and slip gauges.
10&11	Cutting V thread external and internal in a lathe. Checking up with screw pitch gauge. Cutting square thread external & internal on a lathe.	Different thread forms their related dimensions and calculations screw cutting in a lathe. Measurement of threads by three wire methods.

12	Introduction to milling machine, demonstration on working principle, setting of job, setting of cutter in arbor, setting of vice on table. Safety points to be observed while working on a milling machine.	Milling machine importance of milling machine, types and specification of milling machine, driving and feed mechanism of milling machine.
13	Sequence of milling six faces of a solid block. Checking the accuracy with the help of try-square scribing block and vernier height gauge.	Classification & different types of milling cutters & their use. Parts and nomenclature.
14	Step milling using side and face cutter checking with micrometer.	Vernier height gauge construction, graduations vernier setting & reading, vernier bevel protractor, construction graduation setting and reading. Care and maintenance of vernier height gauge and bevel protractor.
15	Straddle and gang milling operations including up-milling and down milling. Milling concave and convex surfaces.	Different milling operations plain-face, angular, form, slot, gang and straddle milling etc. Up and down milling. Different types of milling attachments and their uses.
16	Introduction to indexing head types, setting and aligning of indexing head with reference to job on milling machine.	Indexing-introduction & types. Indexing head-constructural details, function of indexing plates and the sector arms. Calculation for various types of indexing.
17	Milling square and hexagonal job by simple indexing method.	-do-
18	Milling dovetail and 'T'slots both male and female matching each other. Milling Rack of straight teeth.	Gear introduction, use and type. Elements of a spur gear. Gear tooth of each forms types, merits and demerits of each. Spur gear calculations, curves and their uses.
19	Milling of spur gear having even and odd number of teeth.	Selection of gear cutter type and form & various methods of checking gear and its parts.
20 & 21	Introduction to grinding machine surface grinder, cylindrical grinder. Driving and feed mechanism, job holding devices mounting of wheels. Wheel balancing & truing. Grinding of parallel and stepped jobs. Dressing of grinding wheels.	Grinding machine introduction types, specification, their parts and functions & uses. Safety points to be observed while working on a Grinding machine. Types of Abrasives and their uses, Glazing and loading of wheels. Explain the importance and necessity of quality.
22-23	Implant training / Project work (work in a team)	
24-25	Revision	
26	Examination	

SYLLABUS FOR THE TRADE OF MACHINIST

Third Semester

(Semester Code no. MCM - 03)

Duration: Six Month

Week No.	Trade Practical	Trade Theory
01	Checking of alignment of lathe centers and their adjustments. Center drilling, step turning between centers recessing and chamfering & measurement with vernier caliper. Taper turning by taper turning attachment.	Turning of taper by taper turning attachment advantages and dis-advantages taper calculations.
02	Cutting square threads (left & right hand) on a lathe-checking with thread gauge-grinding of tool and setting in correct position.	Screw cutting on a lathe. Terms relating screw thread major/ minor diameter pitch and lead of the screw, depth of thread simple gear train and compound gear train change gears for fractional pitches.
03	1. Cutting multi-start V thread on lathe. 2. Cutting key way broaches.	Difference between single and multi-start threads-their uses merits and demerits. Broach - its types and uses.
04	Cutting ACME threads (Male and female) on a lathe. Lead screw.	Square thread its form and calculation of depth, core dia, pitch dia. Acme thread its forms use and calculations.
05	Cutting acme threads on lathe (Male and female).	Square threads-its forms and calculations of depth, core dia, pitch dia, Acme threads-its forms, use and calculations.
06	Turning of irregular jobs using face plate. Balancing the face plate.	Face plate- its construction safety precaution in holding jobs on face plate.
07	Exercise on use of pillar drill in drilling, counter sinking, counter boring. Spot facing and use of spot facing tools. Further practice of drilling of Radial drills. Practice of reaming on drilled holes.	Pillar drill machine constructional details, functions of parts. Application of pillar drill. Radial drills function parts etc. Reamer- parts, types, uses. Special tools – use and precautions to be observed for shaping internal keyways dovetails & ‘T’ slots.
08	‘T’ slots cutting in shaping machine.	Various material for single point cutting tools, tipped tools, their brazing and grinding process. Tool angles and their effect on cutting various materials.
09	Cross Dovetail cutting on shaper.	Cutting speed, feed, depth of cut for slotting, shaping and time calculation.
10	Shaping cross dovetails mating jobs male and female.	Checking of dovetail grooves with vernier caliper and roller. Their calculations and use of sine bar, slip gauge and dial test indicator.
11	Shaping of casting jobs, using angle plate, jack and clamps. Machining of complex	Properties of metals general idea of physical, mechanical properties of metals, colour,

	shaped intricate casting.	weight, hardness toughness, malleability, ductility their effect on machine ability.
12	Grinding of form tools and shaping of convex and concave surfaces.	Use of radius gauges and template. Introduction to jigs and fixtures. Types and uses.
13	Machining of profiles on a slotting machine. Slotting of a double ended spanner.	Interchangeability – Limit, Fit, Tolerances and allowances.
14	Machining of internal spline and external spline on slotter uses to match each other.	Introduction and their indexing process on a slotter by its rotary table graduations.
15	Cutting external and internal sprocket teeth on slotting machine, use of rotary table.	Form tool for slotting machines. Calculation for spur gear in relation to graduation of circular table.
16	Slotting regular & irregular job and contours and sprockets.	Calculation for cutting sprocket.
17	Planning long jobs having ‘T’ slots and dovetail grooves.	Tool setting for dovetail use of relevant tool and their grinding process. Alignment of long jobs with precision instruments.
18	Setting and planning multiple jobs at a time.	Hydraulic transmission in machine tool- its advantages and application hydraulic system of a planer. Use of planer gauge for setting tool and template for profile checking.
19	Boring a cast block on a vertical milling machine, measurement of bore size.	Vertical milling machine its parts, construction, method of boring in a vertical milling. Difference between horizontal and vertical milling machine.
20	Milling hexagonal hole on a plate by attachment.	Elements of milling cutter Rake angle, primary, secondary and clearance angles, lead etc.
21	Demonstration of marking system of Grinding wheels. Different Tool and Cutter grinding practices on Tool & Cutter grinding m/c. Milling tongue and groove on a mating job. Checking with precision instruments and gauges.	Selection procedure of grinding wheels. Abrasives its types Bonds, Grade Grit, structure, different shape of wheels and their uses. Inside micrometer, Principle, construction graduation reading both in English and metric system gauge types and uses.
22-23	Implant training / Project work (work in a team)	
24-25	Revision	
26	Examination	

SYLLABUS FOR THE TRADE OF MACHINIST

Fourth Semester

(Semester Code no. MCN - 04)

Duration: Six Month

Week No.	Trade Practical	Trade Theory
01.	Demo of parts of CNC machining center – control switches, console buttons and machines specifications (spindle power, axes traverse, etc.). Demonstration of machine parts - bed, spindle motor and drive, tool changer, axes motors and ball screws, guideways, LM guides, console, electrical, coolant system, hydraulic system, chip conveyor. Working of parts explained using multimedia CNC teach ware. Parts shown on machine.	CNC technology basics: Difference between CNC and conventional lathes. Advantages and disadvantages of CNC machines over conventional machines. Schematic diagram of CNC system. Axes convention. Working of parts explained using multimedia CNC teach ware. Parts shown on machine.
02.	CNC part programming with simple exercises and various programming codes. Practice on CNC machine simulator.	Programming – sequence, formats, different codes, canned cycles. Absolute and incremental programming. Tool nose radius compensation (G41/42). Cutting tool materials, cutting tool geometry – insert types, holder types, insert cutting edge geometry. Cutting parameters - cutting speed, feed rate, depth of cut. Process planning, tool selection and cutting parameters selection. Explained using multimedia CNC teachware and CNC machine simulator.
03-04	CNC machining center operation in various modes: jog, single block, auto, MDI, edit, etc. Program entry. Setting of tool offsets, entry of tool radius. Practice on CNC machine simulator.	Program execution in different modes like single block, manual and auto. Tool and work offsets setting. Prepare various programs as per drawing. Concepts taught using multimedia CNC teach ware.
05-06	Program and cut parts on CNC machining center with face milling, contour milling with tool radius compensation, pocket milling, drilling, peck drilling, countersinking, tapping operations using canned cycles for hole operations. First 80 % of the practice is on CNC machine simulator, followed by 20 % on machine.	Surface finish. Surface roughness related BIS symbols
07.	Prepare different types of documentation as per industrial need by different methods of recording information	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
08-09	Milling cylindrical cutter.	Spiral introduction, type and elements. Difference between helix & spiral. Difference between R.H. and L.H. helix

10-11	Milling end mill/drum cam.	Spiral-lead, helix angle and calculation. Cam Introduction development and use.
12	Cutting face cam.	Use of proper cutting speed and feed for various metals. Calculation for the machining time, machining allowances. Lubricant/coolants and various ways of their application.
13.	Cutting a plate cam with angular setting	Cam-lobe, lead setting of dividing head, Calculation.
14.	Milling gears by differential indexing, Measuring the teeth with a vernier gear tooth caliper.	Vernier gear tooth caliper, its construction and application in checking gear tooth.
15.	Milling spline (external) Milling straight fluted Reamer.	Introduction to broaching methods of milling splines. Its calculations and selection of cutters.
16.	Milling a helical groove in a vertical milling machine. Milling a slab mill cutter. Milling twist drill.	Spiral milling lead, pitch, helix angle R.H. and L.H. swiveling the table in relation to the helix angle, selection of cutter for spiral milling. Calculations for spiral milling.
17.	Milling a drum cam. Milling a plate cam.	Cam-types, application in modern m/c. tools, its special advantages, manufacturing process, calculation for milling a drum cam.
18.	Milling helical gears. Cutting bevel gears on a milling machine by using bevel gear cutter.	Helical gear introduction elements and calculation. Introduction geometry and uses of bevel gears. Quality control types of variation, causes of variation, measurement of testing, gear & error.
19.	Milling a rack. Milling face cam.	Introduction to rack, its use & application. Rack cutting attachment, calculation for linear pitch, circular pitch, Gear ratio, Indexing movement, etc
20.	Cutting worm and worm wheel on a milling machine, gashing and finishing.	Introduction, geometry and use of worm and worm wheel.
21.	Cutting graduations on a steel rule on milling machine. Use of tolly cutter.	-do-
22-23	Implant training / Project work (work in a team)	
24-25	Revision	
26	Examination	

TRADE: MACHINIST

LIST OF TOOLS & EQUIPMENTS

A : TRAINEES TOOL KIT:-

Sl. No.	Description	Qty.
1	Steel rule 30 cm graduated both in English & Metric units	16 nos.
2	Outside spring caliper 150 mm	8 nos.
3	Inside spring caliper 150 mm	8 nos.
4	Hermaphrodite caliper 150 mm	8 nos.
5	Divider spring 150 mm	8 nos.
6	Centre Punch 100 mm	8 nos.
7	Hammer B.P. 0.5 kg.	16 nos.
8	Cold chisel flat 25 x 200 mm	16 nos.
9	File flat bastard 300 mm	16 nos.
10	File flat 2 nd cut 250 mm	16 nos.
11	File flat smooth 200 mm	16 nos.
12	Engineers screw driver	16 nos.
13	Combination Plier 150 mm	16 nos.
14	Safety glasses	16 nos.

B: Tools, Instruments and General Shop Out fits

Sl. No.	Description	Quantity
15	Surface plate 400 mm x 400mm grade	1 no.
16	Table for surface plate 900 x 900 x 1200 mm	1 no.
17	Marking off table 1200 x 1200 x 900 mm high	1 no.
18	Scribing block universal 300 mm	2 nos.
19	V- Block 100/7 – 80 – A	2 nos.
20	Try square 300 mm	2 nos.
21	Outside spring caliper 200 mm	2 nos.
22	Divider spring 200 mm	2 nos.
23	Inside spring caliper 200 mm	2 no.
24	Straight edge steel 1 meter	1 no.
25	Straight edge steel 500 mm	1 no.
26	Steel tape 2 meter in case	1 no

27	Steel rule 60 cm graduated both in English & Metric units	2 nos.
28	Sprit level 2V 250, 05 meter	1no
29	Hammer B.P. 800 gms. With handle	4 nos.
30	Screw driver, heavy duty 300 mm with handle	4 nos.
31	Hammer lead 1 kg.	2 nos.
32	Spindle blade screw driver 100 mm	4 nos.
33	Allen Hexagonal keys 2.5 to 12	2 sets
34	Spanner D.E. series 2 (set of 7 pieces)	6 sets
35	Adjustable spanner 300 mm	2 nos.
36	Reduction sleeve Morse 1-1, 3-1, 4-1, 4-2, 5-1, 5-2, 6-1,	2 nos. each
37	Angle plate size 200 x 100 x 200 mm	2 nos.
38	Angle plate adjustable 250 x 150 x 175 mm	2 nos.
39	Solid parallels in pairs (different sizes) in Metric	12 pairs (assorted)
40	Oil Can pressure feed 500 mg.	6nos
41	Oil stone 150 x 50 x 25 mm	2nos
42	Number drills H.S.S. (parallel shank)	1set
43	Twist drills 3 mm to 13 mm in step of 0.5 mm (parallel shank)	2set
44	Drill Chuck 0.20 with taper shank	1no
45	Centre drill A 1 to 5	2set
46	Grinding wheel dresser (diamond)	1no
47	Grinding wheel dresser Huntington type	2 nos.
48	Clamps C 100 mm	2nos
49	Clamps C 200 mm	2nos
50	Tap and Die set in box metric pitch (6 mm to 12 mm)	1set
51	Drill H.S.S. taper shank (6 mm to 12 mm in step of 0.5 mm)	2set
52	File flat 2 nd cut 250 mm	4nos
53	File flat smooth 200 mm	4nos
54	File Half round 2 nd cut 250 mm	4nos
55	File triangular smooth 200 mm	4nos
56	Needle file set	1no.
57	File square 2 nd cut 250 mm	4nos
58	Reamer 6 mm to 25 mm by 1 mm	1set
59	Reamer adjustable 10 mm to 15 mm by 75 mm	1set
60	Tool bits H.S.S. 6 mm square	1 Dozen
61	Tool bits H.S.S. 10 mm square	1 Dozen
62	Tool bits holder (Armstrong) L.H	4nos
63	Tool bits holder (Armstrong) R.H.	4nos
64	Assorted tools and bit holders for lathe, shaper, slotter & planner in different shapes and sizes	As required
65	Hacksaw frame adjustable 250-300 mm with blades	2nos

66	Table chuck 75 mm jaw swivel base	1no
67	Machine vice 200 mm swivel base	4nos
68	Machine vice 160 mm swivel base	2nos
69	Hand vice 50 mm jaw	2nos
70	Radius turning attachment	1no
71	Angle turning attachment	1no
72	Compound angle vice (standard sine)	1no
73	Universal vice 150 mm	1no
74	Universal table angle plate	1no
75	Shaper tool holder turret type	2nos
76	Base chuck for slotter	1no
77	shaper indexing center	1no
78	Knurling tools (set of 3) straight and diamond	1each
79	Plier cutting 200 mm	2nos
80	Carbide tipped tools of different sizes and shapes (throw away tips)	2sets
81	Hand hammer 1 kg. With handle	2nos

C : Milling Cutters

Sl No.	Name & Description of Cutters	Quantity
1	Cylindrical cutter 63 x 90 bore dia	3nos
2	Cylindrical cutter 80 x 90 bore dia.	3 nos
3	Side and face cutter dia 80 x 8	2 nos
4	Side and face cutter dia 160 x 10	3 nos
5	Side and face cutter dia 100 x 12	2 nos
6	Side and face cutter dia 160 x 16	2 nos
7	Side and face cutter dia 200 x 20	3 nos
8	Side and face cutter dia 100 x 10	2 nos
9	Equal angle cutter 45 ⁰ /100	2 nos
10	Equal angle cutter 60 ⁰ /100	2 nos
11	Equal angle cutter 90 ⁰ /100	2 nos
12	Double angle unequal cutter 50 x 12 x 55 ⁰	2 nos
13	Double angle unequal cutter 50 x 12 x 60 ⁰	2 nos
14	Double angle unequal cutter 50 x 12 x 70 ⁰	2 nos
15	Double angle unequal cutter 50 x 12 x 75 ⁰	1 no
16	Single angle cutter 63 x 18 x 45 ⁰ RH	1 no
17	Single angle cutter 63 x 18 x 45 ⁰ LH	1 no
18	Single angle cutter 63 x 18 x 60 ⁰ RH	1 no
19	Single angle cutter 63 x 18 x 60 ⁰ LH	1 no
20	Slitting Saw cutter Ø 75 x 3 X Ø 27 mm	2 nos.
21	Slitting Saw cutter Ø 100 x 6 X Ø 27 mm	2 nos.
22	Shell End Mill Ø 50 x 36 x Ø 22 (preferably inserted tip type)	2 nos.
23	Shell End Mill Ø 75 mm x 50 x Ø 22 (preferably inserted tip type)	2 nos.
24	Parallel shank end mills Ø6, Ø10 and Ø 16 are (double fluted), Ø 20 mm & Ø 25mm (four fluted)	4 nos. each
25	'T' slot cutter with parallel shank- Ø 17.5 x 8 mm width x dia. of shank 8 mm	2 nos.
26	Concave Milling cutter Ø 63 x 6 radius x Ø 27 mm	1 nos.
27	Convex Milling cutter Ø 63 x 6 radius x Ø 27 mm	1 nos.
28	Disc type form milling cutter (involute form -2 module, 20° pressure angle)	1 set

D : MEASURING INSTRUMENTS

Sl. No.	Name & Description of Instruments	Quantity
1	Micrometer outside 0-25 mm	4 nos
2	Micrometer outside 25-50 mm	2 no
3	Micrometer outside 50-75 mm	1 no
4	Micrometer depth gauge 0-200 mm	1no
5	Digital micrometer 0-25 mm	1 no
6	Direct reading vernier caliper 0- 300 (direct reading with dial)	1no
7	Digital vernier caliper 0- 300 mm	1 no
8	Vernier height gauge 250 mm	1 no
9	Vernier gear tooth caliper	1no
10	Combination set with 300 mm rule	2 sets
11	Vernier bevel protractor with 150 m blade	1 no
12	Bevel gauge 200 mm	1 no
13	Telescopic gauge 13 mm to 300 mm	1set
14	Sine Bar 200 mm	1 no
15	Dial test indicator with magnetic gauge type 1 grade A with magnetic base	1 no
16	Center gauge 60 ⁰	1 no
17	Slip gauge set (normal set) metric (for the whole institute)	1 set
18	Screw pitch for metric pitches (25-6 mm)	2 sets
19	Radius gauge metric set (1-6 mm)	1 set
20	Limit plug gauges 5 mm to 25 mm by 2.5 mm	1 set
21	Ring gauges 5 mm to 25 m by 2.5 mm (GO & NO GO)	1 set
22	Taper gauge M.T. No. 1, 2, 3, 4 & 5	1 set
23	Feeler gauge	1 no
24	Planer gauge standard size	1 no
25	Magnifying glass 75 mm	2nos

E : FURNITURE

Sl. No.	Name & Description	Quantity
1	Steel lockers for 12 trainees	1 no
2	Steel chair for Instructor	1 no
3	Steel table for Instructor	1 no
4	Work bench for Fitters with 2 vices of 100 mm jaw	1no
5	Steel cup board 180 x 90 x 45 mm	1 no
6	Steel cup board 120 x 60 x 45 cm	1no
7	Black board with easel	1 no
8	First Aid Box	1 no

F : General Machinery Shop outfit

Sl. No.	Name & Description of Machine	Quantity
1	Shaping machine 450 mm stroke (motorized) with all attachments	2 nos.
2	Shaping machine 315 mm stroke (hydraulic) with all attachments	1 no
3	Double column planer 1500 x 1000 x 1000 (motorized) with all attachments	1no
4	Slotter 180 mm stroke (motorized) with all attachments	1no
5	SS and SC centre lathe (all geared) with specification as: Centre height 150 mm and centre distance 1000 mm along with 4 jaw chuck, Taper turning attachment, steadies, auto feed system, safety guard, motorized coolant system, with lighting arrangement and set of lathe tools.	3 nos.
6	Tool and cutter grinder 250 mm to admit 450 m between center-fully motorized work head supplied with tool rest of different types table clamps and other attachments.	1 no
7	Pillar Drill machine 20 mm capacity with drill chuck & key.	1 no
8	Radial drill 1200 mm area motorized with tapping attachment	1no
9	Silicon carbide grinder for carbide tipped tools	1 no.
10	Double ended Pedestal Grinder with 178 mm wheels(one fine and one rough wheel)	1 no.
11	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 nos.

12	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.	1 no
13	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 along with 150mm universal vice.	1 no
14	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.	1 no
15	Cylindrical grinder Max. grinding length 300 mm Height of centre 130 mm Max. distance between centers 340 mm	1 no
@16	CNC Milling Machine/Vertical 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) with popular control system like Fanuc/Siemens or equivalent along with motorized coolant system.	1 No.
@17	a) Multimedia based simulator 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) b) Desktop with MS-Windows-7 or latest to run above software, networked on LAN.	a) 11 users. b) 11 nos.
18	CNC milling tools assorted such as adapters to suit above machine to accommodate face cutter, shell end mill cutter, taper shank and parallel shank drills/cutters.	2 sets along with cutters & inserts.
19	CNC hole machining tools assorted such as adapters to suit above machine to accommodate different boring bars.	2 sets along with cutters
20	LCD projector / large screen TV	1 no.

NOTE

1. No additional items are required to be provided to the batch working in the second and third shift except the items under trainee's lockers.
2. (@)-Only one number need be provided in each I.T.I. irrespective of No. of Units.
3. Training should be imparted on forging heat treatment by utilizing the existing facilities where-ever available.
4. Institute having centralized computer lab may use the existing infrastructure to impart simulation training & in that case not required to procure item no. 17 b

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