SYLLABUS OF SEMESTER SYSTEM FOR THE TRADE OF

"MACHINIST (GRINDER)"

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 (GRINDER)**

2. **N.C.O. Code No** : 836.10, 836.25, 836.35, 836.36, 836.40, 836.55

3. **Duration of Craftsmen Training** : Two years (Four semesters each of six months duration).

4. **Power norms** : 23.4 KW

5. **Space norms** : 102Sq.mt.

6. **Entry Qualification** : Passed 10^{th} 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 (Grinder)" 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 (Grinder) trade.

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
40 Hours	25 Hours	6 Hours	2 Hours	3 Hours	2 Hours	2 Hours

COURSE INFORMATION

1. Introduction:

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

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 can work in the industry as semiskilled machinist Grinder.
2-The trainee can work in basic fitting and operation in lathe, drilling, surface grinding, cylindrical grinding, centre less grinding and tool and cutter grinding.
3- The trainee can work in CNC operating and programming.

11-Employment opportunities:

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

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

3. 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 (GRINDER)"

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

Week No.	Trade Practical	Trade Theory
1.	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. **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.	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.
2.	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, hacksawing to given dimensions, sawing different types of metals of different sections. **Practical on marking, punching and rough grinding on pedestal grinder.**	-Description of hand tools, Safety precautions, care and maintenance and material from which they are made. -Ferrous and nonferrous metal and their identification by different methods. **Application and use of pedestal grinder.**
3.	Grinding of Chisels, Hack sawing, Measuring different types of jobs by steel rule caliper etc.	Theory of Semi precision instruments.
4.	Drilling, reaming, tapping and threading with dies and use of coolants.	Relation between drill & tap sizes, care of taps and dies and their correct use. Types, properties and selection of coolants and lubricants.
5.	Drilling different sizes of holes by hand and machine. Use of screw drivers, spanners, pliers etc. simple fitting.	Brief description of drilling machine use and care.
6&7	Filling practice, simple fitting.	Heat treatment of metals, its importance, various methods of heat treatment such as hardening, tempering, normalizing, annealing etc.
8.	Centre lathe and parts, setting of jobs and tools grinding of lathe tools of various angles.	Brief description of a Centre lathe, its use.
9.	Parallel turning, taper turning and boring. Using	Lathe tools and their uses taper and its types

	compound rest and TT attachment.	and problems on taper. Taper turning methods and calculations. i.e. Form tool, TT attachment, Compound rest etc.
10.	Simple screw cutting (External and Internal)	Method of screw cutting simple calculation. Tap size drill size & vice versa.
11.	Simple plain turning	Thread and its element types.
12.	Safety rule on shop floor maintenance and control of grinding machines oiling cleaning etc.	Introduction to Grinding trade and machine safety precautions according to IS: 1991-1962.
13.	Measurement of different types of job by steel rule, caliper etc. Taper by angular protractor.	General measuring tools (used in grinding shop) their description, use care and maintenance.
14.	Setting grinding wheel on wheel flange, truing and balancing of wheels. Dressing of grinding wheel	General dressing tools used in grinding section such as wheel, diamond dresser, steel type dresser, abrasive dresser and nonferrous dresser.
15.	Checking measuring various types of jobs using micrometers, Vernier caliper, Vernier Height gauge etc. Grinding practice on cylindrical grinding machine.	Precision instruments English and metric micrometer, vernier caliper, dial test indicator etc. their description and uses.
16.	Grinding practice on surface and cylindrical grinding machine (Grinding should be performed both on soft and hardened materials). Checking dimension by Vernier height gauge.	Principle and value of grinding in finishing process, various types of grinding wheels their construction and characteristic glazed and loaded wheels.
17.	Grinding practice on surface and cylindrical grinding machine. Grinding parallel block and plain mandrel to size.	-do-
18-19.	Rough and finish grinding of surface and cylindrical job according to drawings. Include diamond and CBN	Different types of abrasive, manufacture of grinding wheels, their grades.
20.	Demonstration on selection of grinding wheels for grinding different metals, selection of suitable wheel to obtain rough and IS: 1249-1958.	Factors effecting selection of wheels, identification of wheel, marking system of grinding wheels IS: 551- 1966.
21.	Grinding different metals with suitable grinding wheels.	Grit and different types of bonds, such as vitrified, resinoid, rubber etc. Different types of metals and electroplated bond.
22.	Externals and internal grinding operation, changing the wheel speed, obtain recommended wheel and controlling depth. Grinding sockets, morse taper and checking depth by depth gauge micrometer. Grinding External sleeve.	Grinding wheel speed, surface speed per minute conversion of peripheral speed to r.p.m. Depth of cut and range at usefulness. Depth micrometer and vernier caliper. Common types of surface grinding machine, plain surface, rotary surface, horizontal and vertical surface grinder etc. Method of grinding tapers.
23-25	**Revision**	
26	**Examination**	

SYLLABUS FOR THE TRADE OF"MACHINIST (GRINDER)"

Second Semester
(Semester Code no. MCG - 02)
Duration : Six Month

Week No.	Trade Practical	Trade Theory
1	Introduction Training- Revision of previous works. Machine setting for automatic movements and parallel grinding on cylindrical grinder.	Introduction Training- Revision of previous works. Common types of grinding machines. Plain cylindrical external and internal cylindrical grinder and universal grinder.
2	Testing and mounting wheels sleeves, truing and rebalancing and grinding parallel mandrel.	Test for alignment and checking, balancing at wheel, dressing different types of wheel, dressers, their description and uses.
3	Wheel balance and dressing grinding long bar using steady rest.	Test for alignment and checking, balancing of wheel, dressing different types of wheel, dressers their description and uses.
4	Grinding different types of jobs using machine chuck, face angle plate collets.	Holding devices such as Magnetic chuck, chucks and face plates collets their description and uses. Method of holding jobs on magnetic chuck, face plate and chucks.
5	Table alignment with the help of test bar and dial test indicator parallel grinding and taper grinding (by swiveling machine table)	External grinding operational steps in external grinding of a job and precautions to be taken.
6	Grinding of eccentric job and different types of jobs using jigs and fixtures angle plates.	Holding devices such as jig and fixture angle plates 'V' blocks etc. their description and uses.
7	Grinding of job by using face plate angle plate etc.	Internal grinding operational steps in internal grinding of a job precautions to be taken.
8	Grinding of plain/slot milling cutter.	Milling cutters and its nomenclature.
9	- do -	Grinding of bushes and cylinders steps and precautions to be taken.
10	Grinding bushes on mandrel within the close tolerance limits.	Rough and finish grinding limit fit and tolerances as per ISI: 919-1963. Basic size and its deviation, position of tolerances as per ISI: 919-1963. Basic size and its deviation, position of tolerance zones with respect of zero line. Fits different types clearance, interference and transition. Interchangeable system. Letter symbols for holes and shaft and fundamental deviation hole basis and shaft basis system.
11	Dry and wet grinding of different classes of metals such as cast iron, barzed carbide tip and different classes of steel.	Heat generated in grinding dry and wet grinding use of coolant, their composition and selection. Characteristic of coolant.
12	Grinding square block angle plate and angular block.	Grinding a square job grinding angular surface taker grinding by stane land taper and angle protractor.
13	Grinding practice on drills reamers and taps.	Methods of grinding of drills reamers and taps.

14	Grinding slitting saw and side and face milling cutter.	Methods of grinding of milling cutters such as slitting saws, side and face milling cutter etc.
15	Checking tapered or angular jobs with help of sine bar, Dial gauge.	Use of snap gauges, sine bar and slip gauges their description and uses. Polishing, lapping powder and emery clothes lapping flat surface.
16	Grinding milling cutter with straight flutes	Tools and cutter grinder their description, working principles, operations care and maintenance.
17	Grinding milling cutter with helical flutes	Special types of grinding machines and centreless grinders. Their description, working principles, operations, care and maintenance.
18	Grinding internal bore of cylindrical job and use of telescopic gauge.	Grinding defects vibration, chattering, glazing and loading their causes and remedies.
19	-Do-	Grinding different defects and remedies on its.
20	Grinding carbide tipped tools and gauges (rough and finish grinding using disc and diamond wheels)	Applications of diamond wheel in grinding and grinding of tipped tools.
21	Making simple utility jobs with surface and cylindrical grinders. Preventive maintenance of grinding machines.	Preventive maintenance and its necessity. Mode of frequency of lubrication. Preparation of Maintenance schedule, simple estimation, use of hand book and reference table.
22-23	**Implant training** / Project work (work in a team)	
24-25	**Revision**	
26	**Examination**	

SYLLABUS FOR THE TRADE OF"MACHINIST (GRINDER)"

Third Semester

(Semester Code no. MCG - 03)

Duration: Six Month

Week No.	Trade Practical	Trade Theory
01	Cylindrical and surfaces grinding practice (Maintaining parallelism) on both soft and hard metals.	Cylindrical grinding machine, its parts, use care and maintenance surface grinding machine-its parts use care and maintenance Universal cylindrical grinding machines parts description use, care and maintenance. Internal grinding machine and its parts their description, use care and maintenance.
02	Practice on tools and cutter grinding machine. Machine manipulation and control Mounting jobs on mandrel. Mounting of wheel and guards sharpening of lathe tools and drill on pedestal grinder etc.	Tool and cutter grinding machine-parts and accessories, description use, care and maintenance, pedestal grinder and bench grinder-their description and uses.
03	Grinding practice on plain flat surface with close tolerances	Dial test indicators marking block, height gauge and surface plate their description.
04	Grinding practice on angular surface like V block	Principle of vernier caliper, protractors, micrometers (O/S, I/S and depth) and other instruments having vernier graduations. Combination sets-their use care and maintenance.
05	Parallel block grinding on surface grinding machine within close limits. Plane cylindrical grinding practice to close limit with accuracy of h7.	Bonding materials their kinds description and uses. Grade and structure at grinding wheels. Brief about I.S.O. 9000. Importance of Quality.
06	Cylindrical bore grinding practice. Setting and turning of jobs on chucks and face plates.	Wheel marking system selection of wheels. Specification and types (shapes & size) of grinding wheels, diamond wheels and their uses.
07	Balancing and mounting of grinding wheel Rt. angle grinding practice on surface grinding machine.	Mounting of grinding wheels, grinding wheels, collets and mandrels, balancing of grinding wheels by different methods.
08	Wheels dressing for rough and finishing grinding. Grinding a cube to close limit.	Types of dresses-steel type, abrasive Diamond tool and rotary dresses abrasive bricks and sticks their description, use, care and maintenance.
09	Shoulder grinding practice on cylinder-grinding machine to close limit h7.	Dressing and truing of grinding wheels advantage of balancing, inspections and care of grinding wheels. Wheel storage.
10	Slot grinding practice on surface grinding machines to close limits H7. Finding of different faults while grinding-Cracks, blow holes, chatters.	Heat generated in grinding dry and wet grinding, use of coolants their composition and selection, limit, fit and tolerances as per ISI : 919-1963. Basic size and its deviation position of tolerance zone with respect to zero lines. Fits different types clearance, interference and transition Interchangeable system Letter symbols for holes and shafts and fundamental deviation hole basis and shaft basis systems.

11	Snap gauge grinding practice in close limit.	Gauges-feeler, taper gauge radius, plug, ring snap (fixed and adjustable) and slip their description use care and maintenance.
12	Grinding practice on cylindrical taper using standards ring gauges.	Inside micrometer depth gauge, special types of micrometers, universal dial test indicator their construction and function.
13	Grinding practice of ring gauge using plug gauge.	Special type of grinding machine centreless, thread crankshaft etc. their description, use care and maintenance.
14	Grinding long cylindrical using steady rest to close limit h6.	Essential mechanism of grinding machines, wheel is guards to IS: 1991-1962 machine guards etc. Process of cleaning and oiling at grinding machines (care and Maintenance) types of steady rests their description and use
15	Grinding thin plates using coolants to close limits h6.	Principle types of grinding fluids importance of uniform temperature, selection and use at grinding fluids, method of supplying grinding fluids.
16	Grinding practice on parallel and taper pins using chuck and collets-h6.	Types of holding devices methods of holding work, type of centres - holdong work between centres types of chucks and holding process in chucks.
17	Selection of grinding wheel and grinding practice on rectangular bar of non-ferrous metals.	Holding work on face plate, pneumatic chuck and magnetic chuck. Precautions to taken before grinding, peripheral of surface speed of grinding wheels, importance of constant wheel speeds, calculations at S.F.P.M.
18	Grinding practice on machine centre to close limit h6 or H6.	Calculation at R.P.M. and S.F.P.M. of grinding wheels calculation of work speed for cylindrical grinding speed and feeds for cylindrical grinding speed and feeds for internal grinding.
19	Facing and Chamfering practice.	Traverse and over run of traverse, width of wheel and depth of cut in different types of grinding achiness. Grinding allowance and time estimation. Rough and finish grinding process.
20	Step grinding practice on surface grinding machine to close limit h6 or H6.	Surface grinding methods of surface grinding by using periphery of grinding wheel and ring edge of grinding wheel. Types of surface grinding machines. Work finish, wheel selection holding of work.
21	V-block grinding practice.	Process of grinding angular surfaces. Grinding slots and grooves. Grinding "V" blocks. Recommended wheel speeds for surface grinding machines.
22-23	**Implant training** / Project work (work in a team)	
24-25	**Revision**	
26	**Examination**	

SYLLABUS FOR THE TRADE OF"MACHINIST (GRINDER)"

Fourth Semester

(Semester Code no. MCG - 04)

Duration : Six Month

Week No.	Trade Practical	Trade Theory
01.	Introduction to CNC machine operation like Jog, Reference Edit, MDI ,Auto Mode Prog. Call & Entry, Simulation, Tool off-set & Tool changing /Orientation.	Introduction to CNC Technology CNC M/c. principle advantages classification, drives, controls. Basic information on CNC machine & maintenance of CNC M/c. computer aided CNC Language.
02.	Angular from grinding practice.	Cylindrical-types of cylindrical grinding operation traverse method, plunge cut method and form grinding method. Alignment of head stock and tail stock.
03-	Grinding cylindrical steps with shoulder and chamfer.	Method of plain cylindrical surface grinding step-grinding and shoulder and face grinding.
04	Compound or double taper grinding practice on cylindrical grinder.	Method of grinding external and angle (simple) taper and steep. Taper double compound taper.
05.	Steep taper, grinding practice on lathe centre.	Use of universal head for angular grinding. Measuring and checking of taper and angles. Use of taper plug and ring gauges.
06	Morse taper-plug grinding metric tapers.	Taper and angle checking by using protractors, micrometer and rollers.
07	Taper grinding using sine bar D.T.I. and gauge blocks to close limit h6.	Use of sine bar and gauge block-taper checking by sine bar gauge block D.T.I. micrometer and rollers. Other out of round surfaces. Holding work with fixed steady rest.
08	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
09.	Grinding Taper up to close limit H6.Grinding lathe centre.	Centreless grinding process of holding job, and types of operations. Effect of setting work above and below wheel centre. Jig and fixture holding work by fixture and vice non-electric and magnetic chuck. Use of three jaw and two jaw steady rest
10.	Internal step grinding to close limit, ring gauge, grinding to close limit-H6. Grinding of single angle cutter.	Internal centreless grinding methods of holding jobs and processes of grinding. Selection of wheels. Internal grinding work movement and wheel movement. Rotation and reciprocation of job and wheel spindle, Internal grinding

		allowance, selection of wheels for internal grinding allowance, selection of wheels for internal grinding. Thread grinding method of holding jobs methods of grinding threads and thread calculation.
11.	Cylindrical slot grinding to close limit h5.	Thread grinding method of holding jobs method of grinding threads and thread calculation.
12.	Grinding of angular cutter by using work head.	Various types of thread grinding wheels and their selection. Types of dressers and process of process of dressing selection of coolants and their use.
13.	Lapping practice on flat surface. Lapping practice on cylindrical surface and buffing practice to close limits h5.	Laps and lapping material, types of laps lapping abrasives rotary diamond lap lapping lubricants lapping pressures wet and dry lapping. Hand lapping and machine lapping. Lapping flat surface lapping cylindrical surface polishing wheels polishing operations abrasive buffing wheels
14.	Sharpening tools and drills, sharpening scrapers and chisels.	Grinding boring tools shaping tools, slotting tools, tools planning and drills, grinding of scrapers, chisels and carbide tipped tools. Selection of wheels fluids etc. and methods of grinding.
15.	Grinding of spiral path.	Grinding defects and their corrections, inaccurate work out of round, out of parallel taper on and irregular marks spiral scratches, discoloured burnt surface etc.
16.	Form grinding radius angle, Grinding of concave & convex cutter.	Grinding defects and their correction. Waviness marks of surface, chatters-short close evenly spaced long and regularly spaced, marks in phase with vibration of floor, random marks, random waves etc. Glazing of wheel and loading of wheel.
17.	Slitting saw sharpening practice using tooth rest.	Cutter grinding necessity of sharpening. General method of sharpening milling cutters-clearance angles. Use of setting gauges. Sharpening methods of plain or key way cutters
18	Side and face milling cutter sharpening practice.	Method of indexing direction of wheel rotation, wheel dressing. Types of cutter grinding wheels and their selection. Types of tooth rests and their location. Grinding peripheral teeth on a side and face milling cutter use of indexing attachment.
19	Spiral milling cutter sharpening practice.	Calculation of clearance angle. Setting for cup wheels and straight wheels. Recommended clearance angles for different materials to be cut primary and secondary clearance width of lands.
20	Sharpening end mill cutter.	Sharpening of helical milling cutter using linear and angular setting methods. Sharpening shell end mill and angular cutters
21	Sharpening tap	Grinding flutes of form cutters, grinding taps, reamers, similar types of cutting tools, use of universal attachment. Hones and honing- Type of honing stones-their description and use. Amount and rate of stock removal. Adjustment for elementary honing condition, honing tolerances.
22-23	**In-plant training** / Project work (work in a team)	

24-25	**Revision**
26	**Examination**

TRADE: MACHINIST (GRINDER)

LIST OF TOOLS & EQUIPMENTS

A : TRAINEES TOOL KIT:-

Sl. No.	Description	Quantity
1.	Steel Rule 150mm (graduated both English and Metric).	16 Nos.
2.	Try Square Engineer 150mm	16 Nos.
3.	Outside Calipers (spring) 250mm	16 Nos.
4.	Inside Calipers (spring) 150 mm	16 Nos.
5.	Hammer Ball Peen with handle 0.50 kg.	16 Nos.
6.	Odd leg Caliper 150 mm	16 Nos.
7.	Scriber 150 x 3 mm	16 Nos.
8.	Plier 150 mm	16 Nos.
9.	Goggles (fiber plastic cup) safety glasses (interchangeable glasses)	16 Nos.

B : TOOLS, MEASURING INSTRUMENTS AND GENERAL SHOP OUTFIT :-

Sl. No.	Description	Quantity
M 1.	Hammer Copper 0.50 kg.	2 Nos.
M 2.	Hammer Engineers, Ball Peen 0.50 kg.	2 Nos.
M 3.	Scribing Block with adjustable Vertical spindle 225 mm 4 Angle Plate, adjustable (graduated in degrees) 150 x 150 x 150 mm	2 Nos.
M 4.	Blocks Vee 150 x 100 x 100 mm (fitted with clamps, hardened and ground)	2 Pairs.
M 5.	Blocks Vee (grooved and fitted with clamps) (Hardened and ground) 75 x 75 x 50 mm	2 Pairs.
M 6.	Block parallel, adjustable 150 mm long, 42 mm wide, 18 mm height (hardened and ground)	2 Pairs.
M 7.	Block, parallel, adjustable 100 mm long, 50 mm wide, 32 mm height (hardened and ground)	2 pairs.
8.	Calipers, Vernier 200 mm, inside and outside (graduated in inches and millimeters_	1 Each
9.	Calipers, Vernier, outside 300 mm (graduated in inches and millimeters)	4 Nos.
10.	C-clamps 50 mm, 100 mm and 150 mm	2 Each
M 11.	Oil can, Pressure delivery _1/4 point capacity	4 Nos.
M12.	Oil can Drip delivery (long spout) _ point capacity	4 Nos.
13.	Height Gauge (Metric and English graduated)	1 No.
14.	Combination set (consisting of 300 mm rule centre)	2 Nos.
15.	Comparator Gauge, complete with stand and brackets.	2 Nos.
16.	Chuck, Drill 12 mm cap. (Taper shank)	1 No.
17.	Chuck, Drill 16 mm capacity (Taper shank)	1 No.
18.	Dial Test Indicator complete with stand (universal type with magnetic base 1/100 mm)	2 Nos.
19.	Diamond, Wheel Dressing (single stone mounted)	4 Nos.
20	Files, Hand Flat, 200 mm smooth	8 Nos.
21.	Files, Hand Flat, 250 mm smooth	8 Nos.
22.	Files, 150 mm Half round smooth	8 Nos.
23.	Files, round Dead smooth 200 mm	4 Nos.

24.	Files, Triangular, Dead smooth 200 mm and 150 mm	2 Each
25.	Files, Triangular Dead smooth 150 mm	4 Nos.
A 26.	File Flat Rough 300 mm	4 Nos.
A 27.	File Flat 250 mm Second Cut	4 Nos.
A 28.	Chisel Cold Flat 18 mm	4 Nos.
A 29.	Chisel Cold Flat 12 mm	4 Nos.
30.	Feeler Gauge Metric Set	1 set
31.	Gauge Radius (Inside and Outside) (Metric)	2 Nos.
32.	Gauge, Slip (Metric) workshop grade	2 Sets
33	Sine Bar 100 mm and 150mm	1 Each
34.	Gauge, Telescopic 12 to 150 mm	2 Sets
35.	Gauge, Morse Taper, Plug Nos. 1,2,3,4	1 Each
36.	Gauge, Morse Taper, Ring Nos. 1,2,3,4	1 Each
37.	Glass, Magnifying 250 x 25 x 75 mm dia with handle	1 No.
38.	Hacksaw frame 200 to 300 mm adjustable	2 Nos.
M 39.	Keys, Allen 1 mm to 14 mm by 1 mm	4 sets
40.	Keys, Allen 3 to 12 mm, by 1.5 mm	1 Set
41.	Spirit Level, Engineers 25 mm precision	1 No.
42.	Micrometer outside 0 to 25 mm	3 nos.
43.	Micrometer outside 25 to 50 mm	2 nos.
44.	Micrometer outside 50 to 75 mm	1 no.
45.	Micrometer outside 75 to 100 mm	1 no.
46.	Internal Micrometer 25 to 150 mm with extension Rods.	1 no.
47.	Depth Gauge Micrometer with extension rods to 150 mm with 70 mm Base	1 no.
A 48.	Indicating Micrometer 0.25 mm range, graduation, 01" mm graduation of dial 0.001 mm range of dial + 0.02	1 No.
49	Oil Stone Carborandum, Coarse on one side and fine on the other 200 x 50 x 25 mm	2 Nos.
50	Oil Stone Carborandum, Coarse on one side and fine on other slip 100 x 12 mm triangular.	2 Nos.
51	Oil Stone Carborandum, Coarse on one side and fine on other slip 100 x 18 mm triangular	2 Nos.
52.	Try Square, Engineer's 100 mm blade	2 Nos.
53.	Straight Edge Engineer's 300 x 50 x 12 mm bevelled edge.	1 No.
54.	Screw Driver 200 mm blade	2 Nos.
55.	Screw Driver 300 mm blade	2 Nos.
56	Spanner D.E. open jaw 3 to 18 mm by 3 mm	2 Sets
57	Scraper Flat 25 x 200 mm with handle	2 Nos.
58	Scraper Half round 75 x 12 x 200 mm with handle	2 Nos.
59	Scraper Triangular 62 x 9 x 200 mm with handle	2 Nos.
60	Techometer with male and female rubber attachments (upto 0-10,000 RPM)	1 No.
61.	Table Chuck 75 mm Jaw Swivel Base 200 mm dia. 3 Jaw with bolting arrangement and graduated in degrees	1 No.
62.	Vices, Machine Plain 150 Jaws x 100 mm openings	2 Nos.
63.	Vices, Machine, Swivelling Base 150 mm x 100 mm	2 Nos.
64.	Universal Machine Vice 100 mm for Grinding	2 Nos.
65.	Wheel Dressers, Steel Type (Huntington) (Large)	2 Nos.
66.	Wheel Dressers, Steel (Huntington type Small)	3Nos.
67	Radius Truing Attachment for surface grinding machine	1No.
68	Radius Truing Attachment for cylindrical grinding machine.	1No.
69	Angle Truing Attachment for surface grinding machine.	1 No.
70	Demagnetizer Chuck	1 No.
M 71	Centre Punch 150 x 6 mm dia	4 Nos.
72	Reamer Adjustable 6 to 16 x 1.5 mm	1 Set
73.	Surface Plate 60 x 60 cms	1 No.

74.	Marking Table 90 x 60 x 90 cms	1 No.
A 75.	Hand Drill 6 mm	1 Set
A 76	Taps and Dies complete set in box (Metric)	1 Set
A 77	Taps and Dies set B.A.B.S.F.B.S.W. and American	1 Set
A 78.	Drill Twist (Straight Shank) 1/8" to 1/2" by 1/64"	1 Set
A 79.	Drill Twist (Metric) 3 mm to 12 mm, in step of 1 mm	1 Set
A 80.	Set of Sockets Morse taper (0-1, 1-2 and 2-3)	1 Set
A 81.	Drill Chuck 0 to 12 mm Morse Taper	1 No.
82.	Combination Drill (Centering)	2 Nos.
83.	Screw Pitch Gauge	2 Nos.
84.	Working Benches 340 x 120 x 75 cms with 4 bench vices, 125 mm jaw	1 No.
S 85.	Fire Extinguisher	1 No.
S 86.	Fire Buckets with stand	4 Nos.
87.	Steel lockers with 6 drawers	2 Nos.
88.	Metal Rack 180 x 150 x 45 cms	1 No.
89.	Desk	1 No.
90.	Stool	1 No.
91.	Black Board with Easel	1 No.
A 92.	Magnifying Glass with surface illuminator	1 No.
A 93.	CMTI surface finish standards (in Bakelite)	1 No.
A 94.	Adjustable Wrench 250 mm size	1 No.
A 95.	Hammer (Nylon face) 30 mm	4 Nos.
A 96.	Grease Gun	2 Nos.
A 97.	Magnetic V-Block with push button switch	1 Set
A 98.	Magnetic V-Block base for Dial Indicator 75 x 75 x 100 mm	2 Nos.
A 99.	Diamond Dresser Cluster type	2 Nos.
A 100.	Adjustable Parallel Clamps (Hardened and ground) 100 mm long	2 Pairs
101.	Granite Stone Surface Plate Grade A 600 x 500 x 1000 mm	1 No.
102.	Static balancing stand for grinding wheel	1 No.
103.	Soft Board for display 1.25 mm x 1.85 mm x 10 mm thick	1 No.
A 104.	Dial Test Indicator-Lever type-long point	2 Nos.
A 105.	Magnetic Stand Flexible type base 60 mm x 47.5 mm Magnetic Power 75 kg. ON-OFF Lever control	2 Nos.
A 106.	Cutter Clearance Gauge to Suit Clearance all cutter diameters angle 0"-30".	1 Set
M 107.	Glass Show Case for display of jobs 450 mm x 600 x 850mm	1 No.
Desirable:-		
1.	Shadeograph projector with diascopic and epidia scopic projection, magnification 50, 100, 200, rotary screen 1 minute accuracy and centering, attachment.	1 No.

C : GENERAL MACHINERY

Sl. No.	Description of Machinery	Quantity
S 1.	SS and SC centre lathe (all geared) with minimum specification as: centre height 150 mm and centre distance 750 mm along with 4 jaw chuck, self centering chuck, auto feed system, safety guard, motorized coolant system and lighting arrangement, set of lathe tools, lathe carriers.	2 Nos.
S 2.	Pillar Drill machine 0-12mm drill holding capacity with drill chuck & keys.	1 No.
S 3.	Cylindrical External Grinding Machine fully motorized with dressing arrangement and supplied with face plates and driving dogs, 3-jaw self centering chuck, 4- jaw independent chuck, tail stock assorted centres pump with tank 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) with minimum specification as: To accommodate 750mm job with centre height 150mm. Wheel diameter x Width = 300 x 25mm.	2 Nos.
S 4.	Grinding machine plain surface, wheel dia. 175 mm (or near) with reciprocating table having longitudinal table traverse 200 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.
S 5.	Grinding machine plain surface with horizontal and vertical spindle, reciprocating table having longitudinal table traverse fully motorized and supplied with set of spanners, necessary equipment, diamond tool holders for wheel sized 175 x 30 x 18 mm suitable cup wheels for vertical spindle, spare wheel proper guards and coolant pump with fittings.	2 Nos.
S 6.	Tool and cutter grinding machine of size 250 x 375 mm fully motorized supplied with chuck, centers tool rest, height gauge, table clamps universal vice tooth rest. Diamond dressing tool and holding attachment equipment for tool grinding and assorted grinding wheels for all tool room work (with twist drill grinding attachment).	2 Nos.
S 7.	Lapping machine with motor and chuck 132 cm dia.	1 No.

NOTE:-

(1) No additional items are required to be provided for the batches working in the second shift except the items under the trainees tool kit and lockers.

(2) Additional number of items marked 'S' are not required to be provided for additional number of batches.

(3) Items marked 'A' are to be obtained from the main store.

(4) The specifications of the items in the above list have been given in metric units. The items which are available in the market nearest to the specifications as mentioned above if not available as prescribed, should be produced. Measuring instruments such as steel rules which have graduation both in English and Metric units may be produced, if possible.

(5) Simple hand tools for fitting etc. such as hammers, scribing blocks, V block parallel block, angle plate Allen keys centre punch, oil cans etc. mentioned in the above list and marked 'M' may be made in the Institute as far as possible.

D : ADDITIONAL LIST OF TOOLS AND EQUIPMENTS REQUIRED FOR 3RD AND 4TH SEMESTERS

Sl. No.	Description	Quantity
1.	2.	3.
GENERAL MACHINERY		
1.	Grinding machine universal, machine to be motorized and supplied with assorted arbors spindles for internal work, 3-jaw self centering chuck, 4-jaw independent chuck face plate driving dogs, tail stock and centers, machine to be completed with all guards, sud and driving dogs, 3-jaw self centering chuck pump and tank, pipe fittings, diamond tool holder fixtures, radius dressing attachment and with spanners (internal and external) and general purpose grinding cylindrical magnetic chuck (permanent) 2,000 mm dia.	2 Nos.
2.	Small type hand honing machine with motors sand and bracket and with sets of different types of honing stones and other accessories.	1 nos.
3.	Lathe machine with taper turning attachment 4-jaw chuck and 3-jaw chuck.	1 no.

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 & 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
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