Syllabus for the subject

of

TRADE THEORY-I
&
TRADE PRACTICAL-I

Under

CRAFT INSTRUCTOR TRAINING SCHEME (CITS)

Trade: TURNER

Re-Designed in

– 2014 -

By

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

CONTENTS

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

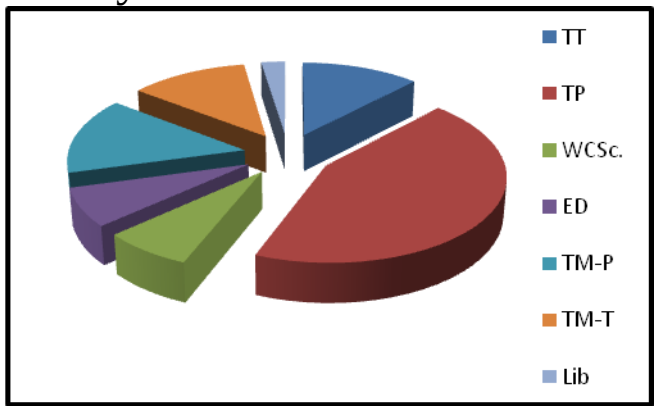
1. Name of the Course	:	**Craft Instructors' Training Scheme**
2. Duration of Instructor Training	:	1 Year (Two semesters each of six months duration).
3. Subjects covered in the Semesters	:	Detailed in Section - C
4. Name of the Subject	:	**TRADE THEORY –I& TRADE PRACTICAL-I**
5. Applicability	:	**TURNER**
6. Examination	:	AITT to be held at the end of each semester.
7. Space Norms	:	(a) One class room of minimum 30sq.m. area(@1.5 Sq. Mt. per trainee) having Minimum width of 5 m. and with 6000 lumen (b) Workshop: 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) 25 KW for Workshop.
9. Unit strength(Batch Size)	:	20
10. Entry qualification	:	Diploma/Degree in Mechanical/Production Engineering from AICTE recognized Board / University OR NTC/NAC in Turner 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 Turner 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: TURNER

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	05	Drilling & Tapping	50	20
2	Hand tools	12	10	Various types of Turning Operations	220	120
3	Precision measuring Instruments	12	10	Threading Operations	120	40
4	Drill & drilling Machines	12	10	Cutting Tool Grinding	50	20
5	Speed, Feed & cutting forces	16	05			
6	Turning operations & Tools	32	25			
7	Threads & its calculation	20	15			
8	Geometrical Tolerance	06	5			
9	Coolant & Lubricant	05	10			
10	Non conventional Machines	05	5			
	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: TURNER 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
01.	Introduction of First aid. Operation of electrical mains. Introduction of PPEs. Response to emergencies e.g.; power failure, fire, and system failure **Soft Skills:** its importance and Job area after completion of training. **Introduction to 5S** concept & its application. Importance of 5S implementation throughout CITS course-workplace cleaning, machine cleaning, signage, proper storage of equipment etc. **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. **Basic Life support (BLS):-** Basic Life Support (BLS) techniques for drowning, choking, electrocution, neck and spinal injury, including CPR (cardiopulmonary resuscitation).	**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. **Technical English:** Prepare different types of documentation as per industrial need by different methods of recording information. **Basic Life support training:** Be able to perform DRSABCD: D: Check for Danger R: Check for a Response S: Send for help A: Open the Airway

		B: Check for normal Breathing C: Perform CPR (Cardio Pulmonary Resuscitation) D: Attach Defibrillator / Monitor as soon as available.
02 & 03	Description about the common hand tools, holding device, marking tools , cutting tools used in shop floor their specification conforming to B.I.S Hammer- Introduction, types specification, material and uses. Hacksaw frame - its types, blade- its specification, material, colour code and uses. Bench vice- Introduction, its parts, specification, materials, Types and uses. Punch – its types, materials & uses. Scriber- Construction, & uses. Surface plate - Its necessity and uses. Files- elements, material, specification, description, types, cut, grade, shape & uses. Try Square- Materials, Parts, uses. Measuring Tools: Steel rule- its types, and units. Introduction about line measurement and end measurement.	Demonstrate about preventive maintenance points for the trade machines. Practice: marking, hack sawing, filling - maintaining parallel faces, right angle. Practice of matchining part filling.
04 & 05	Precision Measuring Instruments: Calculation of least count of vernier caliper, micrometer, bevel protector, its working principle, parts and construction. Measurement of components by vernier caliper, Vernier height gauge, micrometer, and bevel protector, sine bar and slip gauges. Sources of measuring errors and its correction on measured dimensions.	Measurement on different measuring instruments, total reading, Different types of errors and its remedies Care and maintenance of different precision measuring instruments
06	Concept of general- preventive maintenance of related trade machine tools & equipment. 5S – definition, components	Practice of cleaning, preventive maintenance of machines, tools. 5S practice.
07	Cutting edge geometry of turning tools-rake angle, relief angles, positive and negative rakes and their applications, cutting forces.	Practice on negative rake tool on non-ferrous metal.

	Cutting edge geometry of drills.	
08	Drilling Machine- Different types, Parts, uses & operations	Practice on power saw. Practice on drill grinding.
09	Twist drill- Nomenclature, Size, types, cutting angles, holding devices etc. Calculation of blank size for die threading.	Surface plate – use, installation and maintenance.
10	Lathe cutting tools- Introduction, Classification tool nomenclature etc. Cutting forces, cutting power. Machine spindle capacity, 15 minutes/ 30 minutes rating of spindle, speed-power curve, spindle torque	Tools grinding Practice Side Cutting tools Offset turning tools 3- Parting tools
11	. Cutting power for various operations, maximizing cutting power utilization. Sources of measuring errors. Calibration of measuring instruments. Tools setting in correct center height-effects of rake and clearance angle.	Practice on Lathe-dismantling & mounting of chuck. Practice on calibration of measuring instruments.
12	Coolant composition, preparation, health hazards. Geometrical accuracies of lathes, checking accuracies. Construction of reamers – cutting and holding geometries, types of materials – HSS, carbide. Deciding the bore size for reaming.	Checking geometrical accuracies of lathe. Turning job between centers.
13	Mounting and dismounting of Driving plate, faceplate, Steady rest and follower rest - Introduction, construction & uses. Lathe mandrel- its type & uses	Plain turning between centre with follower rest (long bar job), and setting practice to check centre axis alignment between machine spindle axis and tail stock axis
14 & 15	Taper- Necessity, different methods of expressing taper. Different standard tapers, methods of taper turning, important elements of taper. Principle of taper turning by compound slide swiveling method, its calculation, advantages & disadvantages. Taper turning by form tool, its method of turning. Advantages & disadvantage of taper turning by form tool. Principle of taper turning by tailstock setover method. Calculation for tailstock set over method. Advantages & disadvantage of taper	Taper turning practice by swiveling compound slide. Taper turning practice by Tail Checking of taper angle by bevel protector and sine bar. Eccentric marking using Vernier height gauge, job holding & Eccentric turning practice. Practice on Lathe - Ball Turning.

	turning by tailstock. Set over method Taper Turning attachment- Principle. Measurement of roundness, flatness, threads, surface roughness, profiles.	
16	Lathe operation Eccentric turning- Introduction, different methods and uses.	Practice of Crankshaft turning double throws.
17	Thread tolerance- grade, specification & application. Calculation of insert tilt angle to match helix angle in threading.	Practice on Screw thread cutting B.S.W external R/H and L/H. Checking of thread by using screw thread gauge.
18	Square thread- Construction and uses. Calculation involved- depth, core Dia, pitches, and module of Acme & Worm Thread.	Practice on Square threading and tool Grinding.
19.	Acme thread- Construction and uses. Calculation involved- depth, core Dia, pitches, and module of Acme & Worm Thread.	Practice on Acme threading and tool Grinding.
20	Influence of tool height on tool angle for lathe operation. Definition and calculation of Cutting speed, feed, depth of cut, and turning time for lathe operation.	Practice of boring, counter boring, grooving (external & internal) and radius (concave & convex) turning on lathe. Plain turning practice using solid mandrel.
21	Introduction to latest cutting tools, materials, their properties and applications. Geometrical tolerance, tolerance stacking.	Turning practice by using index able inserts.
22	Explain about- non –Conventional machining processes- EDM, ECM, USM etc.	Industrial visit - for Non-conventional machining process uses in Industries.
23	**Industrial visit & Submission of Report**	
24 - 26	**Revision & Trade Test**	

F. List of Tools & Equipment

Trade– TURNER

Under CITS

For a batch of 20 Trainees

Semester-I

Hand Tools:-

SL.NO.	DESCRIPTION	Qty. Per Unit
1.	Hammer brass 500 gm with handle	10 nos.
2.	Screw Driver set	05 sets
3.	Spanner double ended -6mm to 32mm.	02 sets
4.	Spanner adjustable 200mm.	05 nos.
5.	Pliers long nose- 150mm side cutting.	02 nos.
6.	Pliers combination- size 8”	05 nos.
7.	Fire Extinguisher	02 nos.
8.	Buckets	04 nos.
9.	Safety goggles clear glass (Good Quality)	20 nos.
10.	Oil can ½ pint (pressure feed system)	10 nos.
11.	Lathe Mandrels (Different Types)	1 set
12.	Revolving Centre	10 nos.
13.	Angle Plate with slots 200mm	02 nos.
14.	Drill Drift	10 nos.
15.	Morse Taper Plug & Ring gauge MT-0 to MT-7	02 Set each

Marking & Measuring Tools:-

SL.NO.	DESCRIPTION	Qty. Per Unit
1.	Try Square-blade-150mm.	05 nos.
2.	Universal surface gauge- 250mm.	10 nos.
3.	Feeler Gauge-100mm blade.	02 nos.
4.	Radius Gauge 1 to 7mm, 7.5to 15 & 15 to 22mm.	05 each
5.	Combination centre gauge.	05 nos.
6.	Screw Pitch Gauge wit worth & Metric.	05 nos.
7.	Drill angle gauge.	02 nos.
8.	Plain Ring and Plug Gauge size- 20, 22, 24 and 25.	01 set
9.	Thread Plug Gauge M-24 & M-30	02 sets
10.	Thread Ring gauge M-24 and M-30	01 set
11.	Morse Taper Sleeves No. 0-1, 1-2, 2-3, 3-4, 4-5.	05 sets
12.	Angle Gauge for tool grinding	02 nos.
13.	Slip Gauge metric set -113	01 set
14.	Steel Rule- 300mm	10 nos.
15.	Combination set- 300mm	02 nos.
16.	Dial Vernier caliper – 200mm, Accuracy 0.05mm	02 nos.
17.	Scriber 150mm X 3mm.	02 nos.
18.	Prick punch 100mm	05 nos.
19.	Divider spring joint 150 mm.	05 nos.
20.	Centre punch 100mm.	02 nos.
21.	Granite Surface plate 60 x 60 cm.	05 nos.
22.	Marking table (CI) 120x120 cm.	01 no.
23.	Vee Block grade A 5 mm to 60 mm with Magnetic clamp.	02 nos.
24.	Universal Vernier Caliper-200mm.	10 nos.
25.	Vernier Height gauge with Dial-300mm,	01 no.

	Accuracy- 0.02mm	
26.	Magnifying glass Dia- 75 mm	02 nos.
27.	Outside Micrometer-0 to 25mm, Accuracy-0.01mm	05 nos.
28.	Three Point Internal Micrometer- Accuracy-.005mm	02 nos.
29.	Outside Micrometer- 25 to 50mm, Accuracy 0.01mm	05 nos.
30.	Outside Micrometer- 50 to 75mm, Accuracy 0.01mm	02 nos.
31.	Two Point Self Cantering Bore Dial Gauge-Accuracy- .01mm	02 nos.
32.	Digital Outside Micrometer - range 0-25mm (Accuracy 0.001mm)	02 nos.
33.	Inside Micrometer- 25 to50mm, Accuracy 0.01mm	02 nos.
34.	Inside Micrometer- 50 mm to 150 mm, Accuracy-0.01mm	02 nos.
35.	Vernier Bevel Protractor- 300 mm blade.	05 nos.
36.	Outside Vernier Micrometer- 0-25mm, Accuracy 0.001mm	02 nos.
37.	Outside Vernier Micrometer- 25-50mm, Accuracy 0.001mm	02 nos.
38.	Digital Vernier Caliper , Accuracy .01mm, size 200mm	02 nos.
39.	Screw Thread Micrometer interchangeable with anvils	02 nos.
40.	Dial Test Indicator 0.01 mm with Magnetic base both plunger and lever type	02 nos.
41.	Sine Bar with Centers – 200 mm	02 nos.
42.	Dial Vernier caliper – 200mm, Accuracy 0.05mm	02 nos.

Cutting Tools:-

SL.NO.	DESCRIPTION	Qty. Per Unit
1.	Chisel cold- flat 20x150	02 nos.
2.	Hacksaw fixed 200mm (Pistol grip)	10 nos.
3.	File flat 300mm rough	05 nos.
4.	File flat 250mm 2nd cut	05 nos.
5.	File flat mm smooth – 250mm	05 nos.
6.	File half round 250mm 2nd cut	05 nos.
7.	File half round 150 mm smooth.	05 nos.
8.	Twist Drill straight shank- 1 to 12 mm, step range 1mm	02 sets
9.	Drill Chuck with key- Cap. – 12mm	05 nos.
10.	Twist Drill Taper shank- 1 to 12 mm step range 0.5mm	02 sets
11.	Tap Wrench (Adjustable)	05 nos.
12.	Die stock different size	05 nos.
13.	Tap & Die Metric set 6mm to 25mm	02 sets
14.	Reamer machine straight flute-6 to 25mm in step of 1 mm	01 set
15.	Reamer Adjustable 10 to 20mm	01 set
16.	Hand Chaser M-12 & M-16 (External)	02 sets

17.	Hand Chaser M-12 & M-16 (Internal)	02 sets
18.	Combination Drill A-3 & A-5	05 sets
19.	Knurling tool revolving head	10 nos.
20.	Tool Holder RH & straight for 3/8" square tool bit	05 nos.
21.	Parting Tool Holder	05 nos.
22.	Boring Tool holder for 6mm sq. hole	05 nos.

LIST OF MACHINES, EQUIPMENTS & FURNITURES FOR THE TRADE TURNER

Sl. No	DESCRIPTION OF EQUIPMENTS	Qty
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.	08 nos.
2.	Lathe Tool Room 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.	02 nos.
3.	Grinding Machine Pedestal Types D.E. with wheel guard and flanges.	02 nos.
4.	Drilling Machine pillar type- motorized up -12-mm. cap.	01 no.
5.	Power saw machine- hydraulic type (24" blade size)	01 no.
6.	Steel Cupboard with 8 pigeon lockers	03 nos.
7.	Work bench for fitters with two vices of 100mm	02 nos.
8.	Steel cupboard 180x90x45cm	02 nos.
9.	Steel cupboard 120x60x45cm	02 nos.
10.	Test mandrel/test bar-400mm	01 no.
11.	First aid box.	01 no.
12.	Equipment for conducting BLS (Basic Life Support) training. (Optional)	1 set

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Syllabus for the subject

of

TRADE THEORY-II
&
TRADE PRACTICAL-II

Under

CRAFT INSTRUCTOR TRAINING SCHEME (CITS)

Trade: Turner

Re-Designed in

– 2014 -

By

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

G. GENERAL INFORMATION

1. Name of the Course	:	Craft Instructors' Training Scheme
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	:	**TURNER 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.)** (c) Computer lab: 30 sq.m area*
8. Power Norms	:	(a) 1 KW for Class room (b) 30 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 Turner trade.

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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: TURNER

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	Engg. Materials & alloys	06	08	Turning Operations	230	140
2	Heat treatment	4	06	Tool Grinding	52	20
3	Turning operation	15	15	C.N.C programming & simulation	70	40
4	Gauges & precision measuring instruments	12	10			
5	Quality Control	4	05			
6	Jigs & Fixtures	4	10			
7	Grinding	4	5			
8	Limits, Fits & Tolerance	5	10			
9	Tool materials & angles	4	5			
10	CNC	20	15			
11	Power Transmission	4	04			
12	Capstan & Turret Lathe	6	07			
13	**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: TURNER 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	Theory	Practical
01.	Introduction of Engineering Materials- Importance, classification. Difference Between Metal and Non-metals. Common metals and Non-metals. Specification of steel sections as per BIS (such as square, hexagon, flat, angle, channel, round etc. Steel standards, introduction to Indian and international standards –BIS, DIN, EN, JIS, AISI.	Demonstration- Identification of different steel sections as per BIS. Practice – for given steel standards, finding equivalent standards in various international standards.
02.	Metals and Alloys- Classification of Metals. Difference Between Ferrous and Non-ferrous Metals. Properties of metals that influence machinability – hardness, toughness, tensile strength, yield strength.	Practice on parting off with parting tools. Practice Grinding of various shape of chip breaker on tool.
03.	Types of Iron Ore such as- Magnetite, Hematite, Siderite, Production of Iron. Type of Irons and alloys. Heat treatment of steels- Introduction, Definition and Objects of Heat Treatment, Heat-Treatment Processes – Annealing, Normalizing, Tempering, Hardening, Iron-Carbon diagram, martensite, austenite Machinability classification in cutting tool catalogs – P,M,K,N,S,H.	Form turning practice (by offhand)
04.	Multi-start Threads- It's Function different methods, uses ,difference between pitch & lead, Formulate to find out start, Pitch and lead. Gear ratio etc.	Practice on Multi-start thread cutting (LH/RH).
05.	Cutting speed, feed, Machining time and depth of cut-calculation.	Practice on Turning at high speed using Tungsten carbide tools including throwaway tips/ indexable inserts.

06.	Insert-type tools – holder construction, clamping types, for turning, boring, external grooving, internal grooving, drilling tools. Insert materials, insert shapes. Power saw- its function and uses.	Identify, assemble, disassemble insert type tools.
07.	Introduction to Pedestal Grinder- its parts & applications. Selection of grinding for different applications and work piece materials. Dial Test Indicator applications like measurement of parallelism, concentricity.	Practice on Balancing, Truing, Mounting and Dressing of grinding wheel and adjustment of tool rest.
08.	Different types of attachments used on lathe- Introduction to Copying, Relieving, Grinding, Milling & Taper turning attachments.	Taper turning by taper turning attachment (Taper matching).
09.	Measuring instruments such as – Screw pitch gauge, Screw thread Micrometer and Toolmaker microscope etc. Tool Maker's button- Construction & uses. Inside Micrometer- Principle, Construction, Graduation, reading, uses etc. (metric & British system).	Practice on lathe Thread cutting on non-ferrous Metal-Copper/aluminum/brass etc. Advanced eccentric boring practice. Practice on Boring and stepped boring (with in +/-0.05mm).
10.	Limit Gauges- Introduction, Construction, different types and uses. Sine Bar- Introduction, constructions and uses. Slip Gauge- Introduction, types and uses. Checking taper with Sine Bar and Roller- Calculation involved.	Shop floor demonstration on limit gauges. Practice on using sine bar, slip gauges.
11.	Power Transmission- types like belt, rope, chain gear drives. Material used for belts. Types of belts drive, open belt drive, crossed belt drive. Stepped or cone pulley drive. Velocity ratio- open belt drive, Compound belt drive. Length – Open belt, cross belts.	Practice on belt mounting, checking, alignment.
12.	Jig and fixture- definition, different, types and uses.	Shop floor demonstration Identification of Jig, Fixtures & their parts
13.	Digital outside Micrometer- Applications, Construction,	

	reading. Dial Caliper- Applications, Construction and reading.	Practice on measurement with Digital outside Micrometer and dial caliper.
14.	Limit, Fit-and tolerance as per B.I.S: 919, Unilateral and bilateral system of limit, Fits-different types, symbols for holes and shafts. Holes basis & Shaft basis etc. Representation of tolerance in drawing.	V-Thread fitting
15.	Production type lathes - Capstan & turret lathe, Multi - spindle Automat etc. Capstan lathes its main parts, tools function and uses. Bearing- Introduction, construction types and uses. Comparator gauge- Introduction about Mechanical, Electrical/ Electric and optical comparator.	Shop floor demonstration on types of bearing.
16.	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. charts. Total Quality Management (TQM). Machine capability studies	An assembly job preparation combining different machining operations. Practice on SQC – determine sample size, quality for a batch of actual parts of any type.
17 & 18.	Introduction to N.C. & C.N.C. and its comparison Advantages of C.N.C. machine over NC machine. Constructional feature and different parts. General flow of operation of CNC machine tool. Fundamental of part programming : Axis designation , Coordinate system, Machine zero, work piece zero, reference Zero. G-Codes & M-Codes, Feed function, Spindle Speed function, Work Offset, and Tool Offset.	Identifications of different parts & different drives of CNC Lathe machine. Create manual part Programming from part drawing, and simple job preparation on CNC. Part - programming, and its simulation.
19.	**CNC turning** Geometrical accuracies of machine, positioning accuracy, repeatability. Cutting parameters - cutting speed, constant cutting speed,	Make the process sequence and select the appropriate tools for a sample part with various operations. From any manufacturer's tool catalog (hard copy/soft copy from the maufacturer's web site), determine holder,

	limiting spindle speed, feed rate, depth of cut. Productivity, cycle time, machine hour rate, Constant cutting speed in turning, Limiting spindle speed. ISO nomenclature for inserts, turning and boring tools. Insert grades, coatings, chip breaker geometry. Holder, Inserts, grade, chip breaker and cutting parameters selection from manufacturers' tool catalogs. Tool wear, Types of tool wear, tool life.	insert, insert grade, chip breaker geometry, cutting parameters (cutting speed, feed rate, depth of cut) for a specified workpiece material. Tool manufacturer can be any popular make like Taegutec, Sandvik, Kennametal, etc.
20.	Threading using constant area and constant depth of cut. Multi-start threading. Tool nose radius compensation. Understanding and troubleshooting machining problems – improper chip breaking, built-up edge, poor surface finish, chatter, work hardening, profile inaccuracies. Programming using CAM software.	Manual programming using contour programming commands, of a part with various operations including chamfers and radii, threading. Use canned cycles, nose radius compensation. Program a part using CAM software - part with various operations including multi-start threading.
21 & 22	CNC programming on lathe and tool setting. Tool pre setting	Programming on computer and simulation Tool pre setting on pre setter
23	**Industrial visit & Submission of Report**	
24 - 26	**Revision & Trade Test**	

J. List of Tools & Equipment

Trade – TURNER

Under CITS

For a batch of 20 Trainees

Semester-II

Hand Tools:

Sl NO.	DESCRIPTION	Qty. Per Unit
1.	Hammer brass 500 gm with handle	02 nos.
2.	Screw Driver set	05 sets
3.	Spanner double ended -6mm to 32mm.	02 sets
4.	Spanner adjustable 200mm.	05 nos.
5.	Pliers long nose- 150mm side cutting.	02 nos.
6.	Pliers combination- size 8”	05 nos.
7.	Fire Extinguisher	02 nos.
8.	Buckets	04 nos.
9.	Safety goggles clear glass (Good Quality)	20 nos.
10.	Oil can ½ pint (pressure feed system)	10 nos.
11.	Lathe Mandrels (Different Types)	1 Set
12.	Revolving Centre	10 nos.
13.	Angle Plate with slots 200mm	02 nos.
14.	Drill Drift	10 nos.
15.	Morse Taper Plug & Ring gauge MT-0 to MT-7	2 Sets each

Marking & Measuring Tools:

SL.NO.	DESCRIPTION	Quantity Per Unit
1.	Try Square-blade-150mm.	05 nos.
2.	Universal surface gauge- 250mm.	10 nos.
3.	Feeler Gauge-100mm blade.	02 nos.
4.	Radius Gauge 1 to 7mm, 7.5to 15 & 15 to 22mm.	05 each
5.	Combination centre gauge.	05 nos.
6.	Screw Pitch Gauge wit worth & Metric.	05 nos.
7.	Drill angle gauge.	02 nos.
8.	Plain Ring and Plug Gauge size- 12, 15, 16, 18, 20, 22, 24 and 25.	01 set
9.	Thread Plug Gauge M-20 & M-24	01 set
10.	Thread Ring gauge M-20 and M-24	01 set
11.	Morse Taper Sleeves No. 0-1, 1-2, 2-3, 3-4, 4-5.	05 set
12.	Angle Gauge for tool grinding	02 nos.
13.	Slip Gauge metric set -113	01 set
14.	Steel Rule- 300mm	10 nos.
15.	Combination set- 300mm	02 nos.
16.	Dial Vernier caliper – 200mm, Accuracy 0.05mm	02 nos.
17.	Scriber 150mm X 3mm.	02 nos.
18.	Prick punch 100mm	02 nos.
19.	Divider spring joint 150 mm.	05 nos.
20.	Centre punch 100mm.	02 nos.
21.	Granite Surface plate 60 x 60 cm.	01 no.
22.	Marking table (CI) 120x120 cm.	01 no.
23.	Vee Block grade A 5 mm to 60 mm with Magnetic clamp.	02 nos.

24.	Universal Vernier Caliper-200mm.	10 nos.
25.	Vernier Height gauge with Dial-300mm, Accuracy- 0.02mm	01 no.
26.	Magnifying glass Dia- 75 mm	02 nos.
27.	Outside Micrometer-0 to 25mm, Accuracy-0.01mm	05 nos.
28.	Three Point Internal Micrometer- Accuracy- .005mm	02 nos.
29.	Outside Micrometer- 25 to 50mm, Accuracy 0.01mm	05 nos.
30.	Outside Micrometer- 50 to 75mm, Accuracy 0.01mm	02 nos.
31.	Two Point Self Cantering Bore Dial Gauge- Accuracy- .01mm	02 nos.
32.	Digital Outside Micrometer - Accuracy 0.001mm range 0-25mm	02 nos.
33.	Inside Micrometer- 25 to50mm, Accuracy 0.01mm	02 nos.
34.	Inside Micrometer- 50 mm to 150 mm, Accuracy- 0.01mm	02 nos.
35.	Vernier Bevel Protractor- 300 mm blade.	05 nos.
36.	Outside Vernier Micrometer- 0-25mm, Accuracy 0.001mm	02 nos.
37.	Outside Vernier Micrometer- 25-50mm, Accuracy 0.001mm	02 nos.
38.	Digital Vernier Caliper , Accuracy .01mm, size 200mm	02 nos.
39.	Screw Thread Micrometer interchangeable with anvils	02 nos.
40.	Dial Test Indicator 0.01 mm with Magnetic base both plunger and lever type	02 nos.
41.	Sine Bar with Centers – 200 mm	02 nos.
42.	Dial Vernier caliper – 200mm, Accuracy 0.05mm	02 nos.
Cutting Tools:		
SL.NO.	DESCRIPTION	Quantity Per Unit
1.	Chisel cold- flat 20x150	02 nos.
2.	Hacksaw fixed 200mm (Pistol grip)	05 nos.
3.	File flat 300mm rough	05 nos.
4.	File flat 250mm 2^{nd} cut	05 nos.
5.	File flat mm smooth – 250mm	05 nos.
6.	File half round 250mm 2^{nd} cut	05 nos.
7.	File half round 150 mm smooth.	05 nos.
8.	Twist Drill straight shank- 1 to 12 mm, step range 1mm	02 sets
9.	Drill Chuck with key- Cap. – 12mm	05 nos.
10.	Twist Drill Taper shank- 1 to 12 mm step range 0.5mm	02 sets
11.	Tap Wrench (Adjustable)	05 nos.
12.	Die stock – different size	05 nos.
13.	Tap & Die Metric set 6mm to 25mm	02 sets
14.	Reamer machine straight flute-6 to 25mm in step of 1 mm	01 set
15.	Reamer Adjustable 10 to 20mm	01 set
16.	Hand Chaser M-12 & M-16 (External)	02 sets
17.	Hand Chaser M-12 & M-16 (Internal)	02 sets
18.	Combination Drill A-3 & A-5	05 sets
19.	Knurling tool revolving head	10 nos.
20.	Tool Holder RH & straight for 3/8” square tool bit	05 nos.
21.	Parting Tool Holder	05 nos.
22.	Boring Tool holder for 6mm sq. hole	05 nos.

LIST OF MACHINES, EQUIPMENTS & FURNITURES FOR THE TRADE TURNER

Sl. No	DESCRIPTION OF EQUIPMENTS	Qty.
1.	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 etc. along with motorized coolant system.	02 no.
2.	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.	08 nos.
3.	Tool Room 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.	02 nos.
4.	Grinding Machine Pedestal Types D.E. with wheel guard and flanges.	02 nos.
5.	Drilling Machine pillar type- motorized up -12-mm. cap. with drill chuck & key	01 no.
6.	Power saw machine- hydraulic type	01 no.
7.	Steel Cupboard with 8 pigeon lockers	03 nos.
8.	Work bench for fitters with two vices of 100mm	02 nos.
9.	Steel cupboard 180x90x45cm	05 nos.
10.	Steel cupboard 120x60x45cm	07 nos.
11.	First aid box.	1 no.
12.	Test mandrel/test bar 400mm	01 no.
13.	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 trainess + 1 faculty)	1 set.
14.	PCs with MS-Windows to run above simulation software, networked on LAN.	11 nos.
15.	Computer Table & Chairs	11 nos. & 20 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)	01 set
07	Computer Table	01 no.
08	White Board (6ft X 4 ft.)	01 no.
09	LCD Projector Screen	01 no.
10	Air Conditioner 1.5Ton (OPTIONAL)	02 nos.
11	Wall Clock	01 no.
12	Wall charts, Transparencies and DVDs related to the trade	As required
13.	Laser Printer with scanner	01 no.
14.	Steel Cupboard with 8 pigeon lockers	3nos.
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.	01no.

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 & 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