

10. SYLLABUS CONTENT WITH TIME STRUCTURE

10.1 SYLLABUS CONTENT FOR PROFESSIONAL SKILL & KNOWLEDGE

SYLLABUS FOR THE TRADE OF TURNER

First Semester

(Semester Code no. TUR - 01)

Duration : Six Month

LEARNING OBJECTIVES OF 1ST SEMESTER

1. Apply safe working practices.
2. Comply environment regulation and housekeeping
3. Interpret & use Company terminology and technical communication
4. Perform basic fitting operations used in industrial workshop practices and inspection of dimensions
5. Operate lathe machine and identify different parts
6. Mounting of different work holding devices on a lathe machine
7. Grinding of cutting tools used on a lathe machine
8. Produce job using various cutting tools involving different operations.

Week No.	Professional Skills	Professional Knowledge
	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</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>

	accidents. Use of Fire extinguishers.	
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, hack sawing to given dimensions, sawing different types of metals of different sections. Practice on hammering, marking out, chipping, chisel grinding	Measurement, line standard and end standard, steel rule-different types, graduation and limitation. Hammer and chisel-materials, types and uses. Prick punch and scriber.
3 & 4	Filing practice on plain surfaces, right angle by filing. Use of calipers and scale measurement.	Vice – types and uses, Files-different types of uses, cut, grade, shape, materials etc. Try square-different types, parts, material used etc. Calipers-types and uses (firm joint).
5.	Filing at right angle, marking & hack sawing.	Vee – block, scribing block, straight edge and its uses. Hacksaw-their types & uses.
6	Marking operation on flat & round job. Drilling operation.	Center punch- materials, construction & material uses. Drill machine-different parts. Hacksaw blades- sizes , different Parts. Hacksaw blades-sizes, different pitch for different materials. Nomenclature of drill.
7.	Threading with the help of taps and dies.	Surface plate its necessity and use. Tap, - different types (Taper 2 nd and bottoming) care while tapping. Dies different types and uses. Calculation involved to find Out drill size (Metric and Inch).
8.	Getting to know the lathe with its main components, lever positions and various lubrication points as well.	Definition of machine & machine tool and its classification. History and gradual development of lathe.
9.	Mounting of chuck on machine spindle and unloading in various system – faceplate, 3-jaw chuck, 4-jaw chuck.	Classification of lathe in Function and construction of different parts of Lathe.
10 & 11	Turning of round stock on 4-jaw independent chuck. Use of 3-jaw self centering chuck as well.	Types of lathe drivers, merit and demerit. Description in details-head stock-cone pulley type- all geared type-construction & function. Tumbler gear set.

		Reducing speed-necessary & uses. Back Gear Unit –its construction use.
12	Grinding of R.H. and L.H., side cutting tools, checking of angles with tools angle gauge / bevel protractor.	Lathe cutting tool-different types, shapes and different angles (clearances and rake), specification of lathe tools
13 & 14	Facing operation to correct length, center drilling operation,. Grinding of “V” tools for threading of Metric 60 degree threads with guage.	Combination drill- appropriate selection of size from chart of combination drill. Drill, chuck- its uses.
15 & 16	Parallel turning, step turning, practice-measurement with scale and outside caliper to 0.5 mm. accuracy. Measurement with vernier caliper ± 0.5 mm accuracy.	Vernier caliper-its construction, principle graduation and reading, least count etc. Digital vernier caliper. Outside micrometer –different parts, principle, graduation, reading, construction. Digital micrometer. Cutting speed, feed depth of cut, calculation involved-speed feed R.P.M. etc. recommended for different materials.
17	Step turning practice within $\square 0.5$ mm with SQ, shoulder, U/cut on OD. Drilling on Lathe-step drilling, drill grinding practice.	Different types of micrometer, Outside micrometer. Vernier scale graduation and reading. Sources of error with micrometer & how to avoid them. Use of digital measuring instruments. Lathe accessories, chuck independent, self centering, collet, magnetic etc., its function, construction and uses.
18 & 19	Boring practice-Plain & step, internal recessing. Reaming in lathe using solid and adjustable reamer.	Drills-different parts, types, size etc., different cutting angles, cutting speed for different material. Boring tool. Counter - sinking and Counter boring. Letter and number drill, core drill etc. Reamers-types and uses. Lubricant and coolant-types, necessity, system of distribution, selection of coolant for different material: Handling and care.
20	Checking alignment of lathe centers. Mounting job in between centers	Driving plate. Face plate & fixed & traveling steadies- construction and use. Transfer caliper-its construction and uses. Lathe centers-types and their uses. Lathe carrier-function, types & uses.
21	Turning practice-between centers on	Knurling meaning, necessity, types, grade,

&22	mandrel (Gear blanks). Fitting of dissimilar materials- M.S. in brass, aluminium, in cast iron etc. Knurling practice in lathe (Diamond, straight, helical & square).	cutting speed for knurling. Lathe mandrel-different types and their uses. Concept of interchangeability, Limit, Fit and tolerance as per BIS: 919-unilateral and bilateral system of limit, Fits- different types, symbols for holes and shafts. Hole basis & shaft basis etc. Representation of Tolerance in drawing.
23-25	Revision	
26	Examination	

Second Semester
(Semester Code no. TUR - 02)

Duration : Six Months

LEARNING OBJECTIVES OF 2ND SEMESTER

1. Apply safe working practices.
2. Comply environment regulation and housekeeping
3. Interpret & use Company terminology and technical communication
4. Usage of different attachments used on Lathe machine
5. Produce components using different methods of taper turning.
6. Produce components with different thread forms.
7. Manufacture components having eccentric turning.

Week No.	Professional Skills	Professional Knowledge
	Trade Practical	Trade Theory
1	Male taper turning by compound slide swiveling. Use of sine bar.	Taper – different methods of expressing tapers, different standard tapers. Method of taper turning, important dimensions of taper. Taper turning by swiveling compound slide, its calculation.
2 - 3	Male and female taper turning by taper turning attachment / compound slide practice. Blue matching.	Vernier bevel protractor-its function & reading.
04- 05	Eccentric marking practice. Eccentric turning. Use of Vernier height Gauge and V-block. Eccentric boring.	Vernier height gauge, function, description & uses, templates-its function and construction. Screw thread-definition, purpose & its different elements. Fundamentals of thread cutting on lathe. Combination set-square head. Center head, protractor head-its function construction and uses.
06	Practice square block turning using 4-jaw chuck.	-do-
07 - 08	Screw thread cutting (B.S.W) external R/H & L/H, checking of thread by using screw thread gauge, fitting of male and female parts. Application to be covered.	Different types of screw thread- their forms and elements. Application of each type of thread. Drive train. Chain gear formula calculation.
09	Screw thread cutting (B.S.W) internal R/H & L/H	Different methods of forming threads. Calculation involved in finding core dia., gear train (simple gearing) calculation.
10 - 11	Fitting of male & female threaded components (BSW)	Calculations involving driver-driven, lead screw pitch and thread to be cut. Tread chasing dial function, construction and use.
12	Screw thread cutting (External) metric thread-tool grinding	Calculation involving pitch related to ISO profile.
13	Screw thread (Internal) metric & threading tool grinding	Conventional chart for different profiles, metric, B.A., Withworth, pipe etc.
14	Fitting of male and female thread components (Metric)	Calculation involving gear ratios and gearing (Simple & compound gearing)

15 - 16	Tool grinding for Square thread (External), Square threading (External) practice Tool grinding for Square thread (Internal) on pedestal grinder.	Calculation involving tool Thickness, core dia., pitch proportion, depth of cut etc. of sq. thread.
17	Fitting of male and female square threaded components.	Basic process of soldering, welding and brazing.
18 – 19	Acme threads cutting (male & female) & tool grinding.	Calculation involved – depth, core dia., pitch proportion etc. of Acme thread.
20	Fitting of male and female threaded components	Calculation involved depth, core dia., pitch proportion, use of buttress thread.
21	Buttress thread cutting (male& female) & tool grinding. Fitting of male & female threaded components.	Buttress thread cutting (male & female) & tool grinding
22 -23	In-plant training / Project work (work in a team)	
24-25	Revision	
26	Examination	

Third Semester
(Semester Code no. TUR - 03)
Duration : Six Month

LEARNING OBJECTIVES OF 3RD SEMESTER

1. Apply safe working practices.
2. Comply environment regulation and housekeeping
3. Interpret & use Company terminology and technical communication
4. Manufacture components with specific Form.
5. Produce components with internal taper and match male part
6. Mount grinding wheel on pedestal grinder
7. Maintain functionality of lathe by appropriate maintenance method.
8. Turn crank shaft as per drawing
9. Make job having eccentric boring.
10. Produce the job having multi start thread form for machine tools

Week No.	Professional Skills	Professional Knowledge
	Trade Practical	Trade Theory
01	<p>Introduction to various components produced on lathe.</p> <p>Forging practice (lathe tool) of different shapes, heat treatment of tools.</p>	<p>Review of lathe machine, its classification for productivity. Revision of first year topics.</p> <p>Cutting tool material-H.C.S., HSS, Tungsten. Carbide, Ceramic etc, - Constituents and their percentage. Tool life, quality of a cutting material.</p>
02	<p>Form turning practice by hand.</p> <p>Grinding of various shape of chip breaker on tool.</p>	<p>Form tools-function-types and uses, Template-purpose & use. Dial test indicator- construction & uses</p> <p>Calculation involving modified rake and clearance angles of lathe tool at above and below the center height. Subsequent effect of tool setting.</p> <p>Jig and fixture-definition, type and use. Chip breaker on tool-purpose and type</p>
03	<p>Taper turning by taper turning attachment, Morse taper- different number.</p>	<p>Sine bar-construction-types and use. Slip gauges-types., uses and selection.</p>

	Soft jaw boring. Use ring gauge / suitable MT sleeve.	
04	Internal taper turning by taper turning attachment / cross slide. Taper matching exercise (application of Prussian blue, Plug gauge)	Checking of taper with sin bar and roller-calculation involved
05	Turning and boring practice on CI (preferable) or steel & tip brazing on shank.	Method of brazing solder, flux used for tip tools.
06	Turning at high speed using tungsten carbide tools including throw-away tips.	Cutting speed, feed, turning time, depth of cut calculation, cutting speed chart (tungsten carbide tool) etc. Basic classification of tungsten carbide tips.
07	Practice of negative rake tool on non-ferrous metal.	Tool life, negative top rake-its application and performance with respect to positive top rake
08	Balancing, mounting & dressing of grinding wheel (Pedestal). Adjustment of tool post.	Lubricant-function, types, sources of lubricant. Method of lubrication. Dial test indicator use for parallelism and concentricity etc. in respect of lathe work Grinding wheel abrasive, grit, grade, bond etc.
09	Periodical lubrication procedure on lathe, testing of accuracy of alignment. Procedure of checking accuracy of lathe. Preventive maintenance of lathe.	Preventive maintenance, its necessity, frequency of lubrication. Preventive maintenance schedule., TPM (Total Productive Maintenance), EHS (Environment, health, Safety)
10	Holding and truing of Crankshaft – single throw (Desirable).	Marking table-construction and function. Angle plate-construction, eccentricity checking.
11	Turning of long shaft using steady (within 0.1 mm).	Roller and revolving steadies, Necessary, construction, uses etc.
12	Cutting metric threads on inch, lead screw and inch threads on Metric Lead Screw.	Calculation involving gear ratios metric threads cutting on inch L/S Lathe and vice-versa.
13	Use of attachments on lathe for different operations. Thread cutting on non-ferrous metals-copper aluminum brass etc.	Different types of attachments used in lathe. Various procedures of thread measurement thread screw pitch gauge. Screw thread micrometer, tool maker, microscope etc.
14	Advanced eccentric boring (position boring using tool maker's button.)	Tool maker's button and its parts, construction and uses, telescopic gauge its construction and uses.
15	Boring and stepped boring (within +/- 0.05 mm)	Inside micrometer principle, construction graduation, reading, use etc. (Metric & Inch.)
16	Continuation of thread cutting. Fractional odd & even threads.	Calculation involving fractional threads. Odd & even threads.
17	Multiple thread cutting (B.S.W.) external & internal.	Multiple thread function, use, different between pitch & lead, formulate to find out start, pitch,

		lead. Gear ratio etc.
18	Multiple thread cutting 60 deg. (external & internal).	Indexing of start - different methods tool shape for multi-start thread. Setting of a lathe calculation for required change wheel
19	Multi-start thread cutting Acme form (Male & Female)	Calculation involving shape of tool, change wheel, core dia etc.
20	Practice of conventional turning from industrial drawing.	Calculation involving shape, size pitch, core dia. Etc.
21	Multi-start thread cutting, square form (Male & Female) Multiple thread cutting work (External). Cutting of helical grooves in bearing and bushes (Oil groove)	Helix angle, leading angle & following angles. Thread dimensions-tool shape, gear, gear calculation, pitch, depth, lead etc.
22-23	Implant training / Project work (work in a team)	
24-25	Revision	
26	Examination	

Fourth Semester
(Semester Code no. TUR - 04)

Duration : Six Month

LEARNING OBJECTIVES OF 4TH SEMESTER

1. Apply safe working practices.
2. Comply environment regulation and housekeeping
3. Interpret & use Company terminology and technical communication
4. Turn job having center/axial offset (castings/forgings)
5. Produce components on CNC Lathe involving different operations
6. Manufacture and assemble screw jack.
7. Manufacture components having worm gear cutting.
8. Bore soft jaws for holding components.

Week No.	Professional Skills	Professional Knowledge
	Trade Practical	Trade Theory
1- 2	Setting and turning operation involving face and angle plate	Accessories used on face plate –their uses. Angle plate-its construction & use. Balancing-its necessity.
3 - 4	Turning & boring of split bearing – (using boring bar and fixture)	Care for holding split bearing. Fixture and its use in turning.
5 - 6	Thread on taper surface (Vee form).	Setting of tool for taper threads-calculation of taper setting and thread depth.
7	Cutting of Helical grooves in bearings and bushes(oil grooves)	Heat treatment – meaning & procedure hardening, tempering, carbonizing etc.
8	Demo of parts of CNC machine – control switches, console buttons and machines specifications Demonstration of CNC lathe parts - bed, spindle motor and drive, chuck, tailstock, tool changer, axes motor and ballscrews, 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 teachware. Parts shown on machine.

9	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, ISO nomenclature for turning tools, boring tools, inserts. Cutting parameters - cutting speed, feed rate, depth of cut, constant surface speed, limiting spindle speed. Process planning, tool selection and cutting parameters selection. Explained using multimedia CNC teachware and CNC machine simulator.
10-11	CNC turning center operation in various modes : jog, single block, auto, MDI, edit, etc. Program entry. Setting of tool offsets, entry of tool nose radius and orientation.	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 teachware.
12-13	Machining parts on CNC lathe with parallel, taper, step, radius turning, grooving and threading of different pitches. First 60 % of the practice is on CNC machine simulator, followed by 40 % on machine.	Prepare various programs as per drawing. Concepts taught using multimedia CNC teachware.
14-15	Practice of different operations related to trade on CNC machine.	Different types of programming techniques of CNC machine.
16-17	Manufacturing & Assembly of Screw jack/vice/Box nut by performing different lathe operation.	Interchangeability meaning, procedure for adoption, quality control procedure for quality production.
18	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.
19	Read a part drawing and make a process plan for turning operation.	Terms used in part drawings and interpretation of drawings – tolerances, geometrical symbols - cylindricity, parallelism. etc.
20	Practice of special operations on lathes - worm gear cutting, oil groove internal and external,	Automatic lathe-its main parts, types diff. Tools used-circular tool etc

21	Boring on lathe using soft jaws and dial bore gauge to accuracy of +/- 0.05 mm.	Related theory and calculation. Surface finish symbols used on working blueprints- I.S. system lapping, honing etc.
22-23	Implant training / Project work (work in a team)	
24-25	Revision	
26	Examination	