

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

TURNER

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** : **TURNER**
2. **N.C.O. Code No.** : 835.55
3. **Duration of Craftsmen Training:** Two years (Four semesters each of six months duration).
4. **Power norms** : 18.5 KW
5. **Space norms** : 110 Sq.mt.
6. **Entry Qualification** : Passed 10th Class with Science and Mathematics under 10+2 system of Education or its equivalent
7. **Trainees per unit** : 15
- 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 “Fitter” 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).

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.
- 9. For Employability Skills:-** One contract/part time / guest faculty for Generic module
i) MBA/ BBA with two years experience **OR** Graduate in Sociology / Social Welfare / Economics with Two years experience **OR** Graduate / Diploma with Two years experience and trained in Employability Skills from DGET institutes
AND
Must have studied English / Communication Skills and Basic Computer at 12th / Diploma level and above
- OR
- Existing Social Study Instructors duly trained in Employability Skills from DGET institutes

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 Turner

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 semi-skilled turner.
2. The trainee can work in the field of basic fitting, lathe, drilling, Inspection & measurement observing safety precautions.
3. Perform all the turning operations on lathe & perform simple programming & operations on a CNC lathe.
4. Handle different type of Fire extinguishers & personal protective equipments.

3. 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 defense organizations.
6. In public sector industries like BHEL, BEML, NTPC, Army based workshops and Auto industry. etc and private industries in India & abroad.
7. Self employment

4. Further learning pathways:

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

SYLLABUS FOR THE TRADE OF TURNER

First Semester
(Semester Code no. TUR - 01)

Duration : Six Month

Week No.	Trade Practical	Trade Theory
1.	<p>Importance of trade training, List of tools & Machinery used in the trade. Health & Safety: Introduction to safety equipments and their uses. Introduction of first aid, operation of Electrical mains.</p> <p>Occupational Safety & Health Importance of housekeeping & good shop floor practices. Health, Safety and Environment guidelines, legislations & regulations as applicable. Disposal procedure of waste materials like cotton waste, metal chips/burrs etc. Basic safety introduction, Personal protective Equipments(PPE):- Basic injury prevention, Basic first aid, Hazard identification and avoidance, safety signs for Danger, Warning, caution & personal safety message. Preventive measures for electrical accidents & steps to be taken in such accidents. Use of Fire extinguishers.</p>	<p>Importance of safety and general precautions observed in the in the industry/shop floor. All necessary guidance to be provided to the new comers to become familiar with the working of Industrial Training Institute system including stores procedures. Soft Skills: its importance and Job area after completion of training. Introduction of First aid. Operation of electrical mains. Introduction of PPEs. Introduction to 5S concept & its application. Response to emergencies eg; power failure, fire, and system failure.</p>
2.	<p>Identification of tools & equipments as per desired specifications for marking & sawing (Hand tools , Fitting tools & Measuring tools) Selection of material as per application Visual inspection of raw material for rusting, scaling, corrosion etc., Marking out lines, gripping suitably in vice jaws, hack sawing to given dimensions, sawing different types of metals of different sections. Practice on hammering, marking out, chipping, chisel grinding</p>	<p>Measurement, line standard and end standard, steel rule-different types, graduation and limitation. Hammer and chisel-materials, types and uses. Prick punch and scriber.</p>
3 & 4	<p>Filing practice on plain surfaces, right angle by filing. Use of calipers and scale measurement.</p>	<p>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).</p>

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	Vernier caliper-its construction, principle graduation and reading, least count etc. Digital vernier caliper. Outside micrometer –different parts,

	mm accuracy.	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 ± 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 & 22	Turning practice-between centers on mandrel (Gear blanks). Fitting of dissimilar materials- M.S. in brass, aluminium, in cast iron etc. Knurling practice in lathe (Diamond, straight, helical & square).	Knurling meaning, necessity, types, grade, 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	

SYLLABUS FOR WORKSHOP SCIENCE AND CALCULATION
SEMESTER-I

Week No	Workshop Science and Calculation
1	- Introduction to Iron and Steel. Differences in Iron & steel.
2	- Introduction to Property and uses of C.I. and wrought Iron. - Iron and steel properties and uses.
3	- Properties and uses of plain carbon steel and alloy steel.
4	- Properties and uses of non ferrous metals and alloys Fraction and decimal - conversion fraction decimal and vice-versa.
5	- Properties and uses of copper, zinc, lead, tin, aluminum.
6-7	- Composition, properties and uses of brass, bronze, solder, bearing material, timber, rubber etc.
8	- System of units, British, metric and SI units for length, area, volume capacity, weight, time, angle, their conversions. - Effect of alloying elements in the properties of C.I. & steel.
9	- Unit of temperature for & related problems. Standard & absolute temp.
10-11	- Mass, volume, density, weight, sp. Gravity & specific weight. S.I. M.K.S. and F.P.S. units of force, weight etc. their conversion to related problems.
12	- Inertia, rest and motion, velocity and acceleration.
13	- Types of forces, its units and Weight calculation.
14	- Revision & Test - Power and roots Factor, Power base exponents number. Multiplication and division of power and root of a number. Square root of number and problems.
15	- Heat & temperature, thermometric scales, their conversions.
16-17	- Work energy and power, their units and applied problems.
18-19	- Percentage, changing percentage to decimal and fraction and vice versa. Applied problems.
20	- Problem on percentage related to trade.
21	- Different types of loads, stress, strain, modulus of elasticity. Ultimate strength, different types of stress, factor of safety, examples.
22	- Ratio & proportion- Ratio, finding forms ratio proportions, direct proportion and indirect proportion. Application of ratio and proportion & related problems.
23-25	Revision

26	Examination
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SYLLABUS FOR ENGINEERING DRAWING
SEMESTER-I

Week No	Engineering Drawing
1-2	- Engineering Drawing-- introduction to Engg. Drawing and its importance.
3	- Use of drawing instruments –Drawing of straight, inclined and curved lines.
4	- Exercise on linear and angular measurements.
5	- Types of lines their meaning & application as per BIS SP: 46-2003.
6-7	- Simple conventional symbols for material and parts as per BIS SP: 46-2003. - Geometrical construction of rectangles, square, circles.
8	- Geometrical construction of polygon and ellipse, parabola & hyperbola.
9	- Geometrical construction of involutes, oval, and helix.
10-11	- Free hand sketching of straight lines, rectangles, circles, square, polygons, ellipse.
12	- Standard printing style for letters and numbers as per BIS : SP: 46-2003 using stencils
13	- Free hand sketching of simple geometrical solids, cube, cone, prism, cylinder, sphere, pyramids.
14	- Scales- Types & its use.
15	- Revision & Test - Construction of diagonal scale.
16	- Simple dimensioning technique, size and location, dimensions of parts, holes angles, taper, screw etc. as per BIS SP: 46-2003.
17	- Transferring measurements for linear, angular, circular dimensions from the given object to the related free hand sketches using different measuring instruments.
18-19	- Pictorial drawings, isometric drawings of simple geometrical solids.
20	- Oblique/orthographic projection of simple geometrical solids.
21	- Orthographic drawings: Application of both the first angle and third angle. Isometric drawing of simple machined & casting blocks.
22	- Free hand sketches of trade related hand tools and measuring tools.
23-25	Revision
26	Examination

SYLLABUS FOR EMPLOYABILITY SKILLS

SEMESTER-I

1. I.T. Literacy	
Hours of Instruction : 20 Hrs.	Marks Allotted : 20
Computer	- Introduction, Computer and its applications, Hardware and peripherals, Switching on and shutting down of computer.
WINDOWS	- Basics of Operating System, WINDOWS, The user interface of Windows OS, Customizing Windows Operating System, Create, Copy, Move and delete Files and Folders, Use of External memory like pen drive, CD, DVD etc, Use of Common applications.
MS office	- Basic operations of Word Processing, Creating, opening and closing Documents, use of shortcuts, Creation and Editing of Text, Formatting the Text, Printing document, Insertion & creation of Tables. - Basics of Excel worksheet, understanding basic commands, creating simple worksheets, understanding sample worksheets, use of simple formulas and functions, Printing of simple excel sheets
INTERNET	- Basic of Computer Networks (using real life examples), Definitions of Local Area Network (LAN), Wide Area Network (WAN), Internet, Concept of Internet (Network of Networks), Applications of Internet : Browsing, Searching, Emailing, Social Networking
WEB Browser	- Meaning of World Wide Web (WWW), Search Engines with examples, Web Browsing, Accessing the Internet using Web Browser, Downloading Web Pages, Printing Web Pages - Information Security and antivirus tools, Do's and Don'ts in Information Security, Awareness of IT – ACT, Importance of information security and IT act, types of cyber crimes.
2. English Literacy	
Hours of Instruction: 15 Hrs.	Marks Allotted : 15
Pronunciation	- Phonetics and pronouncing simple words.
Listening	- Interpreting conversation and discussions related to everyday life, Responding to spoken instructions in order to carry out requests and commands.
Speaking	- Asking and answering simple questions in English to describe people, things, situations and events.
Reading	- Reading and interpreting simple sentences, forms, hoardings, sign boards and notices.
Writing	- Writing sentences with simple words, reply to everyday office correspondence, - Writing CV & simple application forms.
3. Communication skill	
Hours of Instruction: 15 Hrs.	Marks Allotted : 15
Communication Skills	- Definition, Effective communication, Verbal communication, Use of right words, Non verbal communication, Body Languages.
Motivation	- Self awareness, Goal setting, Career planning, Values and Ethics
Time management	- Managing time effectively through planning
Facing Interviews	- Appearance and behaviour in an interview, Do's and don'ts
Behavioral Skills	- Attitude, Problem Solving, Thinking Skills, Confidence building

Second Semester
(Semester Code no. TUR - 02)
Duration : Six Months

Week No.	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	

SYLLABUS FOR WORKSHOP SCIENCE AND CALCULATION
SEMESTER-II

Week No	Workshop Science and Calculation
1-2	- Simple machines-principle, velocity ratio, mechanical advantage, efficiency, related problems.
3	- Algebraic symbols, fundamental algebra operations, sign and symbols used in algebra, coefficient terms, and unlike terms.
4	- Algebraic addition, subtraction, multiplication and division.
5	- Simple machines like winch pulley and compounding axle etc.
6-7	- Calculation of tap hole sizes for internal threads and blank size for cutting external threads.
8	- Factors and equations: Algebraic formula and solving simple equations.
9	- Factors and different types of factorization (LCM, HCF).
10	- Equations simple simultaneous equation.
11	- Simple simultaneous equation.
12	- Application, construction and solution of problems by equation.
13-14	- Atmospheric pressure, pressure gauge, gauge pressure and absolute pressure and their units.
15	- Simple problems on multiplication, division, power and root using calculator.
16	- Power and exponent. Laws of exponent.
17	- Relation between specific gravity and density simple experimental determination.
18	- Geometry: Fundamental geometrical definition- angles and properties of angles, triangles, and properties of triangles.
19-20	- Pythagoras theorem, properties of similar triangles. - Revision.
21	- Definition and units of torque. Pythagoras theorem, properties of similar triangles. - Revision.
22-23	Implant training / Project work (work in a team)
24-25	Revision
26	Examination

SYLLABUS FOR ENGINEERING DRAWING
SEMESTER-II

Week No	Engineering Drawing
1	- Simple sketches of trade related hand tools & measuring instruments
2	- Introduction to Orthographic Views and its advantages.
3-4	- Orthographic drawings, application of both the first angle and third angle. Method of representing the drawings for simple and complex machine parts, exercises with dimensions.
5	- Standard method of sectioning as per BIS: SP: 46-2003. Exercises for different sectional views on the given orthographic drawing of machine part, castings etc. - Orthographic drawings in first angle projection.
6	- Orthographic drawings in the first angle projection.
7-9	- Orthographic drawings in the third angle projection
10-11	- Standard method of sectioning as per BIS. SP: 46-2003. Exercises for different sectional views on the given orthographic drawing of machine parts, casting etc.
12-14	- Conversion of isometric, oblique drawings to orthographic drawings and vice-versa. Related problems such as 'V' block oriented by various machining operations etc.
15	- Method of representing the drawings for simple and complex machine blocks given for exercises with dimensions.
16	- Reading of production drawing including machining symbol, GD&T.
17-18	- Surface development of simple geometrical solids like cube, rectangular block, cone, pyramid, cylinder, prism etc.
19-20	- Interpretation of solids and conventional application of intersectional curves on drawing. - Solution of NCVT test paper (preliminary) Revision.
21	- Sketches for bolts, nuts, screws and other screwed members.
22-23	Implant training / Project work (work in a team)
24-25	Revision
26	Examination

System	qualities.
House Keeping	Purpose of Housekeeping, Practice of good Housekeeping.5S Principles of Housekeeping: SEIRI – Segregation, SEITON – Arrangement, SEISO – Cleaning, SEIKETSU – maintenance of Standards, SHITSUKE - Discipline

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

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

SYLLABUS FOR WORKSHOP SCIENCE AND CALCULATION
SEMESTER-III

Week No	Workshop Science and Calculation
1	- Revision of 1 st year course.
2	- Heat and temperature, thermometric scales their conversions.
3	- Rectangle, square, Rhombus, parallelogram and their properties.
4	- Circle and properties circle: regular polygons. - Application of geometrical to shop problems.
5-6	- Forces definition. - Compressive, tensile, shear forces and simple problems.
7	- Temperature measuring instruments. Specific heats of solids & liquids, quantity of heat.
8	- Heat loss and heat gain, with simple problems.
9	- Mensuration: Plain figures-triangles, square, rectangle, parallelogram.
10	- Mensuration : Plain figures-segment and sector of circle, ellipse, fillets. - Plain figures. Trapezium, regular polygons, circle, hollow circles.
11	- Mensuration: Solid figures: Prism, cylinder, pyramid, cone. - Solid figures: frustum of a cone, sphere, spherical segment.
12	- Material weight and cost problems related to trade.
13	- Trigonometry: trigonometric ratios, use of trigonometric table.
14	- Area of triangle by trigonometry.
15	- Finding height and distance by trigonometry.
16	- Application of trigonometry in shop problems. - Industrial visit.
17-18	- Application of trigonometry in shop problems.
19-20	- Levers-definition, types and principles of levers.
21	- Mechanical Advantage, velocity ratio and mechanical efficiency.
22-23	Implant training / Project work (work in a team)
24-25	Revision
26	Examination

SYLLABUS FOR ENGINEERING DRAWING
SEMESTER-III

Week No	Engineering Drawing
1	- Revision of first year topics.
2	- Machined components and surface finish symbols.
3	- Screw thread, their standard forms as per BIS, external and internal thread, conventions on the features for drawing as per BIS.
4	- Sketches for bolts, nuts, screws and other screwed members.
5	- Sketching of foundation bolts and types of washers.
6	- Standard rivet forms as per BIS.
7	- Riveted joints-Butt & Lap.
8-9	- Sketches of keys, cotter and pin joints.
10-11	- Sketches for simple pipe, unions with simple pipe line drawings.
12	- Concept of preparation of assembly drawing and detailing. Simple assemblies & their details of trade related tools/job/exercises with the dimensions from the given sample or models.
13	- Single Tool post for the lathe with washer and screw.
14	- Details and assembly of Vee-blocks with clamps.
15	- Details and assembly of Vee-blocks with clamps.
16	- Details of assembly of shaft and pulley. - Industrial visit.
17	- Details1 of assembly of shaft and pulley.
18	- Details of assembly of bush bearing.
19	- Details of assembly bush bearing.
20	- Details of assembly of a simple coupling.
21	- Sketching of different gear wheels and nomenclature.
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

Week No.	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	<p>Demo of parts of CNC machine – control switches, console buttons and machines specifications</p> <p>Demonstration of CNC lathe parts - bed, spindle motor and drive, chuck, tailstock, tool changer, axes motor and ballscrews, guideways, LM guides, console, electricals, coolant system, hydraulic system, chip conveyor.</p> <p>Working of parts explained using multimedia CNC teach ware. Parts shown on machine.</p>	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,	Program execution in different modes like single block, manual and auto. Tool and work offsets

	edit, etc. Program entry. Setting of tool offsets, entry of tool nose radius and orientation.	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	

SYLLABUS FOR WORKSHOP SCIENCE AND CALCULATION
SEMESTER-IV

Week No	Workshop Science and Calculation
1-2	- Centre of gravity, simple experimental determination, stable, unstable & neutral equilibrium, simple explanation
3	- Friction- co-efficient of friction. Simple problem related to friction.
4	- Magnetic substances- natural and artificial magnets.
5	- Method of magnetisation. Use of magnets.
6	- Electricity & its uses. Electric current-positive & negative terminals.
7	- Use of fuses and switches, conductors and insulators.
8	- Simple electric circuits, simple calculations.
9	- Simple calculation based on Ohm's law. - electrical insulating materials.
10-11	- Transmission of power by belt, pulleys & gear drive. - Calculation of Transmission of power by belt pulley and gear drive.
12-13	- Read images, graphs, diagrams –bar chart, pie chart. - Graphs: abscissa and ordinates, graphs of straight line, related to two sets of varying quantities.
14	- Stress, strain, Hooks law, ultimate strength, factor of safety definitions and problems on them.
15-16	- Mechanical properties of metals. - Heat treatment and advantages.
17	- Basic Electronic: Introduction to wiring symbols, units, resistor, capacitor and inductor.
18-21	- Solution of NCVT test papers.
22-23	Implant training / Project work (work in a team)
24-25	Revision
26	Examination

SYLLABUS FOR ENGINEERING DRAWING
SEMESTER-IV

Week No	Engineering Drawing
1-2	- Details and assembly of simple hand – vice.
3-4	- Blue print Reading. Simple exercises related to missing lines.
5-6	- Simple exercises relating missing symbols. - Missing views
7-10	- Simple exercises related to missing section.
11-12	- Sketching of different types of bearings and its conventional representation.
13	- Solution of NCVT test. - Basic electrical and electronic symbols
14	- Study of drawing & Estimation of materials.
15-16	- Solution of NCVT test papers.
17	- Solution of NCVT test papers.
18-21	- Revision

TRADE: TURNER

LIST OF TOOLS & EQUIPMENTS FOR 15 TRAINEES

A : TRAINEES TOOL KIT:-

Sl. No.	Description	For Instructor	For Trainees
1	Caliper out side spring joint 150 mm	1 No	15 Nos.
2	Caliper inside spring joint 150 mm	1 No	15 Nos.
3	Caliper odd-leg firm joint 150 mm	1 No..	15 Nos.
4	Steel Rule 150 mm	1 No..	15 Nos.
5	Scriber 150mm x 3 mm	1 No.	15 Nos.
6.	Hammer ball peen 250 gm with handle	1 no.	15 Nos.
7	Centre punch 100 mm	1 no.	15 Nos.
8	Prick punch 100 mm	1 no.	15 Nos.
9	Divider spring joint 150 mm	1 no.	15 Nos.
10	Safety goggles clear glass (Good quality)	1 no.	15 Nos.

B: TOOLS, EQUIPMENTS AND GENERAL OUTFIT

Sl. No.	Description	For Instructor	For Trainees
11	Surface plate 60 x 60 cm	---	1 no.
12	Work bench 240 x 120x 90cm high	---	1 no.
13	Marking table (CI) 120 x 120 cm	---	1 no
14	Bench vice 125 mm jaw	---	6 nos.
15	Vee-Block 75 and 125 mm with clamp	---	1 pair each
16	Universal Surface gauge 250 mm arm	---	2 nos.
17	Hammer ball peen 750 gm with handle	---	6 nos.
18	Chisel cold flat 20 x 150 mm	---	6 nos.
19	Hammer copper/brass 500 gm with handle	---	12 nos.
20	Hacksaw fixed 200 mm (Pistol grip)	---	6 nos.
21	File flat 300 mm rough	---	6 nos.
22	File flat 250 mm 2 nd cut	---	6 nos.
23	File flat 250 mm smooth	---	6 nos.
24	File half round 250 mm 2 nd cut	---	6 nos.
25	File round 250 mm smooth	1 no.	6 nos
26	File half round 150 mm smooth	1 no.	2 Sets
27	Knurling tool revolving head (Rough, med, fine) diamond and straight	---	2 Sets
28	Combination set 300 mm (Complete Set)	---	6 Nos.
29	Screw Driver 200 & 300 blade heavy duty	---	2 sets each
30	Spanner double ended 6 mm to 21 mm	1 set	2 Nos
31	Spanner adjustable 200 mm	1 no.	---

32	Pliers flat nose 150 mm side cutting	1 no.	15 nos.
33	Caliper transfer inside 150 mm	---	3 nos.
34	Micrometer Outside 0 to 1" Reading 0.0001"	1 no.	----
35	Micrometer Outside 0 to 25 mm Reading 0.01 mm	1 no.	2 sets
36	Micrometer Outside 25 to 50 mm Reading 0.01 mm	----	2 nos.
37	Micrometer Outside 50to 75 mm Reading 0.01 mm	----	2 sets
38	Micrometer Inside up to 25 mm Reading 0.01 mm	1set	2 nos.
39	Micrometer Inside up to 50 to 150 mm reading 0.01 mm	-----	2 nos.
40	Depth Gauge Micrometer 0 to 150 mm Reading 0.01 mm	-----	2 nos.
41	Vernier Caliper Outside, Inside and Depth 200 mm /8 inches with metric & inch scale	1 No.	6 nos.
42	Dial Vernier Caliper with metric 200 mm reading 0.05 mm	1 No	6 nos.
43	Vernier Bevel Protractor 300 mm blade	-----	6 nos.
44	Vernier Micrometer 0 - 25 mm o/s LC 0.001mm	1 No	2 nos.
45	Vernier Micrometer 25 - 50 mm outside reading 0.001mm	1 No.	2 sets
46	Vernier Micrometer 0 inch to 1 inch. Outside Reading 0.0001 inch	1 No.	2 nos.
47	Feeler Gauge 100 mm blade metric set	---	2 sets
48	Radius Gauge 1 to 7 mm & 7.5 to 15 mm	---	6 Nos
49	Centre Gauge com. 60°, 55° and 29°	---	2 sets
50	Screw Pitch Gauge Whitworth & Metric each	---	2 sets
51	Drill Angle Gauge	---	2 sets
52	Dial Test Indicator 0.01 mm with magnetic base	---	2 sets
53	Vernier Height Gauge with dial 300 mm L.C. 0.01 mm	---	1 set
54	Try Square 150 blade	---	4 nos.
55	Magnifying Glass 75 mm dia.	---	4 nos.
56	Plain Ring and Plug Gauge 12 to 50 mm by 1mm	---	1 set each
57	Wheel Dresser Huntingon-type with star cutter	---	1 No.

58	Wheel Dresser Diamond (inserted-0.75 or 1 Carat)	---	2 Nos.
59	Screw Thread micrometer interchangeable	1 No.	1 No
60	Morse Taper Plug & Ring Gauge no. 0 to 7 MT	---	1 set
61	Sin Bar with centers 200 mm	---	2 Nos.
62	Slip Gauge metric set (87 pieces in a Box)	---	2 Nos.
63	Morse Taper Sleeves No. 0-1, 1-2, 2-3, 3-4, 4-5.	---	1 set
64	Drill Drift	---	1 Set.
65	Twist Drill straight shank 1 to 12 mm by 1 mm	---	1 No.
66	Twist Drill taper shank 10-12 mm by 0.5 mm	---	1 set (Box)
67	Drill Chuck 12 mm cap with key	---	2 Sets.
68	Tap & Die B.A. No. 0 to 10 in a box	---	2 Nos...
69	Tap & Die metric set up to 25 mm	---	2 Sets
70	Tap & Die B.S.F. up to 1 inch	---	2 Sets.
71	Tap & Die B.S.W. up to 1 inch	---	2 Sets.
72	Reamer machine straight flute 6 to 25 mm	---	1 Set.
73	Reamer Adjustable 10 to 20 mm	---	1 set.
74	Tool Holder RH & straight for mm square tool bit	---	1 No.
75	Parting Tool Holder with H.S.S. blade	---	12 Nos.
76	Tool Bits 12 X 150 mm sq. assorted shaped	---	15 Nos.
77	Boring Tool holder for 6 mm sq. tool bit	---	15 Nos.
78	Steel Rule 300 mm with Metric and Inch	---	15 Nos.
79	Oil Can ½ pint (pressure feed system)	---	06 Nos.
80	Dog Carrier 235, 50 and 75 mm	---	12 Nos
81	Angle Plate with slots 200 mm	---	04 Nos.
82	Spirit Level 0.05 meter 200 m	---	2 Nos.
83	Tool Maker's button	---	1 set
84	Combination Drill A-2.5 and A-1	---	1 set
85	Oil Stone 12 mm sq. x 100 long fine	---	12 nos.

86	Tap Wrench (adjustable)	---	09 Nos.
87	Die Handle	---	2 Nos.
88	Tool Bit assorted sizes on holder	---	2 Nos.
89	Machine Vice 100 mm jaw (For Drill Machine)	---	03 Nos.
90	Chalk Board on mobile stand	---	1 No.
91	Spare Grinding Wheel Ajax type for carbide tool	---	1 No.
92	Almirah-1980x 910 x 480 mm	---	2 No.
93	St. Locker with drawer (Pigeon holes)	---	.1 No.
94	Desk	---	1 No.
95	Stool	1 No.	4 Nos.
96	Angle Gauge for tool grinding	---	6 Nos
97	Hand Chaser M-12 & M-16 (External)	---	2 Nos.
98	Hand Chaser M-12 & M-16 (Internal)	---	2 Nos.
99	Revolving Centrer (to suit Lathe tailstock)	---	6 Nos
100	Tool Cemented carbide assorted shaped (External) for steel turning –set of 12 nos.	---	1 No.
101	Thread Plug Gauge M-20 & M-21	---	1 set
102	Thread Ring Gauge M-20 & M-21	---	1 No.
103	Machine Chase M-12TO m-21 (Std. Series) to suit on	---	1 set
104	Coventry Die head	---	2 Nos
105	Gauge Drill Grinding	---	1 No
106	Magnetic Chuck 150 mm dia.(Circular type)	---	1 set.
107	Lathe Mandrels (Diff. Types)	---	1 No.
108	Conventry Type Die Head (Self opening)	---	1 No
109	Collapsible Tap with attachment	---	2 Nos
110	Combination Drill	---	4 Nos.each.
111	Fire Extinguisher and buckets	---	02 nos.and 2 nos.

112	Bore dial gauge stems – 12 to 35 mm, 35 to 65 mm., dial gauge indicator of 0.01 accuracy.	1 set each	1 set each
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Note : 1. No additional item of the above list are required for a batch of 15 trainees working in second shift except Serial No. 1 to 10 and lockers

2.The specification of the items in the above list has been given in metric units. The items, which are available in the market nearest to specification as mentioned above, should procure.

C : MACHINERIES AND EQUIPMENTS

Sl.No.	Machinery and Equipment	Quantity	Remarks
1	2	3	4
01.	Lathe S.S. & S.C. (All geared head stock) 15 cm center height, to admit 120 cm between centers. Machine to be motorized and supplied with coolant installation, 4-jaw Independent chuck 250 mm, 3-jaw self-centering chuck 150 mm, fixed steady, traveling steady, face plate, driving plate, 4-way tool post, quick change gear box for Metric or British threads, live and dead centers with taper attachments.	5 nos.	
02.	Lathe S.S & S.C.(all geared type) 20 cm. Center height, 120 cm between centers, gap bed machine to be motorized and supplied with coolant installation, 4-jaw independent chuck, 300 mm , 3-jaw self-centering chuck 200 mm fixed steady, face plate, driving plate, 4-way tool post, quick change gear box for Metric/British threads, live and dead centers with taper attachments.	1 no.	
03.	Lathe tool room S.S. & S.C. (all geared type) 15 cm center height, 120 cm between centers. Machine to be motorized and supplied with coolant installation, 4-jaw independent chuck 250 mm, 3-jaw self-centering chuck 150 mm fixed steady, traveling steady, face plate, driving plate, 1-way tool post, draw in type collets set up to 25 mm, 0.5 mm, relieving attachments.	1 nos.	
04.	Grinding machine pedestal type D.E. 150 mm dia. Wheel with wheel guard and vision.	1 no.	
05.	Grinding machine pedestal type E.E. 150 mm dia. Wheel with wheel and vision guard	1 no.	

06.	Drill machine pillar type-motorized up to 12 mm. Cap.	1 no.	
07.	Power saw machine – hydraulic feed system – 400 mm. Blade size.	1 no.	

D: List of additional machines, tools & equipment for two units (CNC):

Sl. No.	Description	Quantity
1	CNC turning center dia. 150 mm., between center distance 500 mm. At least 8 station turret. Preferably with a popular controller like Fanuc, Siemens, etc.	1 No.
2	Multimedia teachware for CNC technology and interactive CNC machine simulators with console emulator software of popular control system makes : Fanuc, Siemens, Mitsubishi, etc. 1 for faculty, 10 for students	11 nos.
3	Multimedia teachware for CNC technology	1 no.
4	CNC Turning Tools assorted	1 set
5	CNC Boring tools assorted	1 set
6	CNC Grooving tools (External & Internal)	1 set
7	LCD projector / large screen TV	1 no.
8	Digimatic Electronic Vernier Caliper inch and mm 8"/200 mm. LCM 0.005"/0.001 mm	2 nos.
9	Digimatic electronic outside Micrometer (0 to 25 mm & 25 to 50 mm) LC 0.001 mm.	1 no. each

Note: No. additional items of the above lists are to be provided for a batch of 15 trainees working in the second shift.

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