

General Information

1. Name of the Trade : Draughtsman (Mechanical)
2. N.C.O. Code No. : 030.40
3. Duration of Craftsmen Training : 2 years
4. Duration of Apprenticeship Training : 3 years including 2 years of Basic Training.
5. Entry Qualification : Passed 10th class examination under 10 + 2 System of education with science and math's Or its equivalent.
6. Rebate for ITI Trainees : 2 years in the same trade
7. Ratio of Apprentice of Workers. : 1: 10

**SYLLABUS FOR THE TRADE OF DRAUGHTSMAN (MECHANICAL)
UNDER CRAFTSMEN TRAINING SCHEME**

WEEK NO.	Practical	Trade Theory	W/shop Calculation and Science
1.	<p>Induction Training Familiarization with the Institute Importance of trade training, machinery used in the trade, type of work done by the trainees in the institute types of jobs made by the trainees in the trade introduction to safety including fire fighting equipment and their uses etc.</p>	<p>Importance of safety and general precautions observed in the instt. . And in the sections. Importance of trade in the development of industrial cola of the country. Related instruction. Subject to be taught achieve dement to be made. Recreational , medical facilitates and other extra curricular activities of the Instt. (All necessary guidance to be proved to the new comers to become familiar with working of Industrial Training Institute. System including stores procedure etc.</p>	
2.	<p>Practice in using instrument. Drawing of straight and curved lines, Drawing angles, circles etc.</p>	<p>Nomenclature and use of drawing instruments & various equipment in drawing office. their care and maintenance. Lay out of a drawing sheet.</p>	<p>British MKS and SI units-their conversion. More emphasis on MKS & SI units.</p>
03.	<p>Letters, Block letters, Italics etc. and numerals.</p>	<p>Type of lettering proportion and spacing of letters and words.</p>	<p>Units of length and relation between them. Deduction of corresponding units of area and volumes.</p>

04.	Plane geometrical construction triangles, polygons, circles.	Terms and definitions polygons and circles.	Solution of geometrical problems on lines, angles polygons.
05	construction of ellipse parabola & hyperbola, construction of involutes, cycloid curves, helix and spiral.	Definition of ellipse, parabola, hyperbola, different methods of their construction. definition and method of drawing involutes cycloid curves, helix and spiral.	solution of problems on polygons and circle.
06	projection of points and lines. projection of plane figures.	planes and their normal projections, projection and orthographic projection. first angle and third angle projection.	solution of problems on polygons and circles.
07	Projection of solids prism, cones, pyramids and frustums.	Principle of orthographic projection. projection of solids like prism, cones, pyramids and frustums in various position.	Determination of sides and areas of triangles regular and irregular polygons, circles, segment and section.
08.	Projection of solids finding out the true shape surfaces cut by oblique planes.	Solution of problems to find out the true shape of surfaces when solids are cut by different cutting planes.	Simpson's rule & its practical application, area of ellipse.
09	Intensive free hand sketching of m/c parts along with projection of simple machine parts-1 st angle projection. Projection of machine parts drawn in the above exercise 3 rd angle projection.	Solution of problems to find out the true shape of surfaces when solids are cut by different cutting planes.	Determination of surface areas and volumes of cube cylinder, prism, pyramid, cone sphere etc.
10.	Conventional signs and	Lines and their	Definition of mass,

	symbols. Different types of section lines and abbreviations as per I.S.I. Different types of lines & their uses in drawing. Norms of dimension.	meaning, Section lines of different materials, Conventional signs, symbols & abbreviations, hatching, tinting & shading, Norms of dimensioning.	weight, density, specific gravity, simple calculation on weight. Allied problems using MKs and SI units.
11	Scale-plain scales, diagonal scales. Comparative scales, venires scale & chord scale.	Construction of different types of scales, their appropriate uses, R.F. Principle of diagonal & vernier scale.	-----do-----
12.	Free hand sketching, practice in drawing free had straight lines, curved lines polygons, circles, elliptical figures, figures with irregular contour and free hand sketch of a machine part such as tool post of a Lathe . Progress Test	Importance of free hand sketching in machine drawing. Material and equipment required in sketching. Progress Test	Displacement, velocity, acceleration. Equation of motion . Newton's Laws of motion , simple problems on the above. Progress Test
13.	Sectional views- Different types of Sections.	Importance of sectional views. Types of Sectional views & their uses. Parts not shown in Section.	Fundamental algebraic formulae for multiplication and factorization.
14.	Interpenetration of two prisms their axes intersecting at right angles Interpenetration of cone & pyramids intersecting each other.	Definition of interpenetration & interpenetration curves. Common methods to find out the curve of interpenetration.	Simple & simultaneous equation of the first degree.
15.	Interpenetration of prisms with their axis intersecting at an angle. interpenetration of cones and pyramids with their axes intersection at an angle.	Solution of problems on interpenetration of prism, cones, and pyramids, with their axes intersecting at an angle.	Quadratic Equation.
16.	General principles of	Theory of projection	Graphs, common,

	presentation, i.e. Orthographic projections in 1 st and 3 rd angle.	as specified in SP : 46-1938.	logarithms.
17.	Development of surfaces bounded by plane. Development of surfaces bounded by plane of revolution.	Definition of development, its need in industry and different method of developing the surfaces.	Measurement of angles trigonometric ratios, Radium measure.
18.	Development of an oblique with elliptical base etc. Development of solids intersecting. each other.	Principle of Isometric projection, Difference between isometric drawing and isometric projection, Isometric Scale. Dimensioning an isometric drawing.	Trigonometric Ratios of angles of any magnitude.
19.	Isometric projection of geometrical solids.	-----do-----	trigonometric functions of compound angles. Simple solution of triangles.
20.	Isometric projection of a machine part with irregular curves. Free hand isometric drawing of actual objects.	Different methods of drawing Isometric views.	Use of mathematical table (trigonometric and logarithms). use of simple pocket calculator.
21.	Isometric projection of a simple Journal Bearing.	Principle and types of oblique projection. Advantage of oblique projection over isometric projection.	Applied problems.
22.	Oblique projection of solids and machine parts perspective projection of solids.	Types of perspective projection. Fundamental concept, definition. Location of station point.	Simple stresses strains. Simple problems.
23.	Dimensioning technique, symbols for machining and surface finishes (grades and micron values).	Terminology-feature, functional feature, functional dimension, datum dimension, principles.	Hook's Law, Modules of Elasticity, stresses and strains, elastic limit, yield point.

24.	Trimming of prints, folding of prints for filing cabinets or binding as per SP-46-1988.	Units of dimensioning, system of dimensioning, method of dimensioning and common features.	Ultimate stress and breaking stress, factor of safety. Load due to impact.
25.	1 st angle projection with dimension of machine parts. 3 rd angle projection with dimension of machine parts.	Tolerance dimensioning. Indication of symbols for machining and surface finishes on drawing (grades and micron values).	Composition and resolution of forces. Condition of equilibrium of forces in plane.
	Progress Test	Progress Test	Progress Test
26.	Screw threads with IS conventions (free hand sketching as well as with instruments).	Screw thread, terms and nomenclature, types of screw thread, proportion and their uses, thread conventions.	Graphical determination of forces in simple frames.
27.	Nuts, bolts, washers and locking devices with IS conventions (free hand sketching as well as with instruments.)	Types of bolts and nuts, their proportions, uses, different types of locking devices.	Bending moments and shearing force diagrams.
28.	Machine screws, cap screws, studs and set screws, foundation bolts with IS conventions (free hand sketching as well as with instruments.)	Different types of machine screws, cap screws and their specifications. Different types of foundation bolts.	Force, diagram of freely supported beams and cantilevers.
29.	Keys, cotters, circlips and pins with IS conventions.	Purpose, terms, different types of keys (heavy duty and light duty) and proportions use of cotters, pins and circlips.	Torsion strength of shaft, Poisson ratio.
30.	Types of rivets, types of riveted joints with IS conventions.	Types of fastener materials, types of rivets, their proportion and uses. Types of riveted joints. Terms and proportions of riveted joints. Conventional	moments, principle of lever, types of lever, mechanical advantage, velocity ratio and efficiency.

		representation.	
31.	To prepare working drawing of a riveted structure from a conventional one.	Causes of failure of riveted joints, efficiency of riveted joints.	Simple problems on straight and bell cranked lever.
32.	- do -	- do -	- do -
33.	Welding joints. Use of welding symbols. Working drawings of welded structures.	Description of welding joints and their representation (actual and symbolic). Indication of welding symbols on drawings.	Motions such as reciprocating, rotary etc. and their mutual conversion.
34.	Drafting practice with the help of the drafting machine. Layout of drawing sheets with title block and revisionary panel for A0, A1, A2, A3, A4 sizes of sheets.	Description and use of drafting machine. Different sizes of drawing sheets as per ISI.	Link mechanisms.
35.	ALLIED TRADE : PATTERN MAKER Use of Saws, chisels, raps, planes etc. Use of steel rules, squares, scribes and dividers for marking out from drawing.	Safety precaution description, uses and care of hand tools including contraction rule.	Contraction shrinkage and machining allowances, their calculation for different materials.
36.	ALLIED TRADE : MOULDING Different types of mould, cores and core dressing, use of moulding tools. Simple core making floor and box moulding using to part patterns.	Safety precautions, hand tools used for moulding. Description of the use and care of hand tools. Description of different types of moulding. Description of different types of core, sand and dressing materials, description of cupola.	Ferrous and non ferrous metals and alloys. Physical properties, uses. Brief description of cast iron, mild steel, carbon steel – properties and uses.
37.	ALLIED TRADE : BLACKSMITHY Use of different types of black smithy hand tools, hand forging of different types of jobs.	Description of measuring tools and hand tools used in forge work. Description and use of the mechanical hammer. Colour	Heat and temperature thermometric scales and their conversions. Absolute temperature. Use of SI Unit in measurement of heat. Names of temperature

		coding of different metals and identification.	measuring instruments normally used in workshop.
38.	ALLIED TRADE : FITTING Use of different types of fitters hand tools, use centre punch different types of files, calipers, hack saws and hack sawing chisels, hammers.	Description and application of simple measuring tools, description of vices, hammers, cold chisel, files etc. and proper method of using them.	Quantity of heat; specific heat of solid, liquid and gases. Heat gained and heat loss-simple problems.
39.	ALLIED TRADE : TURNING Plain parallel turning, stepped turning, taper turning with offset stock method.	Safety precaution for lathes. Description of parts of lathe and its accessories.	Work-unit of work, energy power unit of power in MKS and SI Units. Applied problems.
40.	ALLIED TRADE : MACHINIST Use of jigs and fixtures. Simple operations on milling machine such as plain milling and key way cutting.	Method of using precision measuring instrument such as inside and outside micrometers, depth gauges, verniers, dial indicators, slip gauges, sine bars, universal bevel protractor, etc.	Meaning of friction examples. Coefficient simple problem.
41.	Marking out castings and forgings. Setting up and operation of shaping, slotting and planning machines.	Brief description of milling, shaping, slotting and planning machines. Quick return mechanism of these machines.	Limiting friction, friction, inclined plane problems.
42.	ALLIED TRADE : SHEET METAL Use of hand tools such as planishing hammers, stakes, mallet, bricks prick punch etc. Development of surfaces from blue print.	Names and brief description of common equipment necessary for sheet metal work. Different types and uses of joints employed in sheet metal work.	Determination of efficiency of simple machines like winch, pulley blocks, wheel and compound axle.

WEEK NO.	Practical	Trade Theory	W/shop Calculation and Science
43	<p>ALLIED TRADE : WELDING</p> <p>Use of hand tools used in Gas and in electric welding. Welding of object by gas and electric according to drawing.</p>	<p>Names and brief description of the hand tools. Identification of gas cylinders. Different types of welded joints and necessary preparation required for these. Welding symbols as applied to drawing.</p>	<p>Calculation of areas of triangles, polygons with the aid of trigonometry.</p>
44.	<p>ALLIED TRADE : ELECTRICIAN</p> <p>Familiarization with the measuring instruments, machinery and panels used in Electrician Trade.</p>	<p>A.C. & D. C.motors, Generators of common types and their uses.</p>	<p>Electricity its uses, Electric current, Positive & Negative terminals, uses of switches and fuses, conductors and insulators.</p>
45.	<p>ALLIED TRADE : I.C. ENGINE</p> <p>Familiarisation & identification of different parts of i.e. Engines (Both spark ignition and compression/ignition – 2 stroke & 4 stroke engines).</p>	<p>Brief description of internal combustion engines, such as cylinder block, piston, carburetor spark plug, camshaft, crank shaft, injector fuel pump etc.</p>	<p>Plotting and reading of simple graphs.</p>
46 & 47	<p>Tracing Exercises on tracing paper and tracing cloth. Ammonia printing with the help of machine.</p>	<p>Types of Ferro-printing papers. Specification of sensitized. Ammonia papers-expiry-precautions in ammonia printing.</p>	<p>REVISION</p>
48.		<p>REVISION</p>	
49.	<p>Industrial study tour at least three different types of industries having big drawing offices.</p>		
50 & 51	<p>INTERNAL TEST</p>		

52.	First Year Final Examination (NCVT).		
53.	Handling of Inking instruments.	Brief description of production of cast iron, wrought iron, steel and alloy steels.	Meaning of (metric) Horse Power. Use of SI unit of power i.e. Watt, KW, MW, Problems on work energy & power using MKS and SI units only.
54.	Drawing of a Rams bottom and safety valve in pencil. Inking and coloring the same. (Hand made paper should be used).	Procedure of inking a drawing. Conventional colors used for different metals as per I.S.I. materials and equipments for coloring procedure of coloring.	Meaning of (metric) Horse Power. Use of SI unit of power i.e. Watt, KW, MW, Problems on work energy & power using MKS and SI units only.
55.	Drawing of screw jack (Details and assembly) Preparation of tracing from the drawing on tracing paper by ink.	Necessities of training, equipment and materials (both conventional and modern like rotoring pen etc.) required for tracing procedure for tracing specification of tracing paper.	Practice in the use of Logarithmic tables for multiplication, division square, cube, square root, cube root etc. simultaneous use of an electronic pocket calculator.
56.	Drawing of plummer block (details and assembly). Preparation of tracing from the drawing on tracing cloth.	Procedure of tracing on tracing cloth and specification of tracing cloth.	- do -
57.	Working drawing of a simple bearing and a foot step bearing.	Types of assembly drawing. Different types of detailed drawings and preparation of bill of materials.	Working cost simple bills of materials from a working drawing.
58.	Details and assembly drawing of an angular plummer block.	Use of bearing types of bearing and materials used.	Working cost simple bills of materials from a working drawing.
59.	Details and assembly drawing of Roller and Ball bearing including tapered roller bearing.	Difference between frictional and anti frictional bearing. Advantages of ant frictional bearing over	Brief description of properties and uses of copper, aluminum, brass etc.

		frictional bearing. Materials and proportion of parts for drawing purposes.	
60.	Pulleys-solid, stepped and built up pulleys.	Belts-power transmitted by belt. Materials of belts slip and creep velocity of belt. Arc of contact.	Properties and uses of lead, tin, zinc, bronze.
61.	Pulleys-pulley with different types of arms, rope pulleys, belt pulleys and drive.	Simple exercise in calculation of belt speeds, nos. of belts needed in V-belt drive, velocity, pulley ration etc. standard pulleys width of pulley face, velocity ratio chain drive.	Properties and uses of different types of steel.

WEEK NO	PRACTICAL	TRADE THEORY	W/S. CAL. & SCI.
62	Working drawing of coupling (Muff coupling, flange coupling, friction grip coupling)	Necessity of coupling. Types uses and proportion of different types of couplings. Materials used for couplings.	Structure of ferrous metals Ferrite, Pearlite, Cementite etc.
63	Working drawing of coupling(claw coupling, universal coupling, knuckle joint)	Heat treatment of steel	Structure of ferrous metals- Ferrite pearlite, cementite etc.
64	Application of shade lines on machine drawings	Shade lines & their use on machine drawings. Conventional method for drawings shade lines, surface shading by means of lines	Definition of pressure, unit of pressure, Atmospheric pressure gauge pressure and absolute pressure in MKS and SI units.
65	Pipe fitting flanges, unions, valves etc.	Piping materials and specifications of W.I. & Steel pipes. Pipe threads pipe fittings, Specification of fittings	Design consideration of pipes, longitudinal stress and circumferential stress.
66	Different types of pipes layout systems	-Do-	Calculation of weight of various products (whose drawings are given) & related costs.
67	Different types of pipe joints	Brief description of different types of pipe joints	- Do-
68 & 69	Working drawing of gears such as spur helical bevel & worm worm and worm wheel	Use of gears in transmission of power. Different types of gears. Cast gears and machined gears. Use of odontograph for drawing profile of gears etc.	Gear elements, transmission of power by gear, Velocity ratio simple problems.
70 & 71	Cams with different motions to followers, different types of followers	Use of cams in industries. Types of cam, kinds of motions, displacement diagrams.	Simple problems involving trigonometric functions. Height and Distance problems with

		Terms used in cam. Types of followers.	trigonometrically ratios.
72	Working drawings of Eccentrics. Piston (ICC Engines) steam with the application of tolerances.	Steam engine, important parts such as cylinder , pistons , piston rod or cross head, connecting rod, crank shaft etc.	Density of solids & liquid , simple experimental determinations
73	Working drawings of connecting rods (IC engines) with the application of tolerance	Brief description of Petrol, diesel and gas engines	Specific gravity principal of Archimedes, Relation between specific gravity & density, simple experimental determination.
74	Valve: such as lever safety valve, dead wt safety valve.	Working principles of valves and their description	Experimental determination of equilibrium on Lever, Lever transmission
75	Assembly drawing of a reciprocating pump.	Brief description and function of reciprocating & centrifugal pump and water turbines.	Experimental determination of forces acting on inclined plane.
76	Sketching and drawing of a tail stock. On the spot sketching to be done.	Brief description working principle and function of hydraulic jack, press accumulator, ram etc	Experimental determination of work & friction, co-efficient of frictions.
77	Electrical and electronics symbols and simple wiring diagrams	Electrical units and quantities. Laws of electricity, simple examples of calculation of current voltage, resistance in series and parallel connection (D.C. Circuit)	Experiments on voltage and its measurement series & parallel connections.
78	Detailed drawing of a built up and north light roof truss elevated gallery for a workshop	Structural steel I.S. specification for rolled sections. Structural steel roof trusses, truss joints and supports.	Triangle of forces and parallelogram of forces simple problems.

79	Detailed drawing of milling fixture.	Use of jigs and fixtures, principle of selecting standard bushing	- Do-
80	Drawing of fixture for drilling hole.	Different locating methods clamping devices	Resolution and composition of forces
	Practice in designing a simple drilling jig for drilling holes in a given component.	Machine foundation. Brief treatment of the principle involved and the precaution to be observed.	Representation of forces by vectors, simple problem of lifting, tackle like jib crane, wall crane etc & solution of problem with the aid of vectors.
82.	Different types of gauges, such as plug, snap, thread, taper etc.	Function of gauges, different types of gauges and their uses. Use of templates in industry.	- do -
83.	Sketching of a press tool giving nomenclature of each part. Drawing of dies and punches for the production of simple work pieces.	Limits and limit systems. Types of fit and tolerance IS-919.	Examples on simply supported beams and cantilevers with dead loads uniformly distributed loads. B.M., S.F. diagrams.
84.	Blow off cock and simple carburetor.	Working of blow off cock and simple carburetor.	- do -
85.	Making foundation drawing for machinery section of R.S.I. and beams. Simple plate girder and built up trusses.	Drawing office practice, general arrangements of drawing, and standard method of drawing.	- do -
86.	Sketching and Assembly Drawing of machine Swivet vice and pipe vice.	Numbering of drawing and standard parts. Familiarization with I.S. 696.	- do -
87	- do -	- do -	- do -

88 to 91	(i) Elementary DOS. (Disc Operating System) (ii) Knowledge of Editor (iii) How to install Auto-Cad (iv) How to load Auto-Cad (v) Elementary Command of Auto Cad. (vi) Knowledge window software. (vii) Free hand working practice on Auto-Cad.	(i) What is Computer? General terms used in Computer. (ii) Elementary DOS Commands. (iii) Word processor commands and their uses. (iv) Window command and their uses. (v) Auto Cad Commands and use of different menus of Auto Cad.	
92 to 96	Preparation of detailed drawings from Assembly. Drawings of simple machine parts such as: Tool Post of shaping machine, head stock etc. Valves, non-return and safety valves.	Production of interchangeable parts fits limits, tolerances and familiarization with IS-919 & IS-2709. Different methods of showing machine surfaces on drawings.	
97 & 98	Making working drawing of projects.	Familiarization with: IS-1444 (Drg.Board) IS-1360 (T.Sqr.) IS-1561 (Set Sqr.) IS-696 (Code of Engg.Drg.)	Revision
99.	Industrial cum study tour at least three different types of industries having big drawing and design offices.		
100.	Test	Test	Test
101.	Open discussion on the basis of difficulties and weakness of students as disclosed by the test.		
102.	Revision	Revision	Revision
103.	Revision	Revision	Revision
104.	Final Examination	Final Examination	Final Examination

NOTE :

1) An effort should be made to ensure that the work is done in trade drawing, that the trainees are prepared for the industrial drawing office. The drawing exercises must introduce the trainees to the current industrial techniques. Such as the use of symbols and separate drawings for the various processes like casting, forging, machining. The trainees are required to go through reference books and standard specifications to find dimensional data required to complete drawing. Practice should be given on modern drawing tools and equipments which are used by progressive industrial establishment, like drafting machines, rotoring-ruking pens etc. Practice should be given in measuring components and producing working drawing from the dimensions taken. Trainees should be sent to the workshop to measure and sketch components and then return to their drawing hall to make working drawings.

2) For Allied training according to the syllabus, the facilities available in the institutes should be utilized. The trainees may be rotated according to the schedule prepared by the Group Instructor in consultation with the Instructor of different trades concerned. No additional equipments for allied training have been provided separately. The syllabus given above is a guide for the Instructor and the schedule of training will depend on the facilities available in the Institute concerned.

3) In the syllabus, names of a number of objects to be drawn have been mentioned in various weeks. These are only examples and should be taken as a guide for instruction.

Sr. No.	Name of the tools & equipment as per the syllabus	No. of required for Instructor & Trainees for one Unit as per DGET Norms.
TRAINEES KIT		
1	DRAUGHTSMAN DRAWING INSTRUMENT BOX CONTAINING COMPASSES WITH PENCIL POINT, POINT DIVIDER, INTERCHANGEABLE, DIVIDER SPRING BOW, PEN SPRING BOW LENGTHENING BAR, PEN DRAWING LINER, SCREW INSTRUMENT, TUBE WITH LEADS.	16
2	SCALE SET CARD BOARD IN CASE (METRIC)	16
3	SET SQUARE CELLULOID 45 DEGREE (250x1.5 M.M.) IS : 1561	16
4	SET SQUARE CELLULOID 60 DEGREE (250x1.5 M.M.) IS 1561	16
5	FRENCH- CURVES (SET OF 12 CELLULOID)	16
6	DRAWING BOARD (700X500) IS : 1444	16
7	TEE-SQUARE (700 M.M. BLADE) IS : 1360	16
8	STEEL RULE 300 M.M. (INCHES AND MILLIMETERS)	16
GENERAL OUTFIT		
1	MINI DRAFTER	16
2	ROTORING PENS (0.1 TO 0.7)	2
3	PLASTIC MODELS FOR DEVELOPMENT AND GEOMETRICAL SOLIDS.	2
4	UNIVERSAL DRAFTING MACHINE 1500X1000 M.M. COMPLETE WITH ACCESSORIES.	2
5	PC-AT FOR AUTO-CAD WITH PLOTTER AND DOT-MATRIX PRINTER.	2
6	WOODEN GEOMETRY BOX FOR BLACK-BOARD WORK.	1
7	CHEST OF DRAWERS (8 DRAWERS)	2
8	AMMONIA PRINTING MACHINE (CONTINUOUS TYPE)	1
9	CALIPER OUTSIDE 150 M.M. (SPRING)	8
10	CALIPER INSIDE 150 M.M. (SPRING)	8
11	STENCIL SET COMPLETE IN BOX.	2
12	STEEL TAPE 2 METERS (PULL TYPE)	1
13	RADIUS AND FILLET TEMPLATES.	1
14	DRAWING TABLE	16

15	STOOLS	16
16	PRINT TRIMMER 1050 M.M. CUTTING EDGE	1
17	CHALK BOARD (ROLLTYPE)	1
18	INSTRUCTOR DESK	1
19	INSTRUCTOR CHAIR	1
20	ALMIRAH STEEL.	1