

**CURRICULUM
FOR THE TRADE OF**

DRAUGHTSMAN (MECHANICAL)

UNDER

DUAL TRAINING SCHEME

2017

BY



**GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT & ENTREPRENEURSHIP
DIRECTORATE GENERAL OF TRAINING**

PROPOSED TIME DISTRIBUTION FOR DRAUGHTSMAN (MECHANICAL)
TRADE UNDER DUAL TRAINING SCHEME

BLOCK WITH DURATION	THEORY	PRAC.	WSC/ CAL	EMP. SKILL	ECA, LIB. & OTHERS	REM.
BLOCK – I (12 months /52 Weeks duration) Institute level trg.	510 hrs.	1080 hrs.	170 hrs.	110 hrs.	50 hrs.	160 hrs. Revision & Test
BLOCK – II (09 months /39 weeks duration) Industry level trg.	---	1560 HRS.	---	---	---	---
BLOCK – III (3 months/ 13 Weeks duration) Institute level trg.	100 hrs.	270 hrs. (Practical practice and submission of report related to industry training)	50 hrs.	---	20 hrs.	Last 2 weeks revision & exam.
GRAND TOTAL	610 HRS.	2910 HRS.	220 HRS.	110 HRS.	70 HRS.	240 HRS.

Total duration of training inclusive of Industry & Institute is 2 years (4160 HRS.)

GENERAL INFORMATION FOR INSTITUTE (ITI)

- 1. Name of the Trade** : **DRAUGHTSMAN(MECHANICAL) (DUAL MODE)**
- 2. NCO Code No.** : 3118.0401
- 3. Duration of Craftsmen Training** : Two year (Three Blocks)
- 4. Power Norms** : 3.7 Kw.
- 5. Space Norms** : 64 Sq. Mtrs
- 6. Entry Qualification** : Passed 10th Class with Science and Mathematics under 10+2 system of Education or its equivalent
- 7. Trainees per unit** : 16 (Max. Supernumeraries: 5)
- 8a. Qualification for Instructor** : Degree in Mechanical Engineering from recognized university with one year post qualification experience in the relevant field.
OR
Diploma in Mechanical Engineering from a recognized board of technical education with two year post qualification experience in the relevant field.
OR
NTC/NAC passed in the "Draftsman Mechanical" trade with 3 years post qualification experience.
- 8b. Desirable Qualification** : Preference will be given to a candidate with Craft Instructor certificate (CIC) in Draftsman Mechanical Trade.

Note:

- (i) Out of two Instructors required for the unit of 2(1+1), one must have Degree/Diploma and other must have NTC/NAC qualifications.
- (ii) Instructor qualification for WCS, as per the training manual.

Distribution of training on Hourly basis:

Total hours /week	Trade practical	Trade theory	Work shop Cal. &Sc.	Employability skills	Extra curricular activity
40 Hours	28Hours	6 Hours	2 Hours	2 Hours	2 Hours

SYLLABUS CONTENT WITH TIME STRUCTURE FOR DRAUGHTSMAN (MECHANICAL) TRADE

Block – I

Duration- 12 Months (52 Weeks)

Institute Level Training: -

Sl. No.	Trade practical	Trade theory
1	<p>Importance of trade training, List of tools & Machinery used in the trade.</p> <p>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.</p> <p>Health, Safety and Environment guidelines, legislations & regulations as applicable.</p> <p>Disposal procedure of waste materials like cotton waste, metal chips/burrs etc.</p> <p>Basic safety introduction, Personal protective Equipments(PPE):-</p> <p>Basic injury prevention, Basic first aid, Hazard identification and avoidance, safety signs for Danger, Warning, caution & personal safety message.</p> <p>Preventive measures for electrical accidents & steps to be taken in such accidents.</p> <p>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.</p> <p>Soft Skills: its importance and Job area after completion of training.</p> <p>Introduction of First aid. Operation of electrical mains.</p> <p>Introduction of PPEs. Introduction to 5S concept & its application.</p> <p>Response to emergencies e.g.; power failure, fire, and system failure.</p>
2	Practice in using instruments. Drawing of straight and curved lines, Drawing angles, circles etc.	Nomenclature, description and use of drawing instruments & various equipments used in drawing office. Their care and maintenance.
3	Layout of drawing sheet as per B.I.S. Different types of lines & their uses in drawing.	Lay out of a drawing sheet as per B.I.S. Lines and their meanings
4	Block letters & numerals. Single & double stroke ratio 7: 4, 5: 4	Type of lettering proportion and spacing of letters and words.
5	Plane geometrical construction triangle, polygons, Circles.	Terms & definitions- polygons and circles.
6	Construction of ellipse, parabola & hyperbola, construction of involutes, cycloid curves, helix & spiral.	Definition of ellipse, parabola, hyperbola, different methods of their construction. Definition & method of drawing involutes cycloid curves, helix & spiral.
7	Dimensioning technique PRACTICE ON COMPUTER. Practice on two useful software via MS- Word & MS Excel, MS Office & operating system.	Terminology – feature, functional feature, functional dimension, datum dimension, Principles. Units of dimensioning, system of dimensioning.

8	Draw orthographic projection of points and lines and plane figures (manually).	Planes and their normal, projections.
9	Draw orthographic projection of solids-prism, cones, pyramids and their frustums (manually).	Projections and orthographic projection. First angle and third angle projection. Principal of orthographic projection. Projection of solids like prism, cones, pyramids and frustums in various position.
10	Free hand sketching, practice in drawing free hand straight lines, curved lines polygons, circles, elliptical figures with irregular contour & free hand sketch of a machine part such as tool post of a Lathe. Intensive free hand sketching of m/c parts along with projection of simple machine parts in 1 st angle projection. Projection of machine parts drawn in the above exercise in 3rd angle projection.	Importance of free hand sketching, machine drawing. Material and equipment required in sketching.
11	Draw Scales – plain scales, diagonal scales. Comparative scales, venire scale & scales of Chords	Constructions of different types of scales, their appropriate uses, Principle of R.F, diagonal & vernier.
12	Sectional views – Different types of section.	Importance sectional views. Types of sectional views & their uses. Parts not shown in section.
13	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.
14	Conventional sings and symbols. Different types of section lines and abbreviations as per B.I.S. Folding of prints for filing Cabinets or binding as per SP: 46-2003	section lines of different materials, conventional signs, symbols & abbreviations, hatching.
15	Development of surfaces bounded by plane. Development of surfaces bounded by plane of revolution. Development of an oblique cone with elliptical base etc. Development of solids intersecting each other.	Definition of surface development, its need in industry & different method of developing the surfaces.
16	Interpenetration of two prisms with their axes intersecting at right angles. Interpenetration of cone cylinder, & pyramids intersecting each other.	Definition of Intersection & interpenetration curves. Common method to find out the curve of Interpenetration
17	Interpenetration of prisms with their axis intersecting at an angle. Interpenetration of cones & pyramids with their axes intersecting at an angle.	Solution of problems on interpenetration of prism, cones, & pyramids with their axes intersecting at an angle. Intersection of cylinder.
18	Isometric projection of geometrical solids.	Principle of isometric projection, Difference between Isometric drawing & Isometric projection. Isometric scale. Dimensioning an isometric drawing.

19	Isometric projection of a machine part with irregular faces. Free hand isometric drawing of actual objects. Isometric projection of a simple Journal Bearing.	Different methods of drawing Isometric views. Principle and types of oblique projection. Advantage of oblique projection over isometric projection.
20	Oblique projection of solids and machine parts, perspective projection of solid.	Types of perspective projection Fundamental concept and definition, Location of station point.
21	Screw threads with BIS conventions (free hand sketching as well as with instruments).	Screw threads, terms nomenclature, types of screw thread, proportion and their uses, threads conventions.
22	-----DO-----	Types of nuts & their proportion, uses. Types of bolts and studs, and their proportion, uses. Different types of locking devices. Different types of machine screws, cap screws, set screws and their specification.
23	Locking devices, machine screws caps screw set screw with BIS convention	Different types of foundation bolts.
24	Foundation bolts with BIS convention. Welded joints.	Types of assembly drawing, types of detailed drawing, preparation of bill of materials. Description of Welded Joints and their representation (Actual and Symbolic) Indication of Welding Symbol on drawing as per BIS.
25	Keys, cotters, circlips and pins with BIS Conventions	Purpose, terms, different types of key (Heavy duty and Light duty) and proportions use of cotters, pins and circlips.
26	Types of rivets BIS conventions	Types of fastening materials, types of rivets, their proportions and uses. Types of riveted joints, terms and proportions or riveted joints. Conventional representation
27	To prepare working drawing of riveted structure as per conventional system	Causes of failure of riveted joint efficiency of riveted joints.
28	Types of riveted joints with BIS conventions	Description and application of simple measuring tools, Description of vices, hammers, cold chisel, files, etc. And proper method of using them. Method of using precision measuring instrument such as vernier height gauges.
29	Use of welding symbols, Working drawing of welded Structures.	INTRODUCTION TO: Various Fitting tools, Measuring tools, turning tools, electrical and Electronics symbols and basic tools and machinery used in Electrical. Various types of shapes and their dimensional concept of sheet metal, welding and Forging Operations.
30	Types of nuts and washers, with BIS Convention	Brief Description of milling shaping slotting and planning machines Quick return mechanism of these machines
31	-----DO-----	Name and brief description of common equipment necessary for sheet metal work. Different types and uses of joints employed in sheet metal work.

32	Types of bolts and studs with BIS convention.	Name 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. Safety precautions, Hand tools used for moulding. description, use and care of hand tools
33	-----DO-----	A.C & D.C Motors Generators of common types and their uses Names and brief description of common equipment necessary for sheet metal work Electrical units and quantities. Laws of electricity. Simple examples of calculation of current voltage, resistance in series and parallel connection (D. C. Circuit). Brief description of internal combustion engines, such as cylinder block piston, carburettor spark plug, camshaft, crank shaft, injector fuel pump, etc.
34	Symbols for machining and surface finishes (grades and micron values)	Limits, fit, tolerance. Toleranced dimensioning, geometrical tolerance. Indications of symbols for machining and surface finishes on drawing(grades and micron values) Production of interchangeable parts, geometrical tolerance. Familiarization with IS: 919, IS:2709.
35	-----DO-----	Couplings, necessity of coupling, classification of couplings. Uses and proportion of different types of couplings.
36	Working drawing of couplings (oldham's coupling, claw coupling, cone friction clutch.)	Materials used for couplings.
37	Working drawing of a simple bearing and foot step bearing	Use of a bearing, types of bearing, frictional and anti frictional bearings.
38	Details and assembly drawing of Plummer block.	Material used for frictional bearings. Properties of frictional bearing (sliding bearing) materials.
39	Details and assembly drawing of self aligning bearing (swivel bearing)	Parts of anti frictional bearings (ball, roller, thrust ball, needle & taper roller). Materials and proportion of parts. Difference between frictional and anti frictional bearings. Advantages of anti frictional bearings.
40	-----DO-----	Introduction to computer, windows
41	Drawing in AutoCAD-Related Exercises using Absolute Co-ordinate system, Polar Co-ordinate System and Relative Co-ordinate System,	Introduction to Auto CAD Advantages of using Autocad
42	Exercise using Line, Break, Erase, Undo Commands in CAD.	Absolute Co-ordinate system , Polar Co-ordinate System and Relative Co-ordinate System Create Line, Break, Erase, Undo
43	CAD: Exercise using Line, Break, Erase, Undo commands with Absolute Co-ordinate system, Polar Co-ordinate System and Relative Co-ordinate System.	Create Line, Break, Erase, Undo
44	CAD: Exercise using Trim, Offset, Fillet, Chamfer Commands.	Trim, Offset, Fillet, Chamfer, Arc and Circle commands.

45	CAD: Exercise using Move, Copy, Array, Insert Block, Make Block, Scale, Rotate, Hatch Commands.	Move, Copy, Array, Insert Block, Make Block, Scale, Rotate, Hatch Commands.
46	CAD: Practice using Creating templates, Inserting drawings, Layers and Modify Layers.	Creating templates, Inserting drawings, Layers Modify Layers.
47	CAD: Drawing practice using Dimensioning drawings.	Dimensioning drawings, Creating styles in dimensioning.
48	CAD: Creating styles in dimensioning. Modifying styles in dimensioning.	Modifying styles in dimensioning.
49	CAD: Drawing practice using 3D primitives, Extrude, Revolve command, subtract, union 3D drawing by using User co-ordinate systems. Plotting, Print preview	Introduction to 3D, 3D primitives, Extrude, Revolve command Setting User co-ordinate Systems, Rotating, Plotting, Print preview.
50		Belts-power transmitted by belt. Materials of belts slip and creep Velocity of belt. Arc of contact. Simple exercise in calculation of belt speeds, nos. of belts needed in V-belt drive, velocity, pulley ratio etc. Standard pulleys width of pulley face, velocity ratio chain drive.
51		Piping materials and specifications of W.I. & Steel pipes. Pipe threads. Pipe fittings. Specifications of fittings. Brief description of different types of pipe joints.
52		Use of gears in transmission of power. Different types of gears. Cast gears and machined gears. Use of udomograph for drawing profile of gears etc
53		Use of Cams in industry. Types of cam, kinds of motion, displacement diagrams. Terms used in cam. Types of followers.
54		I.C Engine Brief description of petrol, diesel and gas engines
55		Working principle of valves and their description.
56		Brief description, working principle and function of hydraulic jack, press accumulator, ram etc. Structural Steel B.I.S. Specification for rolled sections. Structural steel roof truss joints and supports. Different locating methods clamping devices.
57		Different locating methods clamping devices. Lay out of Machine foundations. Brief treatment of the principle Involved and the precautions to be observed. Lay out of machine Foundation.

58	Different types of gauges, such as plug, snap, thread, taper etc. Assembly and detail drawing of Tool post of a lathe using Autocad Sketching of a Press Tool giving nomenclature of each part. Drawing of dies & punches for the production of simple work pieces	Function of gauges, different types of gauges and their uses. Use of templates in industry. Related theories. Related theories of press tool with tolerance Working of Blow off cock & simple carburettor
59	Sketching & Assembly Drawing of Tail stock and Revolving centre.	Related Theory Introduction of Rams bottom safety valve Introduction of tool post of shaping machine.
60	Sketching & Assembly Drawing of Machine Swivel vice & pipe vice. Sketching features – applied features – Constraints–Create / Modify – constraints- create a sketch – create a new Part	Numbering of drawings and standard parts. Familiarization with SP:46-2003 Introduction to Solid works User interface - Menu Bar – Command manager – Feature manager – Design Tree – settings on the Default options – suggested settings – key board short cuts. Create the best profile – create a sketch – create a new part
61	Exercise Using Copy & Paste, filleting, chamfering and Editing a feature definition.	Extrude bosses and cuts, add fillets, and chamfer changing dimensions. Revolved features using axes, circular patterning changes and Rebuild problems. Bottom up assembly modelling
62	Creating ribs, mirror pattern, the Hole wizard, create part configurations, Part design tables, Inset Design Table, Inset new design table.	Components configuration in an assembly, Insert subassemblies, Interference detection.
63	Exercise on simple Drill jig – Part model – assembly-detailing	Drawings & Detailing, create drawing sheets, Add drawing items, Named views, std. 3 views, auxiliary views, section views, detail views. Drawings & Detailing, create drawing sheets, Add drawing items, Named views, standard 3 views, auxiliary views, section views, detail views.
64	-----DO -----	Exploded views – Configuration manager, Animation controller. Annotating Holes and Threads, Creating Centrelines, symbols and leaders, Simulation
65	Exercise on Screw jack – Part model – assembly-detailing.	Revision

NOTE: - Maximum uses of video demonstration and other IT based teaching aids may be adopted to deliver the theoretical knowledge.

Syllabus for

EMPLOYABILITY SKILLS

GENERAL INFORMATION
(Employability Skill)

1. **Name of the subject:** EMPLOYABILITY SKILLS
2. **Hours of Instruction:** 110 Hrs.
3. **Examination:** The examination will be held at the end of the training.
4. **Instructor Qualification:**

MBA OR 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 Studies Instructors duly trained in Employability Skills from DGET institutes

5. **Instructor:**

One full time regular instructor shall be engaged on every 240 numbers of trainees for teaching the subject "Employability Skills". One additional full time regular instructor would be required on increase in every 240 trainees. Wherever the trainees are less than 240 or part thereof, a part-time instructor may be engaged to teach the subject.

ALLOTMENT OF TIME AND MARKS AMONG THE TOPICS

Sl. No.	Topics	Allotted Hours	Marks Allotted	To be covered in
1.	English Literacy	20 hrs.	9	Block - I
2.	I.T. Literacy	20 hrs.	9	
3.	Communication Skills	15 hrs.	7	
	SUB TOTAL:	55	25	
4.	Entrepreneurship Skills	15 hrs.	6	
5.	Productivity	10 hrs.	5	
6.	Occupational safety , health and Environment Education	15 hrs.	6	
7.	Labour Welfare Legislation	05 hrs.	3	
8.	Quality Tools	10 hrs.	5	
	Sub Total:	55	25	
	TOTAL	110 hrs.	50	

Detail of Syllabus

1. English Literacy	
Hours of Instruction: 20 Hrs.	Marks Allotted: 09
Pronunciation	Accentuation (mode of pronunciation) on simple words, Diction (use of word and speech)
Functional Grammar	Transformation of sentences, Voice change, Change of tense, Spellings.
Reading	Reading and understanding simple sentences about self, work and environment
Writing	Construction of simple sentences Writing simple English
Speaking / Spoken English	Speaking with preparation on self, on family, on friends/ classmates, on know, picture reading gain confidence through role-playing and discussions on current happening job description, asking about someone's job habitual actions. Cardinal (fundamental) numbers ordinal numbers. Taking messages, passing messages on and filling in message forms Greeting and introductions office hospitality, Resumes or curriculum vita essential parts, letters of application reference to previous communication.
2. I.T. Literacy	
Hours of Instruction: 20 Hrs.	Marks Allotted: 09
Basics of Computer	Introduction, Computer and its applications, Hardware and peripherals, Switching on-Starting and shutting down of computer.
Computer Operating System	Basics of Operating System, WINDOWS, The user interface of Windows OS, Create, Copy, Move and delete Files and Folders, Use of External memory like pen drive, CD, DVD etc, Use of Common applications.
Word processing and Worksheet	Basic operating of Word Processing, Creating, opening and closing Documents, use of shortcuts, Creating and Editing of Text, Formatting the Text, Insertion & creation of Tables. Printing document. Basics of Excel worksheet, understanding basic commands, creating simple worksheets, understanding sample worksheets, use of simple formulas and functions, Printing of simple excel sheets
Computer Networking and 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), Meaning of World Wide Web (WWW), Web Browser, Web Site, Web page and Search Engines. Accessing the Internet using Web Browser, Downloading and Printing Web Pages, Opening an email account and use of email. Social media sites and its implication. Information Security and antivirus tools, Do's and Don'ts in Information Security, Awareness of IT - ACT, types of cyber crimes.

3. Communication Skills	
Hour of Instruction: 15 Hrs.	Marks Allotted: 07
Topic	Contents
Introduction to Communication Skills	Communication and its importance
	Principles of Effective communication
	Types of communication - verbal, non verbal, written, email, talking on phone.
	Non verbal communication -characteristics, components-Para-language
	Body - language
	Barriers to communication and dealing with barriers. Handling nervousness/ discomfort.
Listening Skills	Listening-hearing and listening, effective listening, barriers to effective listening guidelines for effective listening.
	Triple- A Listening - Attitude, Attention & Adjustment.
	Active Listening Skills.
Motivational Training	Characteristics Essential to Achieving Success
	The Power of Positive Attitude
	Self awareness
	Importance of Commitment
	Ethics and Values
	Ways to Motivate Oneself Personal Goal setting and Employability Planning.
Facing Interviews	Manners, Etiquettes, Dress code for an interview
	Do's & Don'ts for an interview
Behavioral Skills	Problem Solving
	Confidence Building
	Attitude
4. Entrepreneurship Skills	
Hour of Instruction: 15 Hrs.	Marks Allotted: 06
Concept of Entrepreneurship	Entrepreneur - Entrepreneurship - Enterprises:- Conceptual issue Entrepreneurship vs. management, Entrepreneurial motivation. Performance & Record, Role & Function of entrepreneurs in relation to the enterprise & relation to the economy, Source of business ideas, Entrepreneurial opportunities, The process of setting up a business.
Project Preparation & Marketing analysis	Qualities of a good Entrepreneur, SWOT and Risk Analysis. Concept & application of PLC, Sales & distribution Management. Different Between Small Scale & Large Scale Business, Market Survey, Method of marketing, Publicity and advertisement, Marketing Mix.
Institutions Support	Preparation of Project. Role of Various Schemes and Institutes for self-employment i.e. DIC, SIDA, SISI, NSIC,

	SIDO, Idea for financing/ non financing support agencies to familiarizes with the Policies /Programmes & procedure & the available scheme.
Investment Procurement	Project formation, Feasibility, Legal formalities i.e., Shop Act, Estimation & Costing, Investment procedure - Loan procurement - Banking Processes.
5. Productivity	
Hour of Instruction: 10 Hrs. Marks Allotted: 05	
Benefits	Personal / Workman - Incentive, Production linked Bonus, Improvement in living standard. Industry Nation.
Affecting Factors	Skills, Working Aids, Automation, Environment, Motivation How improves or slows down.
Comparison with developed countries	Comparative productivity in developed countries (viz. Germany, Japan and Australia) in selected industries e.g. Manufacturing, Steel, Mining, Construction etc. Living standards of those countries, wages.
Personal Finance Management	Banking processes, Handling ATM, KYC registration, safe cash handling, Personal risk and Insurance.
6. Occupational Safety, Health and Environment Education	
Hour of Instruction: 15 Hrs. Marks Allotted: 06	
Safety & Health	Introduction to Occupational Safety and Health importance of safety and health at workplace.
Occupational Hazards	Basic Hazards, Chemical Hazards, Vibroacoustic Hazards, Mechanical Hazards, Electrical Hazards, Thermal Hazards. Occupational health, Occupational hygienic, Occupational Diseases/ Disorders & its prevention.
Accident & safety	Basic principles for protective equipment. Accident Prevention techniques - control of accidents and safety measures.
First Aid	Care of injured & Sick at the workplaces, First-Aid & Transportation of sick person
Basic Provisions	Idea of basic provision of safety, health, welfare under legislative of India.

Ecosystem	Introduction to Environment. Relationship between Society and Environment, Ecosystem and Factors causing imbalance.
Pollution	Pollution and pollutants including liquid, gaseous, solid and hazardous waste.
Energy Conservation	Conservation of Energy, re-use and recycle.
Global warming	Global warming, climate change and Ozone layer depletion.
Ground Water	Hydrological cycle, ground and surface water, Conservation and Harvesting of water
Environment	Right attitude towards environment, Maintenance of in -house environment
7. Labour Welfare Legislation	
Hour of Instruction: 05 Hrs. Marks Allotted: 03	
Welfare Acts	Benefits guaranteed under various acts- Factories Act, Apprenticeship Act, Employees State Insurance Act (ESI), Payment Wages Act, Employees Provident Fund Act, The Workmen's compensation Act.
8. Quality Tools	
Hour of Instruction: 10 Hrs. Marks Allotted: 05	
Quality Consciousness	Meaning of quality, Quality characteristic.
Quality Circles	Definition, Advantage of small group activity, objectives of quality Circle, Roles and function of Quality Circles in Organization, Operation of Quality circle. Approaches to starting Quality Circles, Steps for continuation Quality Circles.
Quality Management System	Idea of ISO 9000 and BIS systems and its importance in maintaining qualities.
House Keeping	Purpose of House keeping, Practice of good Housekeeping.
Quality Tools	Basic quality tools with a few examples

Tools & Equipments for Employability Skills:

Sl. No.	Name of the Equipment	Quantity
1	Computer (PC) with latest configurations and Internet connection with standard operating system and standard word processor and worksheet software	10 nos.
2	UPS - 500Va	10 nos.
3	Scanner cum Printer	1 no.
4	Computer Tables	10 nos.
5	Computer Chairs	20 nos.
6	LCD Projector	1 no.
7	White Board 1200mm x 900mm	1 no.

* Note: Above Tools & Equipments not required, if Computer LAB is available in the institute.

Syllabus for

Workshop Calculation & Science

GENERAL INFORMATION
(Workshop Calculation & Science)

1. **Name of the subject :** WORKSHOP CALCULATION & SCIENCE
2. **Hours of Instruction:** 220 hrs.
3. **Examination:** The examination for the subject will be held at the end of training.
4. **Instructor Qualification:** Degree in Engineering with two years experience OR
Diploma in Engineering with one year experience
5. **Desirable:** Craft Instructor Certificate in RoD & A course under NCVT.
6. **Instructor:**

One full time instructor is required for 144Engineering seats sanctioned in the institute. Additional instructor will be required on increase in every 144 students.

For seats less than 144, the instructor may be out sourced/ hired on contract basis.

SYLLABUS FOR WORKSHOP CALCULATION AND SCIENCE

(Total duration – 220 hrs.)

Topic No	Workshop Calculation	Workshop Science
1.	Unit: Systems of unit- FPS, CGS, MKS/SI unit, unit of length, Mass and time, Conversion of units	Material Science : properties -Physical & Mechanical, Types -Ferrous & Non-Ferrous, difference between Ferrous and Non-Ferrous metals, introduction of Iron, Cast Iron, Wrought Iron, Steel, difference between Iron and Steel, Alloy steel, carbon steel, stainless steel, Non-Ferrous metals, Non-Ferrous Alloys.
2.	Fractions : Fractions, Decimal fraction, L.C.M., H.C.F., Multiplication and Division of Fractions and Decimals, conversion of Fraction to Decimal and vice versa. Simple problems using Scientific Calculator.	Mass .Weight and Density : Mass, Unit of Mass, Weight, difference between mass and weight, Density, unit of density, specific gravity of metals.
3.	Square Root: Square and Square Root, method of finding out square roots, Simple problem using calculator.	Speed and Velocity: Rest and motion, speed, velocity, difference between speed and velocity, acceleration, retardation, equations of motions, simple related problems.
4.	Ratio & Proportion : Simple calculation on related problems.	Work, Power and Energy: work, unit of work, power, unit of power, Horse power of engines,
5.	Percentage : Introduction, Simple calculation. Changing percentage to decimal and fraction and vice-versa.	mechanical efficiency, energy, use of energy, potential and kinetic energy, examples of potential energy and kinetic energy.
6.	Algebra : Addition, Subtraction, Multiplication, Division, Algebraic formula, Linear equations (with two variables).	Heat & Temperature: Heat and temperature, their units, difference between heat and temperature, boiling point, melting point, scale of temperature, relation between different scale of temperature, Thermometer, pyrometer, transmission of heat, conduction, convection, radiation.
7.	Mensuration : Area and perimeter of square, rectangle, parallelogram, triangle, circle, semi circle, Volume of solids - cube, cuboid, cylinder and Sphere. Surface area of solids -cube, cuboid, cylinder and Sphere.	Basic Electricity: Introduction, use of electricity, how electricity is produced, Types of current_ AC, DC, their comparison, voltage, resistance, their units. Conductor, insulator, Types of connections - series, parallel, electric power, Horse power, energy, unit of electrical energy.
8.	Trigonometry: Trigonometrical ratios, measurement of angles. Trigonometric tables	Levers and Simple Machines: levers and its types. Simple Machines, Effort and Load, Mechanical Advantage, Velocity Ratio, Efficiency of machine, Relationship between Efficiency, velocity ratio and Mechanical Advantage.
9.	- Geometrical construction & theorem: division of line segment, parallel lines, similar	- Forces definition. - Compressive, tensile, shear forces and

	angles, perpendicular lines, isosceles triangle and right angled triangle.	simple problems. -Stress, strain, ultimate strength, factor of safety. -Basic study of stress-strain curve for MS.
10.	- Area of cut-out regular surfaces: circle and segment and sector of circle.	- Temperature measuring instruments. Specific heats of solids & liquids.
11.	- Area of irregular surfaces. - Application related to shop problems.	- Thermal Conductivity, Heat loss and heat gain.
12.	- Volume of cut-out solids: hollow cylinders, frustum of cone, block section. - Volume of simple machine blocks.	- Average Velocity, Acceleration & Retardation. - Related problems.
13.	- Material weight and cost problems related to trade.	- Circular Motion: Relation between circular motion and Linear motion, Centrifugal force, Centripetal force
14.	- Finding the value of unknown sides and angles of a triangle by Trigonometrical method.	- Friction- co-efficient of friction, application and effects of friction in Workshop practice. Centre of gravity and its practical application.
15.	- Finding height and distance by trigonometry.	- Magnetic substances- natural and artificial magnets. - Method of magnetization. Use of magnets.
16.	- Application of trigonometry in shop problems. (viz. taper angle calculation).	- Electrical insulating materials. - Basic concept of earthing.
17.	Graph: - Read images, graphs, diagrams - bar chart, pie chart. - Graphs: abscissa and ordinates, graphs of straight line, related to two sets of varying quantities.	- Transmission of power by belt, pulleys & gear drive. - Calculation of Transmission of power by belt pulley and gear drive.
18.	Simple problem on Statistics: - Frequency distribution table - Calculation of Mean value. - Examples on mass scale productions. - Cumulative frequency -Arithmetic mean	- Heat treatment and advantages
19.	Acceptance of lot by sampling method (within specified limit size) with simple examples (not more than 20 samples).	Concept of pressure - units of pressure, atmospheric pressure, absolute pressure, gauge pressure -gauges used for measuring pressure
20.		Introduction to pneumatics & hydraulics systems.

BLOCK – II

DURATION: 09 MONTHS (39 weeks)(1560 HRS.)

Industry level training

BROAD LEARNING TO BE COVERED IN INDUSTRY FOR DRAUGHTSMAN (MECHANICAL) TRADE:

- 1. Safety and best practices /Basic Industrial Culture (5S, KAIZEN, etc.)**
- 2. Record keeping and documentation**

DETAILS OF PRACTICAL SKILLS TO BE COVERED DURING INDUSTRY TRAINING FOR DRAUGHTSMAN (MECHANICAL) TRADE

Duration of training: - 09 Months

Actual training will depend on the existing facilities available in the establishments.

The candidate should be competent to execute following operation/ skills after completion of the industrial training: -

1. Safety and best practices and Basic Industrial culture.
2. Prepare different types of documentation and record keeping as per industrial standard.
3. Oblique projection of solids and machine parts perspective projection of solid.
4. Working drawing of(muff coupling, flanged coupling, friction grip coupling, pin type flexible coupling, universal coupling) couplings.
5. Auto CAD main Menu, screen menu, command line, model space and layout space.
6. 3DModeling/Inventor: Create a new assembly, Insert components into an assembly, Add mates (degree of freedom).
7. 3DModeling/Inventor: Components configuration in an assembly, Insert subassemblies, Interference detection.
8. 3DModeling/Inventor: Driving dimensions, Bill of materials, Driven (Reference) Dimensions, Annotations, Alternate position view. Drawings & Detailing, create drawing sheets, Add drawing items, Named views, standard 3 views, auxiliary views, section views, detail views.
9. 3DModeling/Inventor: Reattach and replace dimensions, Edit sketch, Edit sketch plane, Edit definition.
10. 3DModeling/Inventor: Difference between sweep and loft Using library features.
11. 3DModeling/Inventor: Annotating Holes and Threads, Creating Centrelines, symbols and leaders, Simulation
12. 3DModeling/Inventor: Introduction to plot & Different ways of plotting.

Theory to be covered during Industrial training:-

1. Autodesk Inventor-user interface
2. Create simple solid models-Part Modeling Basics
3. Understand basic parametric modeling procedure
4. Crating 2D drawings, edit drawing sheet, generating views, creating center marks, centerlines, retrieving dimensions.
5. Creating 3-D sketches, sweep feature, along curve pattern, freeform box
6. Adding threads, creating face fillet, variable radius fillet, shell model, boss feature, lip feature, grill feature.
7. Edit components in place - Component Settings dialog box
8. Sheet metal modeling – setting parameters, creating different features.
9. Top-Down Assembly and Motion Simulation
10. Use of dynamic view commands.
11. Create and edit parametric dimensions and annotation.

SOLIDWORKS SOFTWARE

1. Different types of pulleys, drives, valves, blow off cock, simple carburettor and pumps drawing with assembly.
2. Hydraulic and pneumatic conventional sign and symbols, structural steel roof truss joints.
3. Detailed drawing of drilling jig, milling fixture, Rams bottom safety valve, Tool post of shaping machine, Types of gears and CAM-FOLLOWER.
4. Working drawing of I.C engines with application of tolerance.
5. Different types of pipe joints and layouts

Theory on Solidworks:

1. Introduction to Solidworks
2. User interface, task pans, manager panels and settings
3. Familiar with feature manager, design tree, property manager, configuration manager, Dim Xpert manager, display manager
4. Create a sketch and create a new part
5. Familiar with extrude boss /base, extrude cut, fillet, chamfer and changing dimension
6. Knowledge of revolved features, circular patterning, changes and rebuild process and bottom up assembly modelling.
7. Components configuration in an assembly, subassembly, interference detection
8. Create drawing sheets, detailing, add items, named views, 3-views, auxiliary views, section views, detailed views.
9. Exploded view, animation controller, annotating holes and threads.
10. Creating center lines, symbols and leaders, simulation.

NOTE: -

1. In addition to the above mentioned skills/ operations industry may impart training on any other skills/ operations related to the trade.
2. All the operations/ skills indicated above related to milling machine may be executed both in conventional and CNC machine.
3. Utility jobs-such as actual machine parts-components, accessories etc. should be given to trainees for machining
4. Assignment should be planned so that the trainees may spend 20% of the total time of production type of work (using gauges, templates, fixture etc.) for developing their skill and confidence about manufacturing which will help ever in self-employment, if found necessary in the future.

BLOCK – III

DURATION: 3 months (13 weeks)

Institute level training

For last three months candidates will be engaged in following works: -

1. Revision of theoretical components covered during Block – I.
2. Practical practice and report submission
3. Preparing candidate to face interview, preparation of bio-data, awareness about different jobs in the related field and grooming to be an entrepreneur.
4. Self study and final AITT examination

Note:-

1. The training may be conducted in Block mode i.e. few months in ITI & few in Industry.
2. The training may be conducted in flexible mode i.e. few days of a week in ITI & few days in Industry.
3. Nine months industrial training is mandatory.
4. Last three months of training in ITI is mandatory.
5. No admission of trainees without signing MOU with industry by the Institute (ITI).
6. To sign MOU with ITI, industry must ensure the training facility should be available to impart different skill sets as indicated in Block-II. At least 60% of total skill set in Block-II for DRAUGHTSMAN (MECHANICAL) to be covered in industry.
7. If the industry ensures delivery of skill training as per Sl. 6 then 2nd MOU is not necessary.
8. However, Industry should ensure 100% skill training indicated in Block-II & necessary arrangement to be made to cover training on rest skill set (beyond the % indicated in sl.6) in collaboration with any other related industries. Extensive use of E-learning process may also be adopted.

TRADE: DRAUGHTSMAN (MECHANICAL) (Dual mode)
LIST OF TOOLS & EQUIPMENTS FOR 16 TRAINEES

A: Trainee's Tool Kit:

Sl. No.	Name of the items	Quantity
1.	Draughtsman drawing instrument box containing Compasses with pencil point, point driver, interchangeable, Divider pen point interchangeable, divider spring bow, pen Spring bow lengthening bar, pen drawing liner, screw driver Instrument, tube with lead.	17 set
2.	Set square celluloid 45° (250 X 1.5 mm)	17 Nos
3.	Set square celluloid 30°-60° (250 X 1.5 mm)	17 Nos
4.	French-curves (set of 12 celluloid)	17 set
5.	Mini drafter	17 Nos

B. General Machinery & Shop Outfit

Sl. No.	Name & Description of Machine	Quantity
1.	Chest of drawer 8 drawers(Standard)	2 Nos.
2.	Draughtsman table	17 Nos.
3.	Drawing board (700mm x500 mm) IS: 1444	17 Nos.
4.	Draughtsman stool	17 Nos.
5.	Computer Latest version compatible for running CAD software, preloaded with windows and 20" colour Monitor.	8 Nos
6.	Sever (True dedicated sever)	1 No.
7.	Software: MS- office latest version, CAD with latest Licensed version. [Optional software- Latest Version of SOLIDWOKS, AUTODESK INVENTOR, CATIA & PRO-E (CREO-2)]	8 users
8.	Plotter (Max. A0 size)	1 No.
9.	Laser Jet printer latest model	1 No.
10.	UPS - 5 KVA	2 Nos.
11.	White Board for using LCD projector (optional)	1 No.
12.	Instructor Table	1 No.
13.	Instructor Chair	2 Nos.
14.	Almirah steel	1 No.
15.	3D Visualiser	1 No.
16.	Computer table	8 Nos.
17.	Computer chairs/stool	17 Nos.
18.	Table for server, printers	1 No. each
19.	LCD projector /OHP	1 No.
20.	External storage device (8 GB)	2 Nos.

Format for Internal Assessment

Name & Address of the Assessor :						Year of Enrollment :								
Name & Address of ITI (Govt./Pvt.) :						Date of Assessment :								
Name & Address of the Industry :						Assessment location: Industry / ITI								
Trade Name :			Block:			Duration of the Trade/course:								
Operation/Skill:														
Sl. No	Maximum Marks (Total 100 Marks)		15	5	10	5	10	10	5	10	15	15	Total internal assessment Marks	Result (Y/N)
	Candidate Name	Father's/Mother's Name	<i>Safety consciousness</i>	<i>Workplace hygiene</i>	<i>Attendance/Punctuality</i>	<i>Ability to follow Manuals/Written instructions</i>	<i>Application of knowledge</i>	<i>Skills to handle tools & equipment</i>	<i>Economical use of materials</i>	<i>Speed in doing work</i>	<i>Quality in workmanship</i>	<i>VIVA</i>		
1														
2														

LIST OF TRADE COMMITTEE MEMBERS

Sl. No.	Name & Designation	Organisation with address	Remarks
1.	R. K. Pathak, Director (T)	DGT, MSDE, New Delhi	Chairman
2.	L. K. Mukherjee, DDT	CSTARI, Kolkata	Member
3.	R. N. Manna, Training Officer	CSTARI, Kolkata	Member
4.	Prasoon Kr. Ghosh, Sr. D'man	CSTARI, Kolkata	Member
5.	Amar G. Prabhu, Principale	Don Bosco ITI, Kurla	Member
6.	P. C. Bhandari, Principal	J K Institute of Technology	Member
7.	Asheesh Kr. Gupta, GM (Production)	J K Cement, Nimbahara	Member
8.	Madhuri H. Kamble, Draughtsman Instructor	Don Bosco ITI	Member
9.	Mukesh J. Patil, Draughtsman Instructor	Don Bosco ITI	Member