

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

**“DRAUGHTSMAN (MECHANICAL)”**  
**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** : **DRAUGHTSMAN(MECHANICAL)**
2. **NCO Code No.** : 030.40
3. **Duration of Craftsmen Training:** Two year (Four semesters each of six months duration)
4. **Power Norms** : 3.7 Kw.
5. **Space Norms** : 64 Sq. Mtrs
6. **Entry Qualification** : Passed 10<sup>th</sup> Class with Science and Mathematics under 10+2 system of Education or its equivalent
7. **Trainees per unit** : 20

**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 same or relevant trade with 3 years post qualification experience.

**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 12<sup>th</sup> / 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.	Employability skills	Extra curricular activity
40 Hours	28Hours	6 Hours	2 Hours	2 Hours	2 Hours

## **COURSE INFORMATION**

### **1. Introduction:**

- This course is meant for the candidates who aspire to become a professional draughtsman .

### **2. Terminal Competency/Deliverables:**

After successful completion of this course the trainee shall be able to perform the following skills with proper sequence.

1. Trainees will work as a junior draughtsman in industry
2. Prepare drawing, design new parts ,assembly ,details ,sections, drawing
3. Knowledge in CAD/CAM.
4. Knowledge of Technical English terms used in industry.

### **3. Employment opportunities:**

On successful completion of this course, the candidates shall be gainfully employed in the following industries:

1. Production & Manufacturing industries.
2. Structural Fabrication like bridges, Roof structures, Building & construction.
3. Automobile and allied industries
4. Service industries like road transportation and Railways.
5. Ship building and repair
6. Infrastructure and defence organisations
7. In public sector industries like BHEL, BEML, NTPC, etc and private industries in India & abroad.
8. 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.
- On successful completion of the course trainees can opt for CITS course.

## SYLLABUS FOR THE TRADE OF DRAUGHTSMAN (MECHANICAL)

### First Semester

**(Semester Code no. DMM - 01)**

**Duration : Six Month**

Week no	Trade practical	Trade theory
1	<p>Importance of trade training, List of tools &amp; Machinery used in the trade.</p> <p>Health &amp; Safety: Introduction to safety equipments and their uses. Introduction of first aid, operation of Electrical mains.</p> <p><b>Occupational Safety &amp; Health</b>  <b>Importance of housekeeping &amp; good shop floor practices.</b>                      Health, Safety and Environment guidelines, legislations &amp; 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 &amp; personal safety message.                      Preventive measures for electrical accidents &amp; 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. <b>Soft Skills: its importance and Job area after completion of training.</b>                      Introduction of First aid. Operation of electrical mains. Introduction of PPEs. Introduction to 5S concept &amp; its application.                      Response to emergencies eg; 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	Terminology – feature, functional feature, functional dimension, datum dimension, principles. Units of dimensioning, system of dimensioning, Method of dimensioning & common features.
8	Projection of points and lines. Projection of plane figures.	Planes and their normal, projections.

9-10	Projection of solids- prism, cones, pyramids and frustums.	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.
11	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 <sup>st</sup> angle projection. Projection of machine parts drawn in the above exercise in 3 <sup>rd</sup> angle projection.	Importance of free hand sketching, machine drawing. Material and equipment required in sketching.
12	Scale- plain, scales, diagonal scales. Comparative scales, vernier scale & scales of chords	Constructions of different types of scales, their appropriate uses, Principle of R.F, diagonal & vernier.
13	Sectional views – Different types of section.	Importance sectional views. Types of sectional views & their uses. Parts not shown in section.
14	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.
15	Conventional signs 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.
16-17	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 development, its need in industry & different method of developing the surfaces.
18	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
19	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.
20	Isometric projection of geometrical solids.	Principle of isometric projection, Difference between Isometric drawing & Isometric projection. Isometric scale. Dimensioning an isometric drawing.
21	Isometric projection of a machine part with irregular curves. Free hand isometric	Different methods of drawing Isometric views. Principle and types of oblique projection.

	drawing of actual objects. Isometric projection of a simple Journal Bearing.	Advantage of oblique projection over isometric projection.
22	Oblique projection of solids and machine parts perspective projection of solid.	Types of perspective projection Fundamental concept and definition, Location of station point.
23-24	Revision	
25	Examination	

**SYLLABUS FOR WORKSHOP SCIENCE**  
**SEMESTER-I**

<b>Week No</b>	<b>Workshop Science</b>
1-3	Units & Measurements fundamental and derived units, system of units.
4-8	Introduction to Iron & Steel – its properties & uses. Difference between Iron & Steel.
9-12	Properties and use of non-ferrous metals and its alloy.
13-20	Definition of Various heat treatment processes of Steel and its alloy and advantages
21-22	Units & Measurements fundamental and derived units, system of units.
23-25	<b>Revision</b>
26	<b>Examination</b>

**SYLLABUS FOR CALCULATION**  
**SEMESTER-I**

<b>Week No</b>	<b>Workshop Calculation</b>
1-3	Fractions-Common, fraction, Decimal fraction
4-6	Solving problems percentage, ratio and proportion
7-9	Algebra – addition, subtraction, multiplication and division.
10-12	Algebra – factors & factorization, fractions.
13-16	Algebra- solving of simple equations, quadratic equations & simultaneous equation.
17-22	Units & Measurements fundamental and derived units, system of units.
23-25	<b>Revision</b>

**SYLLABUS FOR EMPLOYABILITY SKILLS****SEMESTER-I**

<b>1. I.T. Literacy</b>	
<b>Hours of Instruction : 20 Hrs.</b>	<b>Marks Allotted : 20</b>
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.
<b>2. English Literacy</b>	
<b>Hours of Instruction: 15 Hrs.</b>	<b>Marks Allotted : 15</b>
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.
<b>3. Communication skill</b>	

<b>Hours of Instruction: 15 Hrs.</b>		<b>Marks Allotted : 15</b>
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	
Behavioural Skills	- Attitude, Problem Solving, Thinking Skills, Confidence building	



**Second Semester**  
**(Semester Code no. DMM - 02)**  
**Duration: Six Month**

<b>Week no</b>	<b>Trade practical</b>	<b>Trade theory</b>
1	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.
2	Types of nuts and washers, with BIS convention Types of bolts and studs with BIS convention.	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.
3	Locking devices, machine screws caps screw set screw with BIS convention	Different types of foundation bolts.
4	Foundation bolts with BIS convention. Welded joints. Use of welding symbols, Working drawing of welded Structures.	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.
5	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.
6	Types of rivets, types of riveted joints with 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
7	To prepare working drawing of riveted structure as per conventional system	Causes of failure of riveted joint efficiency of riveted joints.
8	ALLIED TRADE- FITTING Use of different types of fitters hand tools, use centre punch different types of files, callipers, hacksaws 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. Method of using precision measuring instrument such as vernier height gauges
9	ALLIED TRADE TURNING Plain turning , stepped turning ,Taper turning with different method  ALLIED TRADE MACHINIST Use of jigs and fixtures Simple operations on milling machine such as plain is milling and key way cutting. Marking out castings and forgings. setting	Safety precaution for lathes Description of parts of Lathe & its accessories. Method of using precision measuring instrument such as inside & outside micrometers, depth gauges , vernier, callipers , dial indicators, slip gauges , sine bars, universal bevel protractor, etc.  Brief Description of milling shaping slotting and planning machines Quick return mechanism of

	up and operation of shaping, slotting and planning machines	these machines
10	ALLIED TRADE : SHEET METAL Use of hand tools such as planishing hammers stakes, mallet, bricks prick punch etc. Development of surfaces.	Name and brief description of common equipment necessary for sheet metal work. Different types and uses of joints employed in sheet metal work.
11	ALLIED TRADE :WELDING & FOUNDRY MAN/MOULDER Use of hand tools used In Gas and in electric welding of object by gas and electric according to drawing  Different types of mould, cores and core dressing, use of moulding tools.	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 molding. The description, use and care of hand tools
12	ALLIED TRADE: ELECTRIAN Familiarization with the measuring instruments machinery and panels used in electrician trade Electrical and Electronic symbols and simple wiring diagrams.  ALLIED TRADE:MMV- I.C ENGINE Familiarization & Identification of different parts of i.e. Engines (Both spark ignition & compression/ignition-2 stroke & 4 stroke engines).	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.
13	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.
14	Working drawing of(muff coupling, flanged coupling, friction grip coupling, pin type flexible coupling, universal coupling) couplings.	Couplings, necessity of coupling, classification of couplings. Uses and proportion of different types of couplings.
15	Working drawing of couplings (oldham's coupling, claw coupling, cone friction clutch.)	Materials used for couplings.
16	Working drawing of a simple bearing and foot step bearing	Use of a bearing, types of bearing, frictional and anti frictional bearings.
17	Details and assembly drawing of Plummer block.	Material used for frictional bearings. Properties of frictional bearing (sliding bearing) materials.
18	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.

19	PRACTICE ON COMPUTER Practice on two useful software via MS-Word & MS Excel, MS Office & operating system	Introduction to computer, windows
20	Introduction to Auto CAD, Auto CAD main Menu, screen menu, command line, model space Drawing layouts, Tool bars, File creation, Save, Open existing drawings, creation of Drawing Sheet as per ISO.	Introduction to Auto CAD Advantages of using Autocad
21	Related Exercises using Absolute Co-ordinate system, Polar Co-ordinate System and Relative Co-ordinate System, Exercise using Line, Break, Erase, Undo commands	Absolute Co-ordinate system , Polar Co-ordinate System and Relative Co-ordinate System Create Line, Break, Erase, Undo
22-23	<b>In-plant training</b> / Project work (work in a team)	
24	Revision	
25	Examination	

**SYLLABUS FOR WORKSHOP SCIENCE**  
**SEMESTER-II**

<b>Week No</b>	<b>Workshop Science</b>
1-8	Definition of mass & weight – their units and differences. Definition of speed, velocity & acceleration and their units. Difference between speed & velocity
9-15	Forces – definition - its unit, compressive, tensile and shear force. Newton’s laws of motion. Laws of gravitation.
16-21	Definition of work, Power & energy – their units’..
22	<b>In-plant training</b> / Project work (work in a team)
23-25	Revision
26	Examination

**SYLLABUS FOR WORKSHOP CALCULATION**  
**SEMESTER-II**

<b>Week No</b>	<b>Workshop Calculation</b>
1-3	Logarithm – its applications in multiplication, division, powers, roots (by using log table) and scientific calculator
4-5	Calculation of mass & weight – their units .
6-8	Calculation of speed, velocity & acceleration and their units.
9-12	Forces – Calculation - its unit, compressive, tensile and shear force. Calculation on Newton's laws of motion.
13-15	Calculations on work, Power & energy.
16-18	Calculation of areas of plane figures formed by the combination of standard figures.
19-21	Calculation of volume & weight
22	<b>In-plant training</b> / Project work (work in a team)
23-25	Revision
26	Examination



**SYLLABUS FOR EMPLOYABILITY SKILLS**  
**SEMESTER-II**

<b>1. Entrepreneurship skill</b>	
<b>Hours of Instruction : 10 Hrs.</b>	
<b>Marks Allotted : 10</b>	
Business & Consumer	Types of business in different trades and the importance of skill, Understanding the consumer, market through consumer behavior, market survey, Methods of Marketing, publicity and advertisement
Self Employment	Need and scope for self-employment, Qualities of a good Entrepreneur (values attitude, motive, etc.), SWOT and Risk Analysis
Govt Institutions	Role of various Schemes and Institutes for self-employment i.e. DIC, SIDBI, MSME, NSIC, Financial institutions and banks.
Initiation Formalities	Project Formation, Feasibility, Legal formalities i.e., Shop Act, Estimation & Costing, Investment Procedure - Loan Procurement - Agencies - banking Process
<b>2. Environment Education</b>	
<b>Hours of Instruction : 10 Hrs.</b>	
<b>Marks Allotted : 10</b>	
Ecosystem	Introduction to Environment, Relationship between Society and Environment, Ecosystem and Factors responsible for destruction.
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 and treatment of water.
Environment	Right attitude towards environment, Maintenance of in-house environment.
<b>3. Occupational Safety, Health &amp; Environment</b>	
<b>Hours of Instruction : 10 Hrs.</b>	
<b>Marks Allotted : 10</b>	
Safety & Health	Introduction to Occupational Safety and Health and its importance at workplace
Occupational Hazards	Occupational health, Occupational hygiene, Occupational Diseases/ Disorders & its prevention
Accident & safety	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 provisions of safety, health, welfare under legislation of India
<b>4. Labour Welfare Legislation</b>	
<b>Hours of Instruction : 10 Hrs.</b>	
<b>Marks Allotted : 10</b>	
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
<b>5. Quality Tools</b>	
<b>Hours of Instruction : 10 Hrs.</b>	
<b>Marks Allotted : 10</b>	
Quality Consciousness	Meaning of quality, Quality Characteristic
Quality Circles	Definition, Advantage of small group activity, objectives of Quality Circle, Roles and Functions of Quality Circles in organisation, 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 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. DMM - 03)**  
**Duration: Six Month**

<b>Week no</b>	<b>Trade practical</b>	<b>Trade theory</b>
1	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
2	CAD: Exercise using Trim, Offset, Fillet, Chamfer Commands.	Trim, Offset, Fillet, Chamfer, Arc and Circle commands.
3	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.
4	CAD: Practice using Creating templates, Inserting drawings, Layers and Modify Layers.	Creating templates, Inserting drawings, Layers Modify Layers.
5	CAD: Drawing practice using Dimensioning drawings.	Dimensioning drawings, Creating styles in dimensioning.
6	CAD: Creating styles in dimensioning. Modifying styles in dimensioning.	Modifying styles in dimensioning.
7	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
8-9	Pulleys-solid, stepped and built up pulleys. Pulleys-pulley with different types of arms, rope pulleys, belt pulleys and drive.	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.
10-11	Pipe fittings, flanges, unions, valves etc. Different types of pipes lay out systems. Different types of pipe joints	Piping materials and specifications of W.I. & Steel pipes. Pipe threads. Pipe fittings. Specifications of fittings. Brief description of different types of pipe joints.
12-14	Working drawing of gears such as spurs 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 udomograph for drawing profile of gears etc
15-16	Cams with different motions to followers, different types of follower Drawing.	Use of Cams in industry. Types of cam, kinds of motion, displacement diagrams. Terms used in cam. Types of followers.

17-19	Working drawings of Eccentrics. Piston, Cross Head, Steam engine (I.C.C. Engines) with the application of tolerances. Using Autocad.	Related theories.
20-21	Working drawing of connecting rods (I.C. Engine) with the application of tolerances. Using CAD.	Brief description of petrol, diesel and gas engines
22	<b>In-plant training</b> / Project work (work in a team)	
23-25	Revision	
26	Examination	

**SYLLABUS FOR WORKSHOP SCIENCE**  
**SEMESTER-III**

Week No	Workshop Science
1-2	Friction – definitions, its effect, types. Laws of friction, angle of friction .
3-6	Statics- Triangle of forces, Parallelogram law of forces, Simple problems, Resolution and composition of forces
7	Centre of gravity(CG) – definitions, CG of regular & irregular shape body. Effect of (CG) centre of gravity in the trade work.
8	Definition of specific gravity, density and relative density. Difference between specific gravity & density.
9-10	Levers – definitions, its types, working principle of levers.
11	Moment of a force. Problems with respect to levers of all the three orders.  Graph.
12-16	Elementary trigonometry - ratios, use of trigonometric tables. Sine & Cosine rule .
17-18	Friction – definitions, its effect, types. Laws of friction, angle of friction and its related calculations.
19	Statics- Triangle of forces, Parallelogram law of forces, Simple problems, Resolution and composition of forces
20-21	Centre of gravity(CG) – definitions, Effect of (CG) centre of gravity in the trade work.  Definition of specific gravity, density and relative density. Difference between specific gravity & density.
22-23	<b>In-plant training</b> / Project work (work in a team)
24-25	Revision
26	Examination

**SYLLABUS FOR WORKSHOP CALCULATION**  
**SEMESTER-III**

Week No	Workshop Calculation
1-3	Elementary trigonometry - ratios, use of trigonometric tables. Sine & Cosine rule and Calculation of height and distance.
4-6	Friction – definitions, its effect, types. Laws of friction, angle of friction and its related calculations.
7	Centre of gravity(CG) – definitions, calculation of CG of regular & irregular shape body. Effect of (CG) centre of gravity in the trade work.
8	Definition of specific gravity, density and relative density. Difference between specific gravity & density. Calculation of density of a body.
9-10	Calculation on different types of Levers.
11	Moment of a force. Problems with respect to levers of all the three orders.  Graph.
12-16	Elementary trigonometry - ratios, use of trigonometric tables. Sine & Cosine rule and Calculation of height and distance.
17-18	Friction – definitions, its effect, types. Laws of friction, angle of friction and its related calculations.
19	Statics- Triangle of forces, Parallelogram law of forces, Simple problems, Resolution and composition of forces
20-21	Calculation of CG of regular & irregular shape body. Effect of (CG) centre of gravity in the trade work.  Calculation of density of a body.
22-23	<b>In-plant training</b> / Project work (work in a team)
24-25	Revision
26	Examination

**Fourth Semester**  
**(Semester Code no. DMM - 04)**  
**Duration: Six Month**

Week no	Trade practical	Trade theory
1 -2	Valve: such as lever safety vale, Dead wt. Safety valve. Assembly drawing of reciprocating pump.	Working principle of valves and their description.
3	Hydraulic and pneumatic conventional signs and symbols	Brief description, working principle and function of hydraulic jack, press accumulator, ram etc.
4	Structural steel roof truss joints.	Structural Steel B.I.S. Specification for rolled sections. Structural steel roof truss joints and supports.
5	Drawing of a drilling Jig	Different locating methods clamping devices.
6	Detailed drawing of a milling fixture	Different locating methods clamping devices.
7	Practice in designing a simple drilling jig for drilling holes in a given component.	Lay out of Machine foundations. Brief treatment of the principle Involved and the precautions to be observed. Lay out of machine Foundation.
8	Different types of gauges, such as plug, snap, thread, taper etc.  Assembly and detail drawing of Tool post of a lathe using Autocad	Function of gauges, different types of gauges and their uses. Use of templates in industry.  Related theories.
9	Sketching of a Press Tool giving nomenclature of each part. Drawing of dies & punches for the production of simple work pieces	Related theories of press tool with tolerance
10	Blow off cock & simple carburettor	Working of Blow off cock & simple carburettor
11	Sketching & Assembly Drawing of Tail stock and Revolving centre.	Related Theory
12	Sketching & Assembly Drawing of Rams bottom safety valve	Related Theory
13	Sketching & Assembly Drawing of Tool post of a shaping machine	Related Theory
14	Sketching & Assembly Drawing of Machine Swivel vice & pipe vice.	Numbering of drawings and standard parts. Familiarization with SP:46-2003
15	Sketching features – applied features – Constraints–Create / Modify – constraints- create a sketch – create a new part	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
16	Exercise Using Copy & Paste, filleting, chamfering and Editing a feature definition. Creating ribs, mirror pattern, the Hole wizard, create part configurations, Part design tables, Inset Design Table, Inset new design table.	Extrude bosses and cuts, add fillets, and chamfer changing dimensions. Revolved features using axes, circular patterning changes and Rebuild problems.
17	Create a new assembly, Insert components into an assembly, Add mates (degree of freedom). Components configuration in an assembly, Insert subassemblies, Interference detection.	Bottom up assembly modeling Components configuration in an assembly, Insert subassemblies, Interference detection.
18	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. Reattach and replace dimensions, Edit sketch, Edit sketch plane, Edit definition.	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.
19	Difference between sweep and loft Using library features. Annotating Holes and Threads, Creating Centrelines, symbols and leaders, Simulation Introduction to plot & Different ways of plotting.	Exploded views – Configuration manager, Animation controller. Annotating Holes and Threads, Creating Centrelines, symbols and leaders, Simulation
20	Exercise on simple Drill jig – Part model – assembly-detailing	Revision
21	Exercise on Screw jack – Part model – assembly-detailing	Revision
22-23	<b>In-plant training</b> / Project work (work in a team)	
24	Revision	
25	Examination	

**SYLLABUS FOR WORKSHOP SCIENCE**  
**SEMESTER-IV**

Week No	Workshop Science
1-2	Heat and temperature, difference, unit of heat and temperature. Sources of heat and its effect on bodies. Types of heat transfer methods and their differences.
3-4	Relation between thermometric scales .
5-6	Stress and strain – definitions, types, Hook’s Law. Ultimate strength and factor of safety.
7-9	Electricity – definitions, Ohm’s Law, electrical power, energy and units.
10	Simple examples of current, voltage and resistance in series and parallel connection.
11-12	Magnetism -introduction, magnetization and magnetic materials. Use of magnets. Laws of attraction and repulsion.
13-14	Bending moment and shear force diagrams
15-16	Definition of machines mechanical advantages (MA), velocity ratio (VR), Basic principle of machines, its efficiency. Relation between friction and efficiency in case of idle machines. Relation between efficiency and load.
17-18	Efficiency of machines - winch, pulleys, wheel and axle, screw jack and its calculations.
19-20	cutting speed and feed of lathe and shaper
21	Heat and temperature, difference, unit of heat and temperature. Sources of heat and its effect on bodies. Types of heat transfer methods and their differences.
22	<b>In-plant training</b> / Project work (work in a team)
23-25	Revision
26	Examination

**SYLLABUS FOR WORKSHOP CALCULATION**  
**SEMESTER-IV**

<b>Week No</b>	<b>Workshop Calculation</b>
1-4	Relation between thermometric scales and their calculations. Calculation of quantity of heat of a body.
5-6	Calculation on Stress and strain , Hook's Law. Ultimate strength and factor of safety.
7-8	Problems on ultimate stress and factors of safety, Poisson's Ratio, Modules of rigidity.
9	Electricity – calculation on Ohm's Law, electrical power, energy and units.
10	Simple examples of calculation of current, voltage and resistance in series and parallel connection.
11-12	Magnetism -introduction, magnetization and magnetic materials. Use of magnets. Laws of attraction and repulsion.
13-14	Bending moment and shear force diagrams
15-16	Calculation on machines mechanical advantages (MA), velocity ratio (VR), Basic principle of machines, its efficiency. Relation between friction and efficiency in case of idle machines. Relation between efficiency and load.
17-18	Efficiency of machines - winch, pulleys, wheel and axle, screw jack and its calculations.
19	Calculation of Power transmitted by belt pulley drive, gear drive
20	Calculation of cutting speed and feed of lathe and shaper
21	Calculation on Heat and temperature.
22	<b>In-plant training</b> / Project work (work in a team)
23-25	Revision
26	Examination



**TRADE: DRAUGHTSMAN (MECHANICAL)**

**LIST OF TOOLS & EQUIPMENTS FOR 20 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.	20+1 set
2.	Set square celluloid 45 <sup>0</sup> (250 X 1.5 mm)	20+1 set
3.	Set square celluloid 30 <sup>0</sup> -60 <sup>0</sup> (250 X 1.5 mm)	20+1 set
4.	French-curves (set of 12 celluloid)	4 nos
5.	Mini drafter	20+1 set
6.	Drawing board (700mm x500 mm) IS: 1444	20+1 set

**B : General Machinery & Shop Outfit**

Sl. No.	Name & Description of Machine	Quantity
1.	Chest of drawer 8 drawers( Standard)	2 Nos.
2.	Draughtsman table	20 Nos.
3.	Draughtsman stool	20 Nos.
4.	Computer Latest version compatible for running CAD software, preloaded with windows and 20" colour Monitor.	8 Nos
5.	Sever (True dedicated sever)	1 No.
6.	Software: MS- office latest version, CAD with latest Licensed version ,Latest Version of SOLIDWOKS, AUTODESK INVENTOR, CATIA & PRO-E (CREO-2)	8 users
7.	Plotter (Max. A0 size)	1 No.
8.	Laser Jet printer latest model	1 No.
9.	UPS - 5 KVA	2 Nos.
10.	White Board for using LCD projector(optional)	1 No.
11.	Instructor Table	1 No.
12.	Instructor Chair	2 Nos.
13.	Almirah steel	1 No.
14.	3D Visualiser	1 No.
15.	Computer table	8 Nos.

16.	Computer chairs	16 Nos.
17.	Table for server, printers	1 No. each
18.	LCD projector /OHP	1 No.
19.	External storage device (8 GB )	2 Nos.

Note: No additional items are required to be provided for the batch working in the second shift except the items from sl. No. 1 to 6 under trainee's kit.

## LIST OF TRADE COMMITTEE MEMBERS

Sl. No.	Name & Designation Sh/Mr/Ms.	Organization	Mentor Council Designation
<b>Members of Sector Mentor council</b>			
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
<b>Mentor</b>			
21.	Sunil Kumar Gupta (Director)	DGET HQ, New Delhi.	Mentor

<b>Members of Core Group</b>			
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
<b>Other industry representatives</b>			
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