



COMPETENCY-BASED CURRICULUM

FOR THE TRADE OF

DRAUGHTSMAN (MECHANICAL)

UNDER

[CRAFTSMAN TRAINING SCHEME (CTS)]

IN SEMESTER PATTERN

**Government of India
Ministry of Skill Development and Entrepreneurship**

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1. INTRODUCTION

India is one of the youngest nations in the world. Our youth are our strength. However, a challenge facing the country is that of skilling our youth as per the demands of the industry. Recognizing the need for quickly coordinating the skill development and entrepreneurship efforts of all concerned stakeholders, the Government of India created the Ministry of Skill Development and Entrepreneurship on 9th November, 2014. To create further convergence between the Vocational Training System through Industrial Training Institutes (ITIs) and the new skill initiatives of the Government, the Training and Apprenticeship Training divisions from the Directorate General of Employment and Training (DGET) under the Ministry of Labour and Employment stand transferred to the Ministry of Skill Development and Entrepreneurship (MSDE) with effect from 16th April, 2015. This move brings over 11000 ITIs and scores of other institutions, and the Apprenticeship and Training divisions, under the Ministry.

The Ministry of Skill Development and Entrepreneurship is an apex organization for the development and coordination of the vocational training including Women's Vocational Training in our country. The Ministry conducts the vocational training programmes through the Craftsmen Training Scheme (CTS), Apprenticeship Training Scheme (ATS), Modular Employable Scheme (MES) under the Skill Development Initiative (SDI) Scheme, and Craftsmen Instructor Training Scheme (CITS) to cater the needs of different segments of the Labour market. The National Council for Vocational Training (NCVT) acts as a central agency to advise Government of India in framing the training policy and coordinating vocational training throughout India. The day-to-day administration of the ITIs rests with the State Governments/ Union Territories.

- Training courses under the CTS is being offered through a network of more than 11000 Government and Private Industrial Training Institutes (ITIs) located all over the country with a total seating capacity of more than 16 Lakhs with an objective to provide skilled workforce to the industry in 126 trades. Skill development courses exclusively for women are also being offered under CTS and other schemes through Government and Private ITIs and Regional Vocational Training Institutes (RVTIs) for Women.
- The Apprentices Act, 1961 was enacted with the objective of regulating the program of apprenticeship training in the industry by utilizing the facilities available within for imparting on-the-job training. The Act makes it obligatory for employers in specified industries to engage apprentices in designated trades to impart on the job training for school leavers, and ITI passed outs to develop skilled manpower for the industry.
- The Ministry is implementing the Employable Scheme (MES) under the Skill Development Initiative Scheme to provide vocational training to people to develop skilled manpower for the industry through a network of Vocational Training Providers (VTPs) located across the country.

Central Staff Training and Research Institute (CSTARI), Kolkata is the nodal institute for the development/revision of curricula under all vocational training schemes of the Ministry. National Instructional Media Institute (NIMI), Chennai is to make available instructional material in various trades for the use of trainees and trainers to ensure overall improvement in the standard of institutional training under the CTS and ATS schemes. The institute is actively involved in the development, production and dissemination of instructional media Packages (IMPs) comprising of books on Trade Theory, Trade Practical, Test/Assignment, and Instructor's Guide.

The National Skills Qualification Framework (NSQF), published in the Gazette of India on 27th December, 2013, is a national framework that aims to integrate general and vocational streams of education and training. The main goal of the NSQF is to focus on competency-based qualifications, which in turn facilitate and enhance transparency, both within and between general and vocational streams. The National Skill Development Agency (NSDA) under the Ministry is responsible for anchoring and implementation of the Framework, by bringing together the key stakeholders through the National Skill Qualifications Committee (NSQC).

The competency-based framework organizes qualifications into ten levels, with the entry level being 1, and the highest level being 10. Each level of the NSQF is described by a statement of learning outcomes in five domains, known as level descriptors. These five domains are (1) Process, (2) Professional knowledge, (3) Professional skill, (4) core skill, and (5) Responsibility. The paradigm shift from learning focused on inputs to an outcome/competency-based education would help in the Recognition of Prior Learning (RPL), and simultaneously enable the alignment of the Indian qualifications with international ones. Government funding is expected to be on a preferential basis for NSQF compliant courses. The NSQF notification provides a Qualification Register, which is the official national database of all qualifications aligned to NSQF levels. Through this Register, learners can expect access to all NSQF compliant qualifications.

The Ministry has set up Mentor Councils to focus on courses under NCVT in various sectors with representation from thought leaders among different stakeholders viz., industries, innovative entrepreneurs who have proved to be game-changers, academic/professional institutions, and champion ITIs for each of the sectors. The Mentor Council for each sector reviews curriculum, admission criteria, course duration, and requirement of trainers and assessment/evaluation systems for the sector on a continuous basis and make recommendations regarding the same. Sector-wise Core Groups are formed to plan and prepare the documentation for the competency-based curricula for the courses under each sector.

2. GENERAL INFORMATION

1	Qualification	DRAUGHTSMAN(MECHANICAL)
2	N.C.O./NOS Code No.	3118.40
3	NSQF Level	Level- 4
4	Duration of the course/qualification	02 Years
5	Entry Qualification	Passed 10 th Class with Science and Mathematics under 10+2 system of Education or its equivalent
6	Trainees per unit	16 (Supernumeraries/Ex-Trainee allowed :5)

Note:

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

Distribution of notional training hours of the training per week:

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

3. COURSE STRUCTURE

Name of the Qualification: **DRAUGHTSMAN (MECHANICAL)**

Total duration of the course: Two Years (Four semesters)

Training duration details:

Course Elements	Hourly Distribution
Professional Skills	2400 hrs
Professional Knowledge	595 hrs
Workshop Calculation & Science	180 hrs
Employability Skills	110 hrs
Extra Curricular Activities	180 hrs
In-plant Training/Project Work	240 hrs
Admission & Examination	160 hrs
Total	3865 hrs.

4. JOB ROLES

4.1 Brief description

Draughtsman, Mechanical prepares drawings of machines, plants, mechanical components, equipments, etc. from sketches, notes, data or sample for purposes of manufacture or repairs. Takes instructions from **Mechanical Engineer** and calculates dimensions as required, from available materials (notes, data etc.) or sample. Draws to scale detailed drawings, assembly drawings, showing plan, elevations, sectional views etc. according to nature of work and operations required. Prints (writes) dimensions, tolerances, material to be used and other details to give clear picture and facilitate understanding. Maintains copies of drawings and makes blue prints. May trace drawings. May design simple mechanical parts. May prepare estimates for materials and labour required. May specialise in making drawings of jigs and tools and be designated accordingly. Create objects on Drawing Space using toolbars, commands and menus in CAD application software and also creating objects on 3D modeling space in CAD viewing printable drawing and plotting them.

Plan and organize assigned work and detect & resolve issues during execution. Demonstrate possible solutions and agree tasks within the team. Communicate with required clarity and understand technical English. Sensitive to environment, self-learning and productivity.

4.2 NOS & QP/NCO Mapping:

NCO-3118.40

NOS:-

- 1. CSC/ N 0402 (Make or modify changes to 2D mechanical engineering drawings using CAD system)**
- 2. CSC/ N 1335 (Use basic health and safety practices at the workplace)**
- 3. CSC/ N 1336 (Work effectively with others)**

5. NSQF LEVEL COMPLIANCE

The Broad Learning outcomes of **Draughtsman (Mechanical)** trade under CTS matches with the Level descriptor at Level 4.

The NSQF level 4 descriptor is given below:

LEVEL	Process required	Professional knowledge	Professional skill	Core skill	Responsibility
Level 4	work in familiar, predictable, routine, situation of clear choice	factual knowledge of field of knowledge or study	recall and demonstrate practical skill, routine and repetitive in narrow range of application, using appropriate rule and tool, using quality concepts	language to communicate written or oral, with required clarity, skill to basic Arithmetic and algebraic principles, basic understanding of social political and natural environment	Responsibility for own work and learning.

6. GENERAL TRAINING PLAN, EXAMINATION & PASS REGULATION

General Training Plan

The knowledge and skill components as stated in the section for 'learning outcomes' are to be imparted in accordance with the instructions in respect of the content and time structure.

Assessment

The assessment for the semester-based qualification is carried out by conducting formative assessments, and end-of-semester examinations, as per the guidelines given in the Curriculum. The internal assessments for theory subjects and practical are conducted for evaluating the knowledge and skill acquired by trainees and the behavioural transformation of the trainees as per the learning outcomes. Theory examinations are conducted in Trade Theory, Workshop Calculation & Science, Engineering Drawing and Employability Skills. Trade practical examinations are conducted by the respective State Governments. The details of the examination and assessment standard are in a latter section. NCVT prepares the question papers for the Trade practical. Candidates are to demonstrate that they can:

1. Read & interpret technical parameters/documentation, plan and organize work processes, and identify necessary materials and tools,
2. Perform a task/job with due consideration to safety rules, accident prevention regulations and environmental protection stipulations,
3. Apply Professional Knowledge, Core Skills, and Employability Skills while performing the task/job.
4. Check the task/job as per the drawing for proper functioning, and identify and rectify errors in the job, if any.
5. Document the technical parameters related to the task/job.

Pass regulation

For the purposes of determining the overall result, weightage of 25 percent is applied to each semester examination. The minimum pass percent for Practical is 60% & minimum pass percent for Theory subject is 40%.

7. LEARNING OUTCOMES

The following are minimum broad learning outcomes after completion of the Draughtsman (Mechanical) course of 2-years duration:

A. GENERIC OUTCOMES

1. Recognize & comply safe working practices, environment regulation and housekeeping.
2. Work in a team, understand and practice soft skills, technical English to communicate with required clarity.
3. Demonstrate knowledge of concept and principles of basic arithmetic, algebraic, trigonometric, statistics, co-ordinate system and apply knowledge of specific area to perform practical operations.
4. Understand and explain basic science in the field of study including basic electrical, and hydraulics & pneumatics.
5. Understand and explain the concept in productivity, quality tools, and labour welfare legislation and apply such in day to day work to improve productivity & quality.
6. Explain energy conservation, global warming and pollution and contribute in day to day work by optimally using available resources.
7. Explain personnel finance, entrepreneurship and manage/organize related task in day to day work for personal & societal growth.
8. Understand and apply basic computer working, basic operating system and uses internet services to get accustomed & take benefit of IT developments in the industry.

B. SPECIFIC OUTCOMES

SEMESTER - I

10. Construct different Geometrical figures using drawing Instruments.
11. Draw orthographic Projections giving proper dimensioning with title block using appropriate line type and scale.
12. Construct free hand sketches of simple machine parts such as tool post of a Lathe with correct proportions.
13. Draw Sectional views showing orthographic, isometric and oblique projections.
14. Develop surface and interpenetration of solid in orthographic projection.

SEMESTER – II

15. Draw Different types of fasteners and locking devices as per BIS convention.
16. Acquire basic knowledge on tools and equipment of Allied trades viz. Fitter, Turner, Machinist, Sheet Metal Worker, Welder, Foundry man, Electrician and Maintenance Motor Vehicles and apply it in day to day work.
17. Draw different Couplings and Bearings with Tolerance Dimension and indicating surface finish symbol.
18. Create objects on Drawing Space using toolbars, commands and menus in CAD application software.

SEMESTER – III

19. Customize object drawing on CAD using Toolbars viz. Draw, Modify, Dimensioning. Format Layer and Style.
20. Create objects using 3D Modeling Space and Print Preview and Plotting in CAD.
21. Draw detail and assembly Drawing of machine parts viz., Pulleys, Pipe fittings, Gears and Cams applying range of cognitive and practical skills.
22. Draw IC Engine Parts with dimensioning and tolerance using CAD, applying quality concept.

SEMESTER – IV

23. Draw detail and assembly of Manufacturing and Process tools applying conventional signs & symbols.
24. Measure and inspect by using gauges and measuring instruments and check for accuracy without any assistance.
25. Create and plot a machine part with assembly, detail and Title Block in model and layout space in CAD.
26. Create production drawing of machine part.

8. ASSESSABLE OUTCOMES WITH ASSESSMENT CRITERIA

Note:

1. The training shall be conducted as per the syllabus.
2. The trainee shall demonstrate the competencies that are defined below in the assessable outcomes highlighted below.
3. The trainee shall be assessed for his/her achievement levels in all the assessable outcomes on the basis of the formative assessment, Theory & Practical examinations, observation, and viva-voce.
4. The trainee shall be assessed for his/her achievement levels in all the assessable outcomes of the Employability Skills, Workshop Calculation & Science on the basis of Theory Examinations, and for his/her ability to apply the concepts in Practical.
5. The assessable outcomes and assessment criteria will serve as a set of guidelines for Trainers, Paper setters, Moderators, and Assessors.

Assessable outcomes along with assessment criteria to be achieved after each semester and completion of qualification:

Generic assessable outcomes:

ASSESSABLE OUTCOMES	ASSESSMENT CRITERIA
1. Recognize & comply safe working practices, environment regulation and housekeeping.	1.1 Follow and maintain procedures to achieve a safe working environment in line with occupational health and safety regulations and requirements and according to site policy.
	1.2 Recognize and report all unsafe situations according to site policy.
	1.3 Identify and take necessary precautions on fire and safety hazards and report according to site policy and procedures.
	1.4 Identify, handle and store / dispose off dangerous goods and substances according to site policy and procedures following safety regulations and requirements.
	1.5 Identify and observe site policies and procedures in regard to illness or accident.
	1.6 Identify safety alarms accurately.
	1.7 Report supervisor/ Competent of authority in the event of accident or sickness of any staff and record accident details correctly according to site accident/injury procedures.
	1.8 Identify and observe site evacuation procedures according to site policy.
	1.9 Identify Personal Productive Equipment (PPE) and use the same as per related working environment.
	1.10 Identify basic first aid and use them under different circumstances.

	<p>1.11 Identify different fire extinguisher and use the same as per requirement.</p> <p>1.12 Identify environmental pollution & contribute to the avoidance of instances of environmental pollution.</p> <p>1.13 Deploy environmental protection legislation & regulations</p> <p>1.14 Take opportunities to use energy and materials in an environmentally friendly manner</p> <p>1.15 Avoid waste and dispose waste as per procedure</p> <p>1.16 Recognize different components of 5S and apply the same in the working environment.</p>
2. Work in a team, understand and practice soft skills, technical English to communicate with required clarity.	<p>2.1 Obtain sources of information and recognize information.</p> <p>2.2 Use and draw up technical drawings and documents.</p> <p>2.3 Use documents and technical regulations and occupationally related provisions.</p> <p>2.4 Conduct appropriate and target oriented discussions with higher authority and within the team.</p> <p>2.5 Present facts and circumstances, possible solutions & use English special terminology.</p> <p>2.6 Resolve disputes within the team</p> <p>2.7 Conduct written communication.</p>
3. Demonstrate knowledge of concept and principles of basic arithmetic, algebraic, trigonometric, statistics, co-ordinate system and apply knowledge of specific area to perform practical operations.	<p>3.1 Semester examination to test basic skills on arithmetic, algebra, trigonometry and statistics.</p> <p>3.2 Their applications will also be assessed during execution of assessable outcome and also tested during theory and practical examination.</p>
4. Understand and explain basic science in the field of study including basic electrical, and hydraulics & pneumatics.	<p>4.1 Semester examination to test basic skills on science in the field of study including basic electrical and hydraulics & pneumatics.</p> <p>4.2 Their applications will also be assessed during execution of assessable outcome and also tested during theory and practical examination.</p>
5. Read and apply engineering drawing for different application in the field of work.	<p>5.1 Semester examination to test basic skills on engineering drawing.</p> <p>5.2 Their applications will also be assessed during execution of assessable outcome and also tested during theory and practical examination.</p>
6. Understand and explain the concept in productivity, quality tools, and labour welfare legislation and apply such in day to day work to improve productivity & quality.	<p>6.1 Semester examination to test the concept in productivity, quality tools and labour welfare legislation.</p> <p>6.2 Their applications will also be assessed during execution of assessable outcome.</p>

<p>7. Explain energy conservation, global warming and pollution and contribute in day to day work by optimally using available resources.</p>	<p>7.1 Semester examination to test knowledge on energy conservation, global warming and pollution. 7.2 Their applications will also be assessed during execution of assessable outcome.</p>
<p>8. Explain personnel finance, entrepreneurship and manage/organize related task in day to day work for personal & societal growth.</p>	<p>8.1 Semester examination to test knowledge on personnel finance, entrepreneurship. 8.2 Their applications will also be assessed during execution of assessable outcome.</p>
<p>9. Understand and apply basic computer working, basic operating system and uses internet services to get accustomed & take benefit of IT developments in the industry.</p>	<p>9.1 Semester examination to test knowledge on basic computer working, basic operating system and uses internet services. 9.2 Their applications will also be assessed during execution of assessable outcome.</p>

Specific assessable outcomes:

Semester-I

ASSESSABLE OUTCOME	ASSESSMENT CRITERIA
10. Construct different Geometrical figures using drawing Instruments.	10.1 Identify drawing instruments and its accuracy to use properly.
	10.2 Layout of drawing sheet as per B.I.S.
	10.3 Folding of printed sheet for filing Cabinets or binding as per SP: 46-2003
	10.4 Block letters & numerals, Single & double stroke as per BIS.
	10.5 Use of different types of lines as per BIS.
	10.6 Construct Triangle, polygons, circle, ellipse, parabola & hyperbola, involutes, cycloid curves, helix & spiral.
11. Orthographic Projections giving proper dimensioning with title block using appropriate line type and scale.	11.1 Draw Projection of points, lines and plain figures.
	11.2 Draw Projection of solids viz. prism, cones, pyramids and frustums in 1 st angle and 3 rd angle method.
	11.3 Provide dimension on object as per BIS.
	11.4 Construct Scale- plain scales, diagonal scales. Comparative scales, venier scale & scale of chords and apply RF in drawing.
12. Free hand sketches of simple machine parts with correct proportions.	12.1 Sketch Free hand drawing viz. straight lines, curved lines polygons, circles, elliptical figures with irregular contour, etc.
	12.2 Sketch free hand of a machine part such as tool post of a Lathe .
	12.3 Give dimensions of machine parts in accordance with as specified proportion .
13. Sectional views showing orthographic, isometric and oblique projections.	13.1 Draw sectional views – Different types of section .
	13.2 Draw projection of solids, finding out the true shape surfaces cut by oblique planes.
	13.3 Provide conventional sings & symbols and abbreviations as per B.I.S.
	13.4 Draw Isometric projection of a solid blocks, machine parts.
	13.5 Draw Oblique projection of solids and machine parts.
14. Development of surface and interpenetration of solid in orthographic projection.	14.1 Draw development of surfaces.
	14.2 Draw development of an oblique cone with elliptical base etc.
	14.3 Draw development of solids intersecting each other.
	14.4 Draw orthographic projection of interpenetrated two prisms with their axes intersecting at different angles.
	14.5 Draw orthographic projection of interpenetrated cone, cylinder & pyramids intersecting each other.

Semester-II

ASSESSABLE OUTCOME	ASSESSMENT CRITERIA
15. Draw Different types of fasteners and locking devices as per BIS convention.	15.1 Draw Screw threads with BIS conventions.
	15.2 Draw Locking devices and fasteners as per BIS.
	15.3 Draw Welded joints giving welding symbols in welded Structures.
	15.4 Draw Keys, cotters, circlips and pins as per convention
	15.5 Draw rivets and riveted joints with conventional representation.
16. Understand and explain basic knowledge on tools and equipment of Allied trades viz. Fitter, Turner, Machinist, Sheet Metal Worker, Welder, Foundry man, Electrician and Maintenance Motor Vehicles and apply it in day to day work.	16.1 Identify different types of fitters hand tools, use centre punch different types of files, callipers, hacksaws and hack sawing chisels, hammers.
	16.2 Identify Plain turning , stepped turning ,Taper turning with different method
	16.3 Identify the use of jigs and fixtures Simple operations on milling machine such as plain milling and key way cutting.
	16.4 Check how to mark out castings and forgings, setting up and operation of shaping, slotting and planing machines.
	16.5 Identify the use of hand tools such as planishing hammers stakes, mallet, bricks prick punch etc. evaluate development of surfaces.
	16.6 Identify the hand tools used In Gas and in electric welding of object by gas and electric according to drawing.
	16.7 Acquaint with different types of mould, cores and core dressing, use of moulding tools.
	16.8 Identify the measuring instruments machinery and panels used in electrician trade Electrical and Electronic symbols and simple wiring diagrams.
	16.9 Identify different parts of i.e. Engines (Both spark ignition & compression/ignition-2 stroke & 4 stroke engines).
	17. Draw different Couplings and Bearings with Tolerance Dimension and indicating surface finish symbol.
17.2 Select proper scale, layout and detailing with bill of material.	
17.3 Draw muff coupling, flanged coupling, friction grip coupling, pin type flexible coupling, universal coupling, oldham's coupling, claw coupling, cone friction clutch.	
17.4 Draw simple bearing and foot step bearing, Plummer Block and self aligning bearing (swivel bearing).	
18. Create objects on Drawing Space using toolbars, commands and menus in CAD application software	18.1 Select Drawing limit of the CAD drawing space under supervision.
	18.2 Select proper setting and toolbars, choice of system, scale under supervision.
	18.3 Draw object with CAD viz. 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.
	18.4 Operate CAD Drawing space viz. Absolute Coordinate system, Polar Co-ordinate System and Relative Co-ordinate System,.
	18.5 Draw 2D drafting by using CAD toolbars under supervision.

Semester-III

ASSESSABLE OUTCOME	ASSESSMENT CRITERIA
19. Customize object drawing on CAD using Toolbars viz. Draw, Modify, Dimensioning. Format Layer and Style.	19.1 Identify Draw and Modify tools in CAD toolbars Line, Break, Erase, Undo commands with Absolute Co-ordinate system, Polar Co-ordinate System and Relative Co-ordinate System, under supervision
	19.2 Identify and apply Trim, Offset, Fillet, Chamfer Commands , under supervision
	19.3 Identify Move, Copy, Array, Insert Block, Make Block, Scale, Rotate, Hatch Commands , under supervision
	19.4 Creating templates, Inserting drawings, Layers, Modify Layers under supervision.
	19.5 Identify and customize different Dimension and Text styles.
	19.6 Provide title and dimension on object drawing.
20. Create objects using 3D Modeling Space and Print Preview and Plotting in CAD.	20.1 Identify 3D toolbars, menus, co-ordinate system under supervision.
	20.2 Identify three axes of the object. under supervision.
	20.3 Change origin to create aligned objects under supervision.
	20.4 Create object in 3D primitives, Extrude, Revolve command, subtract, union 3D drawing by changing User co-ordinate systems.
	20.5 Customize page set up, Print preview and Plotting under supervision.
21. Draw detail and assembly Drawing of machine parts viz., Pulleys, Pipe fittings, Gears and Cams applying range of cognitive and practical skills.	21.1 Draw Pulleys-solid, stepped built up and pulley with different types of arms, rope pulleys, belt pulleys.
	21.2 Draw Pipe fittings, flanges, unions, valves etc. Different types of pipes lay out systems. Different types of pipe joints.
	21.3 Draw gears such as spurs helical, bevel & worm, worm and worm wheel
	21.4 Draw Cams with different motions to followers, different types of follower.
22. Draw IC Engine Parts with dimensioning and tolerance using CAD, applying quality concept.	22 Draw Eccentrics, Piston, Cross Head, Connecting rod of I.C. Engines with the application of tolerances using CAD under supervision.

Semester-IV

ASSESSABLE OUTCOME	ASSESSMENT CRITERIA
23. Draw detail and assembly of Manufacturing and Process tools applying conventional signs & symbols.	23.1 Identify and Draw Valve: such as lever safety vale, Dead wt. Safety valve. Assembly drawing of reciprocating pump under assistance.
	23.2 Identify and Draw Layout diagram using Hydraulic and pneumatic conventional signs and symbols.
	23.3 Identify and Draw Structural steel roof truss joints.
	23.4 Identify and Draw detailed drawing of a drilling Jig and milling fixture.
	23.5 Identify and Draw Press Tool giving nomenclature of each part and dies & punches.
	23.6 Identify and Draw Blow off cock & simple carburettor.
	23.7 Identify and Draw Tail stock and Revolving centre
	23.8 Identify and Draw assembly drawing of Rams bottom safety valve
	23.9 Identify and Draw assembly drawing of Tool post of a shaping machine
	23.10 Identify and Draw assembly drawing of Machine Swivel vice & pipe vice.
24. Measure and inspect by using gauges and measuring instruments and check for accuracy without any assistance.	24.1 Identify proper measuring tools and gauges to measure the part.
	24.2 Check the accuracy of the instruments.
	24.3 Measure with the help of different types of gauges, such as plug, snap, thread, taper, measuring instruments etc.
25. Create and plot a machine part with assembly, detail and Title Block in model and layout space in CAD.	25.1 Identify sheet size, scale of drawing and system in CAD.
	25.2 Create drawing environment in CAD.
	25.3 Draw assembly and detail drawing of machine part using CAD
	25.4 Identify and customize different Dimension, layers and Text styles.
	25.5 Identify and create viewports in the Layout space for each component.
	25.5 Provide title and dimension on object drawing and bill of materials.
26. Create production drawing of machine part.	25.6 Customize page set up, Print preview and Plotting of required drawing.
	26.1 Identify and measure the components of machine part.
	26.2 Create production drawing with machining symbol, tolerance dimensions and bill of materials without assistance.

9. SYLLABUS CONTENT WITH TIME STRUCTURE

SYLLABUS FOR THE TRADE OF DRAUGHTSMAN (MECHANICAL)

9.1 Syllabus Content for Professional Skill & Knowledge

First Semester (Semester Code No. **DMM - 01**)

Duration: Six Months

Learning Objectives (1st Semester)

1. Apply safe working practices.
2. Comply environment regulation and housekeeping.
3. Interpret & use Company terminology and technical communication.
4. Making geometrical figures using drawing instruments.
5. Free hand sketching of machine parts.
6. Sectional views showing Orthographic, Isometric and Oblique projection.
7. Projection and surface development of solid blocks and machine parts.

Detailed Syllabus:

Week 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</p> <p>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. Basic safety introduction,</p> <p>Personal protective Equipments(PPE):- 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.</p> <p>All necessary guidance to be provided to the new comers to become familiar with the working of Industrial Training Institute system including stores procedures. Soft Skills: its importance and Job area after completion of training.</p> <p>Introduction of First aid. Operation of electrical mains. Introduction of PPEs. Introduction to 5S concept & its application.</p> <p>Response to emergencies e.g.; power failure, fire, and system failure.</p>
2	<p>Practice in using instruments. Drawing of straight and curved lines, Drawing angles, circles etc.</p>	<p>Nomenclature, description and use of drawing instruments & various equipments used in drawing office. Their care and maintenance.</p>

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 st angle projection. Projection of machine parts drawn in the above exercise in 3 rd angle projection.	Importance of free hand sketching, machine drawing. Material and equipment required in sketching.
12	Scale- 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.
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 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.

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 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.
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	

Second Semester (Semester Code No : DMM - 02)

Duration: Six Months

Learning Objectives (2nd Semester)

1. Applying safe working practices.
2. Complying environment regulation and housekeeping.
3. Interpreting & use Company terminology and technical communication.
4. Drawing different fasteners and locking devices as per standard.
5. Acquiring knowledge of tools and machineries of allied trades.
6. Drawing machine parts with tolerance dimension and surface finish symbol.
7. Drawing objects in CAD application software.

Detailed Syllabus:

Week no	Trade practical	Trade theory
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 up and operation of shaping, slotting and planning machines	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 these machines

10	<p>ALLIED TRADE : SHEET METAL Use of hand tools such as planishing hammers stakes, mallet, bricks prick punch etc. Development of surfaces.</p>	<p>Name and brief description of common equipment necessary for sheet metal work. Different types and uses of joints employed in sheet metal work.</p>
11	<p>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.</p>	<p>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</p>
12	<p>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).</p>	<p>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.</p>
13	<p>Symbols for machining and surface finishes (grades and micron values)</p>	<p>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.</p>
14	<p>Working drawing of(muff coupling, flanged coupling, friction grip coupling, pin type flexible coupling, universal coupling) couplings.</p>	<p>Couplings, necessity of coupling, classification of couplings. Uses and proportion of different types of couplings.</p>
15	<p>Working drawing of couplings (oldham's coupling, claw coupling, cone friction clutch.)</p>	<p>Materials used for couplings.</p>
16	<p>Working drawing of a simple bearing and foot step bearing</p>	<p>Use of a bearing, types of bearing, frictional and anti frictional bearings.</p>
17	<p>Details and assembly drawing of Plummer block.</p>	<p>Material used for frictional bearings. Properties of frictional bearing (sliding bearing) materials.</p>
18	<p>Details and assembly drawing of self aligning bearing (swivel bearing)</p>	<p>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.</p>

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	In-plant training / Project work (work in a team)	
24	Revision	
25	Examination	

Third Semester (Semester Code No. **DMM - 03**)

Duration: Six Month

Learning Objectives (3rd Semester)

1. Applying safe working practices.
2. Complying environment regulation and housekeeping.
3. Interpreting & use Company terminology and technical communication.
4. Customizing CAD toolbar in drawing objects.
5. Creating objects on 3D modeling space in CAD.
6. Viewing printable CAD drawing and plotting them.
7. Practical skill in complete detailed assembled drawing of machine parts.

Detailed Syllabus:

Week no.	Trade practical	Trade theory
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	In-plant training / Project work (work in a team)	
23-25	Revision	
26	Examination	

Fourth Semester (Semester Code No. **DMM - 04**)

Duration: Six Month

Learning Objectives (4th Semester)

1. Safe working practices.
2. Complying environment regulation and housekeeping.
3. Interpreting & use Company terminology and technical communication.
4. Drawing of detailed and assembled production and process tools with conventional sign and symbols.
5. Checking and measuring machine parts using gauges and measuring instruments.
6. Creating production CAD drawing with title block in layout and model space.

Detailed Syllabus:

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 modelling 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	In-plant training / Project work (work in a team)	
24	Revision	
25	Examination	

9.2 SYLLABUS CONTENT OF CORE SKILLS

First Semester(Semester Code No DMM - 01)

Duration: Six Month

LEARNING OBJECTIVES OF 1ST SEMESTER

1. Demonstrate basic arithmetic to derive value of unknown quantity / variable.
2. Understand & apply engineering material, their classification, properties and applications in the day to day technical application.
3. Explain & apply speed, velocity, work, power & energy for application in field of work.

Sl. No.	Professional Knowledge
	Workshop Calculation and Science
1.	Unit: Systems of unit- FPS, CGS, MKS/SI unit, unit of length, Mass and time, Conversion of units
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.
3.	Square Root: Square and Square Root, method of finding out square roots, Simple problem using calculator.
4.	Ratio & Proportion: Simple calculation on related problems.
5.	Percentage: Introduction, Simple calculation. Changing percentage to decimal and fraction and vice-versa.
6.	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.
7.	Mass, Weight and Density: Mass, Unit of Mass, Weight, difference between mass and weight, Density, unit of density, specific gravity of metals.
8.	Speed and Velocity: Rest and motion, speed, velocity, difference between speed and velocity, acceleration, retardation, equations of motions, simple related problems.
9.	Work, Power and Energy: work, unit of work, power, unit of power, Horse power of engines, mechanical efficiency, energy, use of energy, potential and kinetic energy, examples of potential energy and kinetic energy.

Second Semester (Semester Code No DMM - 02)

Duration: Six Month

LEARNING OBJECTIVES OF 2ND SEMESTER

1. Demonstrate basic algebraic, mensuration, trigonometric facts and formulas to derive value of unknown quantity / variable.
2. Apply the factual knowledge of basic heat & temperature, basic electricity for day to day practical application.
3. Explain & apply principles of simple machine & levers for mechanical advantage, efficiency for practical application.

Sl. No.	Professional Knowledge
	Workshop Calculation and Science
1.	Algebra: Addition, Subtraction, Multiplication, Division, Algebraic formula, Linear equations (with two variables).
2.	Mensuration : Area and perimeter of square, rectangle, parallelogram, triangle, circle, semi-circle, Volume of solids – cube, cuboids, cylinder and Sphere. Surface area of solids – cube, cuboids, cylinder and Sphere.
3.	Trigonometry: Trigonometrical ratios, measurement of angles. Trigonometric tables
4.	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.
5.	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.
6.	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.

Third Semester (Semester Code No **DMM - 03**)

Duration: Six Month

LEARNING OBJECTIVES OF 3RD SEMESTER

1. Demonstrate & apply calculation of area of cut-out regular & irregular surfaces, Volume of geometrical shapes and their cut section in related shop floor problems.
2. Calculate value of unknown sides and angles of geometrical shapes by trigonometrical methods and apply in shop floor problems.
3. Understand & apply concept of forces, stress & strain, factor of safety for practical application.
4. Factual knowledge of thermal conductivity, temperature measuring instruments, average velocity and circular motion for day to day application.

Sl. No.	Professional Knowledge
	Workshop Calculation and Science
1.	- Geometrical construction & theorem: division of line segment, parallel lines, similar angles, perpendicular lines, isosceles triangle and right angled triangle.
2.	- Area of cut-out regular surfaces: circle and segment and sector of circle.
3.	- Area of irregular surfaces. - Application related to shop problems.
4.	- Volume of cut-out solids: hollow cylinders, frustum of cone, block section. - Volume of simple machine blocks.
5.	- Material weight and cost problems related to trade.
6.	- Finding the value of unknown sides and angles of a triangle by Trigonometrical method.
7.	- Finding height and distance by trigonometry.
8.	- Application of trigonometry in shop problems. (viz. taper angle calculation).
9.	- Forces definition. - Compressive, tensile, shear forces and simple problems. - Stress, strain, ultimate strength, factor of safety. - Basic study of stress-strain curve for MS.
10.	- Temperature measuring instruments. Specific heats of solids & liquids.
11.	- Thermal Conductivity, Heat loss and heat gain.
12.	- Average Velocity, Acceleration & Retardation. - Related problems.
13.	- Circular Motion: Relation between circular motion and Linear motion, Centrifugal force, Centripetal force

LEARNING OBJECTIVES OF 4TH SEMESTER

1. Read & interpret different types graphs.
2. Solve simple statistical problem and apply sampling method for inspection purpose.
3. Factual knowledge of friction, magnetism and their application and affects.
4. Understand the application of electrical insulating materials & concept of earthing.
5. Understand & apply transmission of power, heat treatment & their advantages.
6. Factual knowledge of pressure, its units and measuring system and understand basic concept of pneumatics & hydraulic system.

Sl. No.	Professional Knowledge
	Workshop Calculation and Science
1.	Graph: - Read images, graphs, diagrams - Bar chart, pie chart. - Graphs: abscissa and ordinates, graphs of straight line, related to two sets of varying quantities.
2.	Simple problem on Statistics: - Frequency distribution table - Calculation of Mean value. - Examples on mass scale productions. -Cumulative frequency -Arithmetic mean
3.	Acceptance of lot by sampling method (within specified limit size) with simple examples (not more than 20 samples).
4.	- Friction- co-efficient of friction, application and effects of friction in Workshop practice. Centre of gravity and its practical application.
5.	- Magnetic substances- natural and artificial magnets. - Method of magnetization. Use of magnets.
6.	- Electrical insulating materials. - Basic concept of earthing.
7.	- Transmission of power by belt, pulleys & gear drive. - Calculation of Transmission of power by belt pulley and gear drive.
8.	- Heat treatment and advantages.
9.	Concept of pressure – units of pressure, atmospheric pressure, absolute pressure, gauge pressure – gauges used for measuring pressure
10.	Introduction to pneumatics & hydraulics systems.

10. SYLLABUS CONTENT OF EMPLOYABILITY SKILLS

General Information

Name of the subject	: EMPLOYABILITY SKILLS
Applicability	: CTS- Mandatory for all trades ATS- Mandatory for fresher only
Hours of Instruction	110 Hrs.
Examination	: The examination shall be held at the end of semesters.
Instructor Qualification	<ul style="list-style-type: none"> • 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 ITIs 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
Instructor	<ul style="list-style-type: none"> • One full-time instructor is required for 1000 seats and above • For seats less than 1000, the instructor may be out sourced/ hired on contract basis.

Semester-wise Distribution of Topics (Employability Skill)

Course Duration	Topics		Examination
	Semester 1	Semester 2	
01 Year (Two semesters)	1. English Literacy 2. I.T. Literacy 3. Communication Skills	1. Entrepreneurship Skills 2. Productivity 3. Occupational Safety , Health, and Environment Education 4. Labour Welfare 5. Legislation 6. Quality Tools	Final examination at the end of second semester

Syllabus Content for Employability Skills

Semester 1

Learning Objectives (1st semester)

1. Read, write and communicate in English language for day to day work.
2. Communicate in written and oral and with required clarity ensuring that the information communicated is clear, concise and accurate.
3. Understand and apply basic computer working, basic operating system and uses internet services to get accustomed & take benefit of IT developments in the industry.

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 known, 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	<p>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),</p> <p>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.</p> <p>Information Security and antivirus tools, Do's and Don'ts in Information Security, Awareness of IT – ACT, types of cyber-crimes.</p>
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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, nonverbal, written, email, talking on phone.
	Nonverbal 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

Semester 2

Learning Objectives (2nd Semester)

1. Knowledge of business activities, ability to interact with consumers for development of businesses.
2. Understand and apply productivity, its benefits and factors affecting the productivity.
3. Follow and maintain procedures to achieve a safe working environment in line with occupational health, safety, environment regulations and Labour welfare legislation and requirements.
4. Understand and apply quality concepts as per ISO and BIS system and its importance.
5. Recognize different components of 5S and apply the same in the working environment.

4. Entrepreneurship skill Hour of Instruction: 15 Hrs.Marks Allotted: 06	
Topic	Content
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
5. Productivity Hour of Instruction: 10 Hrs.Marks Allotted: 05	
Productivity	Definition, Necessity, Meaning of GDP.
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 & Environment Hour of Instruction: 15 Hrs.Marks Allotted: 06	
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
7.Labour Welfare Legislation Hour of Instruction: 05 Hrs.Marks Allotted: 03	
Labour Welfare Legislation	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 Functions 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 Housekeeping, Practice of good Housekeeping.5S Principles of Housekeeping: SEIRI – Segregation, SEITON – Arrangement, SEISO – Cleaning, SEIKETSU – maintenance of Standards, SHITSUKE - Discipline

11. INFRASTRUCTURE

1. Instructors' Qualification	<p>Degree in Mechanical Engineering from recognized Engineering College /university with one year experience in the relevant field.</p> <p style="text-align: center;">OR</p> <p>Diploma in Mechanical Engineering from recognized board of technical education with two years' experience in the relevant field.</p> <p style="text-align: center;">OR</p> <p>10th Class Pass + NTC/NAC in the Trade of “Draughtsman (Mechanical)” With 3 years post-qualification experience in the relevant field.</p>
Desirable qualification	Preference will be given to a candidate with CIC (Craft Instructor Certificate) in Draughtsman (Mechanical) Trade.
3. Space Norms	64 Sq.m
4. Power Norms	3.7 KW
5.Tools, Equipment & General Machinery	(As per Annexure II)

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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.
- iii) The list of Tools, Equipment & General Machinery listed in Annexure – II is for a particular trade Draughtsman (Mechanical) comprising of four semesters and not for a single semester.

12. ASSESSMENT STANDARD

12.1 ASSESSMENT GUIDELINES:

Appropriate arrangements should be made to ensure that there will be no artificial barriers to assessment. The nature of special needs should be taken into account while undertaking the assessment. Due consideration shall be given while assessing for teamwork, avoidance/reduction of scrap/wastage and disposal of scarp/wastage as per procedure, behavioral attitude, sensitive to environment and regularity in training. The sensitivity towards OSHE and self-learning attitude shall be considered while assessing competency.

Assessment shall be evidence based comprising the following:

- 1) Job carried out in labs/workshop
- 2) Record book/ daily diary
- 3) Answer sheet for assessment
- 4) Viva-voce
- 5) Progress Chart
- 6) Attendance and punctuality
- 7) Assignment
- 8) Project work

Evidence of internal assessment should be preserved for an appropriate period of time for audit and verification by examination body.

The following marking pattern to be adopted while assessing:

a) Weightage in the range of 60-75% to be allotted during assessment under following performance level:

For performance in this grade, the candidate with occasional guidance and showing due regard for safety procedures and practices, has produced work that demonstrates attainment of an acceptable standard of craftsmanship. In this work there is evidence of:

- Demonstration of good skill in the use of hand tools, machine tools, and workshop equipment
- Below 70% tolerance dimension achieved while undertaking different work with those demanded by the component/job.
- A fairly good level of neatness and consistency in the finish
- Occasional support in completing the project/job.

b) Weightage in the range of above 75%- 90% to be allotted during assessment under following performance level:

For this grade, the candidate, with little guidance and showing due regard for safety procedures and practices, has produced work that demonstrates attainment of a reasonable standard of craftsmanship. In this work there is evidence of:

- Good skill levels in the use of hand tools, machine tools, and workshop equipment
- 70-80% tolerance dimension achieved while undertaking different work with those demanded by the component/job.
- A good level of neatness and consistency in the finish
- Little support in completing the project/job

c) Weightage in the range of above 90% to be allotted during assessment under following performance level:

For performance in this grade, the candidate, with minimal or no support in organization and execution and with due regard for safety procedures and practices, has produced work which demonstrates attainment of a high standard of craftsmanship. In this work there is evidence of:

- High skill levels in the use of hand tools, machine tools, and workshop equipment
- Above 80% tolerance dimension achieved while undertaking different work with those demanded by the component/job.
- A high level of neatness and consistency in the finish.
- Minimal or no support in completing the project.

12.2. INTERNAL ASSESSMENT (FORMATIVE ASSESSMENT)

Comp. No.	ASSESSABLE OUTCOME	INTERNAL ASSESSMENT Marks
GENERIC		
1.	Recognize & comply safe working practices, environment regulation and housekeeping.	
2.	Work in a team, understand and practice soft skills, technical English to communicate with required clarity.	
3.	Demonstrate knowledge of concept and principles of basic arithmetic, algebraic, trigonometric, statistics, co-ordinate system and apply knowledge of specific area to perform practical operations.	
4.	Understand and explain basic science in the field of study including basic electrical, and hydraulics & pneumatics.	
5.	Read and apply engineering drawing for different application in the field of work.	
6.	Understand and explain the concepts of productivity, quality tools, and labour welfare legislation and apply such in day to day work to improve productivity & quality.	
7.	Explain energy conservation, global warming, and pollution and contribute in the day to day work by optimally using available resources.	
8.	Explain personnel finance, entrepreneurship, and manage/organize related task in the day to day work for personal & societal growth.	
9.	Understand and apply basic computer working, basic operating system, simulate part program using simulation software and uses internet services to get accustomed & take benefit of IT developments in the industry.	
SPECIFIC		
10.	Construct different Geometrical figures using drawing Instruments.	
11.	Draw orthographic Projections giving proper dimensioning with title block using appropriate line type and scale.	
12.	Construct free hand sketches of simple machine parts such as tool post of a Lathe with correct proportions.	
13.	Draw Sectional views showing orthographic, isometric and oblique projections.	
14.	Develop surface and interpenetration of solid in orthographic projection.	
Sub-Total of Internal assessment for Semester- I		

15.	Draw Different types of fasteners and locking devices as per BIS convention.	
16.	Identify tools and equipment of Allied trades viz. Fitter, Turner, Machinist, Sheet Metal Worker, Welder, Foundry man, Electrician and Maintenance Motor Vehicles .	
17.	Draw different Couplings and Bearings with Tolerance Dimension and indicating surface finish symbol.	
18.	Create objects on Drawing Space using toolbars, commands and menus in CAD application software.	
	Sub-Total of Internal assessment for Semester- II	100
19.	Create object drawing on CAD using Toolbars viz. Draw, Modify, Dimensioning. Format Layer and Style.	
20.	Create objects using 3D Modeling Space and Print Preview and Plotting in CAD.	
21.	Draw detail and assembly Drawing of machine parts viz., Pulleys, Pipe fittings, Gears and Cams applying range of cognitive and practical skills.	
22.	Draw IC Engine Parts with dimension and tolerance using CAD.	
	Sub-Total of Internal assessment for Semester- III	100
23.	Draw detail and assembly of Manufacturing and Process tools applying conventional signs & symbols.	
24.	Measure and inspect by using gauges and measuring instruments and check for accuracy .	
25.	Create and plot a machine part with assembly, detail and Title Block in model and layout space in CAD.	
26.	Create production drawing of machine part.	
	Sub-Total of Internal Assessment for Semester- IV	100
	Total of Internal Assessment	400

Note: The generic outcome to be assessed along with the specific outcome.

12.3 FINAL ASSESSMENT- All India Trade TEST (SUMMATIVE ASSESSMENT)

- There shall be a single objective type Examination paper for the subjects Engineering Drawing and Workshop Calculation & Science.
- There shall be a single objective type Examination paper for the subjects Trade Theory and Employability Skills.
- The two objective type Examination papers as mentioned above shall be conducted by National Council for Vocational Training (NCVT), whereas examination for the subject Trade Practical shall be conducted by the State Governments. NCVT shall supply the Question Paper for the subject Trade Practical.

MARKING PATTERN		
Sl. No.	Subject for the trade test	Maximum marks for the each subject
	Practical	300
	Trade Theory	200 Objective type Written Test of 200 marks (Trade Theory 150 Marks & Employability Skills 50 marks)
	Employability Skills	
	Workshop Calculation and Science.	50 Objective Type Written test of 50 marks (Workshop Calculation and Science 50 marks)
	Internal assessment	100
TOTAL:		650

13. LIST OF TRADE COMMITTEE MEMBERS

Sl. No.	Name & Designation Sh/Mr/Ms.	Organization	Mentor Council Designation
Members of Sector Mentor council			
1.	A. D. Shahane, Vice-President, (Corporate Trg.)	Larsen & Turbo Ltd., Mumbai:400001	Chairman
2.	Dr. P.K.Jain, Professor	IIT, Roorkee, Roorkee-247667, Uttarakhand	Member
3.	N. Ramakrishnan, Professor	IIT Gandhinagar, Gujarat-382424	Member
4.	Dr. P.V.Rao, Professor	IIT Delhi, New Delhi-110016	Member
5.	Dr. Debdas Roy, Asstt. Professor	NIFFT, Hatia, Ranchi-834003, Jharkhand	Member
6.	Dr. Anil Kumar Singh, Professor	NIFFT, Hatia, Ranchi-834003, Jharkhand	Member
7.	Dr. P.P.Bandyopadhyay Professor	IIT Kharagpur, Kharagpur- 721302, West Bengal	Member
8.	Dr. P.K.Ray, Professor	IIT Kharagpur, Kharagpur- 721302, West Bengal	Member
9.	S. S. Maity, MD	Central Tool Room & Training Centre (CTTC), Bhubaneswar	Member
10.	Dr. Ramesh Babu N, Professor	IIT Madras, Chennai	Member
11.	R.K. Sridharan, Manager/HRDC	Bharat Heavy Electricals Ltd, Ranipet, Tamil Nadu	Member
12.	N. Krishna Murthy Principal Scientific Officer	CQA(Heavy Vehicles), DGQA, Chennai, Tamil Nadu	Member
13.	Sunil Khodke Training Manager	Bobst India Pvt. Ltd., Pune	Member
14.	Ajay Dhuri	TATA Motors, Pune	Member
15.	Uday Apte	TATA Motors, Pune	Member
16.	H B Jagadeesh, Sr. Manager	HMT, Bengaluru	Member
17.	K Venugopal Director & COO	NTTF, Peenya, Bengaluru	Member
18.	B.A.Damahe, Principal L&T Institute of Technology	L&T Institute of Technology, Mumbai	Member
19.	Lakshmanan. R Senior Manager	BOSCH Ltd., Bengaluru	Member
20.	R C Agnihotri Principal	Indo- Swiss Training Centre Chandigarh, 160030	Member
Mentor			
21.	Sunil Kumar Gupta (Director)	DGET HQ, New Delhi.	Mentor
Members of Core Group			

22.	N. Nath. (ADT)	CSTARI, Kolkata	Co-ordinator
23.	H.Charles (TO)	NIMI, Chennai.	Member
24.	Sukhdev Singh (JDT)	ATI Kanpur	Team Leader
25.	Ravi Pandey (V.I)	ATI Kanpur	Member
26.	A.K. Nasakar (T.O)	ATI Kolkata	Member
27.	Samir Sarkar (T.O)	ATI Kolkata	Member
28.	J. Ram Eswara Rao (T.O)	RDAT Hyderabad	Member
29.	T.G. Kadam (T.O)	ATI Mumbai	Member
30.	K. Mahendar (DDT)	ATI Chennai	Member
31.	Shrikant S Sonnavane (T.O)	ATI Mumbai	Member
32.	K. Nagasrinivas (DDT)	ATI Hyderabad	Member
33.	G.N. Eswarappa (DDT)	FTI Bangalore	Member
34.	G. Govindan, Sr. Draughtsman	ATI Chennai	Member
35.	M.N.Renukaradhya, Dy.Director/Principal Grade I.,	Govt. ITI, Tumkur Road, Banglore, Karnataka	Member
36.	B.V.Venkatesh Reddy. JTO	Govt. ITI, Tumkur Road, Banglore, Karnataka	Member
37.	N.M.Kajale, Principal,	Govt. ITI Velhe, Distt: Pune, Maharashtra	Member
38.	Subrata Polley, Instructor	ITI Howrah Homes, West Bengal	Member
39.	VINOD KUMAR.R Sr.Instructor	Govt.ITI Dhanuvachapuram Trivendrum, Dist., Kerala	Member
40.	M. Anbalagan, B.E., Assistant Training Officer	Govt. ITI Coimbatore, Tamil Nadu	Member
41.	K. Lakshmi Narayanan, T.O.	DET, Tamil Nadu	Member
Other industry representatives			
42.	Venugopal Parvatikar	Skill Sonics, Bangalore	Member
43.	Venkata Dasari	Skill Sonics, Bangalore	Member
44.	Srihari, D	CADEM Tech. Pvt. Ltd., Bengaluru	Member
45.	Dasarathi.G.V.	CADEM Tech. Pvt. Ltd., Bengaluru	Member
46.	L.R.S.Mani	Ohm Shakti Industries, Bengaluru	Member

TRADE: DRAUGHTSMAN (MECHANICAL)**14. LIST OF TOOLS & EQUIPMENTS FOR 16 TRAINEES****A : TRAINEES 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.	16+1 set
2.	Set square celluloid 45° (250 X 1.5 mm)	16+1 set
3.	Set square celluloid 30°-60° (250 X 1.5 mm)	16+1 set
4.	French-curves (set of 12 celluloid)	4 nos.
5.	Mini drafter	16+1 set
6.	Drawing board (700mm x500 mm) IS: 1444	16+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	16 Nos.
3.	Draughtsman stool	16 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.

GUIDELINES FOR INSTRUCTORS AND PAPER SETTERS

1. All questions of theory paper for the trade will be in objective type format.
2. Due care to be taken for proper & inclusive delivery among the batch. Some of the following method of delivery may be adopted:
 - a. Lecture
 - b. Lesson
 - c. Demonstration
 - d. Practice
 - e. Group discussion
 - f. Discussion with peer group
 - g. Project work
 - h. Industrial visit
3. Maximum utilization of latest form of training viz., audio visual aids, integration of IT, etc. May be adopted.
4. The total hours to be devoted against each topic may be decided with due diligence to safety & with prioritizing transfer of required skills.
5. Questions may be set based on following instructions:-

Sl. No.	Question on different aspect	Weightage in %age	Key Words may be like
1	Information received	25	What, Who, When
2	Knowledge	50	Define, Identify, Recall, State, Write, List & Name
3	Understanding	15	Describe, Distinguish, Explain, Interpret & Summarize
4	Application	10	Apply, Compare, Demonstrate, Examine, Solve & Use

6. Due weightage to be given to all the topics under the syllabus while setting the question paper.