CURRICULUM

FOR THE TRADE OF

DRAUGHTSMAN (MECHANICAL)

UNDER

APPRENTICESHIP TRAINING SCHEME

सत्यमेव जयते
Government of India

GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT& ENTREPRENURESHIP
DIRECTORATE GENERAL OF TRAINING

CONTENTS

1. ACKNOWLEDGEMENT

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Co-ordinator for the course: Sh. NirmalyaNath., ADT

Sl. No.	Name & Designation Sh./Mr./Ms.	Organization	Remarks
1.	N. Nath, ADT	CSTARI, Kolkata	Expert
2.	R. N. Manna, T.O.	CSTARI, Kolkata	Expert
3.	Prasoon Kr. Ghosh, Sr.D/Man	CSTARI, Kolkata	Expert
4.	Rupen Kr. Saha, T.O.	ATI, Kolkata	Expert

2. BACKGROUND

2. 1. Apprenticeship Training Scheme under Apprentice Act 1961

The Apprentices Act, 1961 was enacted with the objective of regulating the programme of training of apprentices in the industry by utilizing the facilities available therein for imparting on-the-job training. The Act makes it obligatory for employers in specified industries to engage apprentices in designated trades to impart Apprenticeship Training on the job in industry to school leavers and person having National Trade Certificate(ITI pass-outs) issued by National Council for Vocational Training (NCVT) to develop skilled manpower for the industry**.** There are four categories of apprentices namely**; trade apprentice, graduate, technician and technician (vocational) apprentices.**

Qualifications and period of apprenticeship training of **trade apprentices** vary from trade to trade. The apprenticeship training for trade apprentices consists of basic training followed by practical training. At the end of the training, the apprentices are required to appear in a trade test conducted by NCVT and those successful in the trade tests are awarded the National Apprenticeship Certificate.

The period of apprenticeship training for graduate (engineers), technician (diploma holders and technician (vocational) apprentices is one year. Certificates are awarded on completion of training by the Department of Education, Ministry of Human Resource Development.

2. 2. Changes in Industrial Scenario

Recently we have seen huge changes in the Indian industry. The Indian Industry registered an impressive growth during the last decade and half. The number of industries in India have increased manifold in the last fifteen years especially in services and manufacturing sectors. It has been realized that India would become a prosperous and a modern state by raising skill levels, including by engaging a larger proportion of apprentices, will be critical to success; as will stronger collaboration between industry and the trainees to ensure the supply of skilled workforce and drive development through employment. Various initiatives to build up an adequate infrastructure for rapid industrialization and improve the industrial scenario in India have been taken.

2. 3. Reformation

The Apprentices Act, 1961 has been amended and brought into effect from 22nd December, 2014 to make it more responsive to industry and youth. Key amendments are as given below:

- Prescription of number of apprentices to be engaged at establishment level instead of trade-wise.

- Establishment can also engage apprentices in optional trades which are not designated, with the discretion of entry level qualification and syllabus.

- Scope has been extended also to non-engineering occupations.

- Establishments have been permitted to outsource basic training in an institute of their choice.

- The burden of compliance on industry has been reduced significantly.

3. RATIONALE

(Need for Apprenticeship in **Draughtsman Mechanical**trade)

1. The greater degree of relevance of the training to familiar with basic drafting terminologyand developing multi-view drawings.
2. Acquiring effort to ensure that the work is done in trade drawing, that the trainees are prepared for the industrial drawing office.
3. It will enhance the ability to introduce the trainees to the current Industrial techniques.
4. It will help to use of symbols and separate drawing for the various processes like casting, forging, machining.
5. Exposure to go through standard specifications and dimensional data required to complete drawing.
6. It will enhance the ability to work with modern drawing tools and equipment which are used by progressive industrial establishment.
7. It provides exposure to observe the componentsphysically and measuring to produce working drawing from the dimensions taken.
8. It will enhance the ability to practice the aspiring draftsman with solving problems in manufacturing process.
9. Acquiring opportunity to design and draw assembled or sub-assembled component that can be a part of their professional portfolio.
10. The use of CAD technology has become the standard for draftsmen in the creation and manipulation of mechanical designs.

4. JOB ROLES: REFERENCE NCO

Brief description of Job roles:

Draughtsman, Mechanical prepares drawings of machines, plants, mechanical components, equipments, etc. from sketches, notes, data or sample forpurposes of manufacture or repairs. Takesinstructions from **Mechanical Engineer** andcalculates dimensions as required, fromavailable materials (notes, data etc.) orsample. Draws to scale detailed drawings,assembly drawings, showing plan,elevations, sectional views etc. according tonature of work and operations required.Prints (writes) dimensions, tolerances,material to be used and other details to givesclear picture and facilitate understanding.Maintains copies of drawings and makes blue prints. May trace drawings.Maydesign simple mechanical parts. Mayprepare estimates for materials and labourrequired. May specialise in makingdrawings of jigs and tools and be designatedaccordingly.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.

Reference NCO:

NCO-3118.40

5. GENERAL INFORMATION

1. **Name of the Trade** **: Draughtsman (Mechanical)**

2. **N.C.O. Code No.** : **3118.40**

3. **Duration of Apprenticeship Training (Basic Training + Practical Training):**2years

3.1 **For Freshers: -**Duration of Basic Training: -

a) Block –I : 3 months

b) Block – II : 3 months

Total duration of Basic Training: **6 months**

Duration of Practical Training (On -job Training): -

a) Block–I: 9 months

b) Block–II : 9 months

Total duration of Practical Training: **18 months**

3.2 **For ITI Passed: -** Duration of Basic Training: **- NIL**

Duration of Practical Training (On -job Training): **12 months**

4. **Entry Qualification** : Passed 10^{th} class examination under 10+2 system of education with Science &Mathematics or its equivalent.

5. **Selection of Apprentices:** The apprentices will be selected as per Apprentices Act amended time to time.

6. **Rebate for ITI passed trainees** : i) **One year** in the trade of **Draughtsman (Mechanical)**

Note: Industry may impart training as per above time schedule for different block, however this is not fixed. The industry may adjust the duration of training considering the fact that all the components under the syllabus must be covered. However the flexibility should be given keeping in view that no safety aspects is compromised.

6. COURSE STRUCTURE

Training duration details: -

Time (in months)	1-3	4-12	13-15	16-24
Basic Training	**Block– I**	**-----**	**Block – II**	**------**
Practical Training (On - job training)	**----**	**Block – I**	**------**	**Block – II**

Components of Training	Duration of Training in Months ➡																							
⬇	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Basic Training Block - I																								
Practical Training Block - I																								
Basic Training Block - II																								
Practical Training Block - II																								

7. SYLLABUS

7.1 BASIC TRAINING
(BLOCK – I &II)
DURATION: 06 MONTHS

GENERAL INFORMATION

1) **Name of the Trade** :Draughtsman (Mechanical)
2) **Hours of Instruction** : 1000 Hrs. (500 hrs. in each block)
3) **Batch size** : 20
4) **Power Norms** : 3.7KW
5) **Space Norms** : 64Sq.m.
6) **Examination** : The internal assessment will beheld on completion of each Block.
7) **Instructor Qualification** :

i) Degree/Diploma in **Mechanical**Engg. from recognized university/Board with one/two year post qualification experience respectivelyin the relevant field.

OR

ii) NTC/NAC in the trade of '**Draughtsman Mechanical'** with three year post qualificationexperience in the relevant field.

Preference will be given to a candidate with Craft Instructor Certificate (CIC)

8) **Tools, Equipments & Machinery required**: - As per Annexure – I

7.1.1 DETAILSYLLABUS OF CORE SKILL

A. Block– I
Basic Training

Topic No.	b) Workshop Science & Calculation	Duration (in hours)
1.	**Units & Measurements-** FPS, CGS, MKS/SI unit, unit of length, Mass and time. Fundamentals and derived units Conversion of units and applied problems.	**20**
2.	**Material Science** : properties -Physical & Mechanical, Types -Ferrous & Non-Ferrous, difference between Ferrous and Non-Ferrous metals	
3.	**Mass .Weight and Density** : Mass, Unit of Mass, Weight, difference between mass and weight, Density, unit of density,	
4.	**Speed and Velocity:** Rest and motion, speed, velocity, difference between speed and velocity, acceleration, retardation. Average Velocity, Acceleration & Retardation. Related problems. Circular Motion: Relation between circular motion and Linear motion, Centrifugal force, Centripetal force	
5.	**Ratio & Proportion** : Simple calculation on related problems. **Percentage:** Introduction, Simple calculation.	
6.	**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. Meaning of H.P., I.H.P., B.H.P., and F.H.P. and CC and Torque.	

B. Block- II
Basic Training

Topic No.	b) Workshop Science & Calculation	Duration (in hours)
1.	**Algebra:** Addition, Subtraction, Multiplication, Division, Algebraic formula, Linear equations (with two variables).	**20**
2.	**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.	
3.	**Mensuration:** Area and perimeter of square, rectangle, parallelogram, triangle, circle, semi circle, Volume of solids - cube, cuboid, cylinder and Sphere. Surface area of solids -cube, cuboid, cylinder and Sphere. Volume of cut-out solids: hollow cylinders, frustum of cone, block section. Volume of simple solid blocks.	
4.	**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. Concept of earthling.	
5.	**Simple machines Transmission of power:** -Transmission of power by belt, pulleys & gear drive. **Heat treatment process: -** Heat treatment and advantages. Annealing, Normalizing, Hardening, Tempering.	
6.	**Trigonometry:** Trigonometrical ratios, measurement of angles. Trigonometric tables. Finding the value of unknown sides and angles of a triangle by Trigonometrical method. Finding height and distance by trigonometry. Application of trigonometry in shop problems. (viz. taper angle calculation). Calculate the area of triangle by using trigonometry and application of Pythagoras theorem.	
7.	**Concept of pressure** - **Definition**:-Force, Pressure, and their units, atmospheric pressure, gauges used for measuring pressure, problems. Introduction to pneumatics & hydraulics systems.	
8.	**Simple exercises related to trade related Test Papers. Solution of NCVT test papers.**	

7.1.2 DETAIL SYLLABUS OF PROFESSIONAL SKILLS & PROFESSIONAL KNOWLEDGE

A. Block –I

Basic Training

Week No.	Professional Skills	Professional Knowledge
1	Safety: - its importance, classification, personal, general, workshop and job safety. Occupational health and safety. Basic injury prevention, Basic first aid, Hazard identification and avoidance, safety signs for Danger, Warning, caution & personal safety message. Preventive measures for electrical accidents & steps to be taken in such accidents. Importance of housekeeping & good shop floor practices. Disposal procedure of waste materials like cotton waste, metal chips/burrs etc. Fire& safety: Use of Fire extinguishers.	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 Institute system including stores procedures. Introduction of First aid. Safety attitude development of the trainee by educating him to use Personal Protective Equipment (PPE). Response to emergencies eg; power failure, fire, and system failure. Accidents- Definition types and causes. First-Aid, nature and causes of injury and utilization of first-aid. Introduction to 5S concept & its application. Fire: - Types, causes and prevention methods. Fire Extinguisher, its types. Define environment, environment Pollution, Pollutants, type of Pollution (Air pollution, water pollution, soil pollution noise pollution, thermal pollution, radiation. Global warming its causes and remedies. Industrial Waste its types, sources and waste Management.
2	Practice in using instruments. Drawing of straight and curved lines, Drawing angles, circles etc. Prepare a figure containing all types of lines. Layout of drawing sheet as per B.I.S. Folding of prints for filing Cabinets or binding as per SP: 46-2003	Nomenclature, description and use of drawing instruments & various equipments used in drawing office. Their care and maintenance. Different types of Lines and their meanings & their uses. Lay out of a drawing sheet as per B.I.S.
3	Block letters & numerals. Single & double stroke ratio 7: 4, 5: 4, free hand lettering practice. Preparation of Title Block as per Industry Drawing sheet.	Type of lettering proportion and spacing of letters and words. Knowledge of stencil lettering.
4	Draw lines and object representing scale factor. Draw a vernier scale with a reading.	Constructions of different types of scales, their appropriate uses, Principle of R.F, diagonal & vernier.
5	Plane geometrical construction of triangle, polygons, Circles, ellipse and parabola.	Terms & definitions- polygons and circles. Methods to draw geometrical figures.

6	Projection of lines and laminar planes. Projection of solids- prism, cones, pyramids and their 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.
7	Dimensioning technique – presenting on solid geometrical figure. Conventional sings and symbols. Different types of section lines and abbreviations as per B.I.S.	Units of dimensioning, system of dimensioning, Method of dimensioning & common features. Section lines of different materials, conventional signs, symbols & abbreviations, hatching.
8	Sectional views – Different types of solid section.	Importance sectional views. Types of sectional views & their uses. Parts not shown in section.
9	Development of surfaces of geometrical blocks.	Definition of development, its need in industry & different method of developing the surfaces.
10	Isometric projection of geometrical solids. Oblique projection of solids. Perspective projection of solids.	Principle of isometric projection, Difference between Isometric view & Isometric projection. Isometric scale. Dimensioning an isometric drawing. Principle and types of oblique projection. Types of perspective projection Fundamental concept and definition, Location of station point.
11	Drawing bolts, nuts and studs, Locking devices, machine screws, set screw and Foundation bolts with BIS convention. Drawingwelded joints and riveted joints, keys, cotters and pins with BIS conventions.	Types of bolts and studs, and their proportion, uses.Different types of locking devicesand their specification.Different types of foundation bolts. Description of Riveted joints. Welded Joints and their representation (Actual and Symbolic) on drawing as per BIS.
12.	Intensive free hand sketching of m/c parts along with projection of simple machine parts in 1st angle projection. Projection of machine parts drawn in the above exercise in 3rd angle projection by taking physical measurement.	Importance of free hand sketching, machine drawing. Material and equipment required in sketching. Method of using precision measuring instrument such as inside & outside micrometers, depth gauges , vernier, calipers, dial indicators, slip gauges , sine bars, universal bevel protractor, etc.
13	**Revision & Internal Assessment**	

B. Block –II
Basic Training

Week No.	Professional Skills	Professional Knowledge
1	Symbols for machining and surface finishes (grades and micron values) Working drawing of flanged couplings.	Limits, fit, tolerance. Dimensional tolerance, 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. Couplings, necessity of coupling, classification of couplings.
2	Half sectional drawing of a simple bush bearing and foot step bearing.	Use of a bearing, types of bearing, frictional and anti frictional bearings. Parts of anti frictional bearings (ball, roller, thrust ball, needle & taper roller)
3	Pulleys-solid, stepped and built up pulleys.	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.
4	Working drawing of gears such as spur gears.	Use of gears in transmission of power. Different types of gears. Cast gears and machined gears.
5	Cams with different motions to followers.	Use of Cams in industry. Types of cam, kinds of motion, displacement diagrams. Terms used in cam. Types of followers.
6	Sketching & Assembly Drawing of machine vice.	Brief Description of lathe, milling, shaping slotting and planning machines; Quick return mechanism of these machines.
7	Sectional drawing of pipe fittings - flanges, unions, valves etc. Line diagram of piping layout drawing with welded, flanged and screwed fittings.	Piping materials and specifications of W.I. & Steel pipes, Pipe threads, Specifications of pipe fittings.Brief description of different pipe joints.
8	Reproduction and duplication of Engineering Drawing. Numbering and preservation of drawing.	Classification of charts, graphs and diagram. Blue prints, Plotter print, photo copies, Xerox printing. Method of numbering and preserving of drawings. Preparation of the Master registers of the drawing.
9	Introduction to CAD, 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 CAD Advantages of using CAD
10	Related Exercises using Absolute Co-ordinate system, Polar Co-ordinate System and Relative	Absolute Co-ordinate system , Polar Co-ordinate System and

	Co-ordinate System, Exercise using commands set of tools in Draw, Modify and Dimension. Creating drawing using CAD shortcut keyboard command.	Relative Co-ordinate System Knowledge of Workspace in drawing space: 2D classic, Drafting & annotation, 3D modeling, etc. Use of drawing utilities, Snap, Ortho, Grid, Osnap, Polar tracking. Customization of working environment with tool using shortcut key, menu driven or ribbon setting.
11	CAD: Practice using Creating templates, Inserting drawings, Layers and Modify Layers. Viewing Drawing in viewports in layout space.	Knowledge of model space & layout space, how to create viewport & template. Managing drawing in page setup manager.
12	Exposure of 3D modeling.	Introduction to 3D, 3D primitives, Extrude, Revolve command. Setting User co-ordinate Systems, Rotating, Plotting, Print preview
13	**Revision & Internal Assessment**	

7.1.3 EMPLOYABILITY SKILLS

GENERAL INFORMATION

1)	**Name of the subject**	**:**	**EMPLOYABILITY SKILLS**
2)	**Applicability**	**:**	ATS- Mandatory for fresher only
3)	**Hours of Instruction**	**:**	**110 Hrs. (55 hrs. in each block)**
4)	**Examination**	**:**	The examination will be held at the end of two years Training by NCVT.
5)	**Instructor Qualification**	**:**	

i)MBA/BBA with two years experience or graduate in sociology/social welfare/Economics with two years experience and trained in Employability skill from DGET Institute.

And

Must have studied in English/Communication Skill and Basic Computer at 12th /diploma level

OR

ii) Existing Social Study Instructor duly trained in Employability Skill from DGET Institute.

7.1.3.1 SYLLABUS OF EMPLOYABILITY SKILLS

A. Block – I
Basic Training

Topic No.	Topic	Duration (in hours)
	English Literacy	**15**
1	**Pronunciation :** Accentuation (mode of pronunciation) on simple words, Diction (use of word and speech)	
2	**Functional Grammar** Transformation of sentences, Voice change, Change of tense, Spellings.	
3	**Reading** Reading and understanding simple sentences about self, work and environment	
4	**Writing** Construction of simple sentences Writing simple English	
5	**Speaking / Spoken English** Speaking with preparation on self, on family, on friends/ classmates, on know, picture reading gain confidence through role-playing and discussions on current happening job description, asking about someone's job habitual actions. Cardinal (fundamental) numbers ordinal numbers. Taking messages, passing messages on and filling in message forms Greeting and introductions office hospitality, Resumes or curriculum vita essential parts, letters of application reference to previous communication.	
	I.T. Literacy	**15**
1	**Basics of Computer** Introduction, Computer and its applications, Hardware and peripherals, Switching on-Starting and shutting down of computer.	
2	**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.	
3	**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	
4.	**Computer Networking and INTERNET** Basic of computer Networks (using real life examples), Definitions of Local Area Network (LAN), Wide Area Network (WAN), Internet, Concept of Internet (Network of Networks), Meaning of World Wide Web (WWW), Web Browser, Web Site, Web page	

	and Search Engines. Accessing the Internet using Web Browser, Downloading and Printing Web Pages, Opening an email account and use of email. Social media sites and its implication. Information Security and antivirus tools, Do's and Don'ts in Information Security, Awareness of IT - ACT, types of cyber crimes.	
	Communication Skill	**25**
1	**Introduction to Communication Skills** Communication and its importance Principles of Effective communication Types of communication - verbal, non verbal, written, email, talking on phone. Non verbal communication -characteristics, components-Para-language Body - language Barriers to communication and dealing with barriers. Handling nervousness/ discomfort. Case study/Exercise	
2	**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.	
3	**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. Case study/Exercise	
4	**Facing Interviews** Manners, Etiquettes, Dress code for an interview Do's & Don'ts for an interview	
5	**Behavioral Skills** **Organizational Behavior** Problem Solving Confidence Building Attitude Decision making Case study/Exercise	

B. Block– II
Basic Training

Topic No.	Topic	Duration (in hours)
	Entrepreneurship skill	**15**
1	**Concept of Entrepreneurship** **Entrepreneurship-** Entrepreneurship - Enterprises:-Conceptual issue Entrepreneurship vs. Management, Entrepreneurial motivation. Performance & Record, Role & Function of entrepreneurs in relation to the enterprise & relation to the economy, Source of business ideas, Entrepreneurial opportunities, The process of setting up a business.	
2	**Project Preparation & Marketing analysis** Qualities of a good Entrepreneur, SWOT and Risk Analysis. Concept & application of Product Life Cycle (PLC), Sales & distribution Management. Different Between Small Scale & Large Scale Business, Market Survey, Method of marketing, Publicity and advertisement, Marketing Mix.	
3	**Institutions Support** Preparation of Project. Role of Various Schemes and Institutes for self-employment i.e. DIC, SIDA, SISI, NSIC, SIDO, Idea for financing/ non financing support agencies to familiarizes with the Policies /Programmes& procedure & the available scheme.	
4	**Investment Procurement** Project formation, Feasibility, Legal formalities i.e., Shop Act, Estimation & Costing, Investment procedure - Loan procurement - Banking Processes.	
	Productivity	**10**
1	**Productivity** Definition, Necessity, Meaning of GDP.	
2	**Affecting Factors** Skills, Working Aids, Automation, Environment, Motivation How improves or slows down.	
3	**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.	
4	**Personal Finance Management** Banking processes, Handling ATM, KYC registration, safe cash handling, Personal risk and Insurance.	
	Occupational Safety, Health & Environment Education	**15**
1	**Safety & Health** Introduction to Occupational Safety and Health importance of safety and health at workplace.	
2	**Occupational Hazards** Basic Hazards, Chemical Hazards, Vibro-acoustic Hazards, Mechanical Hazards, Electrical Hazards, Thermal Hazards. Occupational health, Occupational hygienic,	

	Occupational Diseases/ Disorders & its prevention.	
3	**Accident & safety** Basic principles for protective equipment. Accident Prevention techniques - control of accidents and safety measures.	
4	**First Aid** Care of injured & Sick at the workplaces, First-Aid & Transportation of sick person	
5	**Basic Provisions** Idea of basic provision of safety, health, welfare under legislation of India.	
6	**Ecosystem** Introduction to Environment. Relationship between Society and Environment, Ecosystem and Factors causing imbalance.	
7	**Pollution** Pollution and pollutants including liquid, gaseous, solid and hazardous waste.	
8	**Energy Conservation** Conservation of Energy, re-use and recycle.	
9	**Global warming** Global warming, climate change and Ozone layer depletion.	
10	**Ground Water** Hydrological cycle, ground and surface water, Conservation and Harvesting of water	
11	**Environment** Right attitude towards environment, Maintenance of in -house environment	
	Labour Welfare Legislation	**5**
1	**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.	
	Quality Tools	**10**
1	**Quality Consciousness :** Meaning of quality, Quality Characteristic	
2	**Quality Circles :** Definition, Advantage of small group activity, objectives of quality Circle, Roles and function of Quality Circles in Organization, Operation of Quality circle. Approaches to starting Quality Circles, Steps for continuation Quality Circles.	
3	**Quality Management System :** Idea of ISO 9000 and BIS systems and its importance in maintaining qualities.	
4	**House Keeping :** Purpose of Housekeeping, Practice of good Housekeeping.	
5	**Quality Tools** Basic quality tools with a few examples	

7.2 PRACTICAL TRAINING (ON-JOB TRAINING)
(BLOCK – I&II)
DURATION: 18 MONTHS (9 months in each block)

GENERAL INFORMATION

1) **Name of the Trade** :**Draughtsman Mechanical**
2) **Duration of On-Job Training** : As per Apprenticeship Act amended time to time.
3) **Batch size** : a) Apprentice selection as per Apprenticeship guidelines.
   b) Maximum 20 candidates in a group.
4) **Examination** : i) The internal assessment will be held on completion of each block
   ii) NCVT exam will be conducted at the end of 2nd year.
5) **Instructor Qualification** :

i) Degree/Diploma in **Mechanical**Engg. from recognized university/Board With one/two year post qualification experience in the relevant field.

OR

ii) NTC/NAC in the trade of **Draughtsman Mechanical** with three year post qualificationexperience in the relevant field.

Preference will be given to a candidate with Craft Instructor Certificate (CIC)

6) **Infrastructure for On-Job Training** : - As per Annexure – II

7.2.1 BROAD SKILL COMPONENT TO BE COVERED DURING ON-JOB TRAINING

A. BLOCK – I (09 months)

1. Safety and best practices/Basic Industrial Culture (5S, KAIZEN, etc.)
2. Prepare different types of documentation as per industrial need by different methods of recording information.
3. Construct different Geometrical figures using drawing Instruments.
4. Draw orthographic Projections giving proper dimensioning with title block using appropriate line type and scale.
5. Construct free hand sketches of simple machine parts such as tool post of a Lathe with correct proportions.
6. Draw Sectional views showing orthographic, isometric and oblique projections.
7. Develop surface and interpenetration of solid in orthographic projection.
8. Draw different types of fasteners and locking devices as per BIS convention.
9. 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.
10. Draw different couplings and bearings with tolerance dimension indicating surface finish symbol.
11. Creating of part list/ BOM for sub assembly and assembly drawings.
12. Introduction and overview of various CAD Software's available in market which are used in different industries.
13. Creation of Standard templates and Callouts that are required Drafting in CAD Software
14. Create objects on drawing space using toolbars, commands and menus in CAD application software.

B. BLOCK – II (09 months)

1. Customize object drawing on CAD using Toolbars viz. Draw, Modify, Dimensioning, Format Layer and Style.
2. Create objects using 3D Modeling Space and Print Preview and Plotting in CAD. Prepare object in 3D and convert it 2D from 3D only.
3. Draw detail and assembly drawing of machine parts viz., Pulleys, Pipe fittings, Gears and Cams using CAD.

4. Draw IC Engine Parts with dimensioning and tolerance using CAD, applying quality concept.
5. Draw detail and assembly of Manufacturing and Process tools applying conventional signs & symbols using CAD.
6. Measure and inspect different components by using gauges and measuring instruments and check for accuracy without any assistance.
7. Interpretation and representation ISO tolerances and fits. Create document of limits, Fits and Tolerances used in various parts of machine assembly.
8. Create and plot a machine part with assembly, specify detail in Title Block and layout space in CAD.
9. Representation of sealing elements, springs and fluidic power e.g. hydraulic and pneumatic elements.
10. Create production drawing of machine part/complex drawing applying GD&T (Geometrical Dimensioning &Tolerances).
11. Create documents for various materials used in various parts with material properties and it's use in that part.
12. Basic information about various ERP packages used in various industries.
13. Basic information of 7 QC tools & Basic manufacturing processes for various components.

8. ASSESSMENT STANDARD

8.1 Assessment Guideline:

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 assessment. Due consideration to be given while assessing for team work, avoidance/reduction of scrape/wastage and disposal of scarp/wastage as per procedure, behavioral attitude and regularity in training.

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 this grade, the candidate with occasional guidance and showing due regard for safety procedures and practices, has produced work which demonstrates attainment of an acceptable standard of craftsmanship.

In this work there is evidence of:

- good skill levels in the use of hand tools, machine tools and workshop equipment
- many tolerances while undertaking different work are in line 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 above75%- 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 which 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
- the majority of tolerances while undertaking different work are in line 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
- tolerances while undertaking different work being substantially in line 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

8.2 FINAL ASSESSMENT- ALL INDIA TRADE TEST

(SUMMATIVE ASSESSMENT FOR TWO YEARS TRADE)

SUBJECTS	Marks	Sessional Marks	Full Marks	Pass Marks	Duration of Exam.
Practical	300	100	400	240	**08 hrs.**
Trade Theory	100	20	120	48	3 hrs.
Workshop Cal. & Sc.	50	10	60	24	3 hrs.
Engineering Drawing	50	20	70	28	4 hrs.
Employability Skill	50		50	17	2 hrs.
Grand Total	**550**	**150**	**700**	**-**	

Note: - The candidate pass in each subject conducted under all India trade test.

9. FURTHER LEARNING PATHWAYS

- On successful completion of the course trainees can opt for Diploma course (Lateral entry).[Applicable for candidates only who undergone ATS after CTS]
- On successful completion of the course trainees can opt for CITS course.

Employment opportunities:

On successful completion of this course, the candidates may 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 (Central and State) and private industries in India & abroad.
8. Self employment

ANNEXURE – I

TOOLS & EQUIPMENT FOR BASIC TRAINING

INFRASTRUCTURE FOR PROFESSIONAL SKILL & PROFESSIONAL KNOWLEDGE

TRADE:Draughtsman Mechanical

LIST OF TOOLS & EQUIPMENTS FOR 20APPRENTICES

A : TRAINEES TOOL KIT:-

Sl. No.	Name of the items	Quantity (indicative)
1.	Draughtsman drawing instrument box containing 20 Nos 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 set
2.	Set square celluloid 45^0 (250 X 1.5 mm)	20 set
3.	Set square celluloid 30^0-60^0 (250 X 1.5 mm)	20 set
4.	French-curves (set of 12 celluloid)	4 nos
5.	Mini drafter	20 set
6.	Drawing board (700mm x500 mm) IS: 1444	20 set

B :TOOLS INSTRUMENTS AND GENERAL SHOP OUTFITS

Sl. No.	Name of the items	Quantity (indicative)
7.	Chest of drawer 8 drawers(Standard)	2 Nos.
8.	Draughtsman table	20 Nos.
9.	Draughtsman stool	20 Nos.
10.	Software: MS- office latest version, CAD with latest Licensed version ,Latest Version of SOLIDWOKS, AUTODESK INVENTOR, CATIA & PRO-E (CREO-2)	8 users
11.	White Board for using LCD projector(optional)	1 No.
12.	Instructor Table	1 No.

13.	Instructor Chair	2 Nos.
14.	Almirah steel	1 No.
15.	3D Visualiser	1 No.
16.	Computer table	8 Nos.
17.	Computer chairs	16 Nos.
18.	Table for server, printers	1 No. each
19.	External storage device (8 GB)	2 Nos.

C :GENERAL MACHINERY INSTALLATIONS:-

Sl. No.	Name & Description of Machines	Quantity (indicative)
1.	Computer Latest version compatible for running CAD software, preloaded with windows and 20" colour Monitor.	8 Nos
2	Sever (True dedicated sever)	1 No.
3	Plotter (Max. A0 size)	1 No.
4	Laser Jet printer latest model	1 No.
5	UPS - 5 KVA	2 Nos.
6	LCD projector /OHP	1 No.

Note: In case of basic training setup by the industry the tools, equipment and machinery available in the industry may also be used for imparting basic training.

ANNEXURE – II

INFRASTRUCTURE FOR ON-JOB TRAINING

TRADE: Draughtsman Mechanical

For Batch of 20APPRENTICES

Actual training will depend on the existing facilities available in the establishments. However, the industry should ensure that the broad skills defined against On-Job Training part (i.e. 9 months + 9 months) are imparted. In case of any short fall the concern industry may impart the training in cluster mode/ any other industry/ at ITI.

ANNEXURE-III

GUIDELINES FOR INSTRUCTORS AND PAPER SETTERS

1.Due care to be taken for proper & inclusive delivery among the batch. Some of the following some 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

2. Maximum utilization of latest form of training viz., audio visual aids, integration of IT, etc. may be adopted.

3. The total hours to be devoted against each topic may be decided with due diligence to safety & with prioritizing transfer of required skills.