CURRICULUM

FOR THE TRADE OF

UTILITY OPERATOR

UNDER

APPRENTICESHIP TRAINING SCHEME

2017

सत्यमेव जयते
Government of India

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

CONTENTS

1. ACKNOWLEDGEMENT

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1. TATA Steel, Jamshedpur

Special acknowledgement is extended by DGT to the following expert members who had contributed immensely in this curriculum.

Co-ordinator for the course: Sh. Nirmalya Nath., ADT

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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 **Utility Operator** trade)

1. Operate and maintain equipment in order to repair, clean, install, and maintain water and gas distribution systems and sanitary and storm water collection systems.

   - Perform routine maintenance checks on vehicles and equipment.
   - Operate and maintain equipment used in sewer line and distribution line maintenance and repair, including high pressure jet rodder, mechanical rodder, cleaning bucket machine, trenchers, Mobil steamer, backhoe, loader, excavators, and hydro-excavator, cable crane, and closed circuit television equipment.
   - Assist in the preparation of work sites to include the erection of appropriate barricades, warning devices, equipment, and shoring equipment.
   - Operate and maintain equipment used in ditch, open channel, and shoreline maintenance and repair, including excavators and backhoes.

2. Perform routine service work in order to maintain water, sanitary and storm water pumping stations, and regulator stations.

   - Analyze and record hour meter data at pump stations.
   - Record and report defects or failures in collection, filtration, and conveyance of wastewater, gas, water, and storm water.
   - Assist in the maintenance and repair of motors and pumps and report equipment defects or failures.
   - Assist in cleaning wet wells and bar screens in sanitary pump stations.
   - Assist in the removal of filter media at the City of Duluth Water Treatment Plant.
   - Assist in snow removal at pump stations.
   - Assist in wastewater and storm water flow monitoring and sampling.
   - Assist in the installation and maintenance of water and gas service mains, water and gas services, large meters, and regulator stations.

3. Perform skilled and semiskilled work in order to install, maintain, and repair the water and gas distribution and sanitary and storm sewer collection systems.

   - Install and maintain water mains, valves, hydrants, gas mains, and
   - Sanitary and storm sewer mains, services, manholes, catch basins and leads.
   - Prepare work site by setting up traffic control, breaking street surfaces, digging, and shoring.
   - Make repairs to work sites by refilling trenches, mixing, pouring and smoothing asphalt, gravel and other materials to replace street surfaces, including landscaping.
   - Perform work to cut, thread and tap pipes.
   - Install pipe sections by positioning, joining, aligning, calking, and sealing joints.
   - Install valves and stops.
   - Operate, inspect, repair, and test hydrants, valves, services, and mains.

4. JOB ROLES: REFERENCE NCO

Brief description of Job roles:

Boiler, Attendant Boiler Attendant operates boilers to generate steam of required pressure by controlling and adjusting water feed, draught, evaporation, fire, etc., for heat or power. Opens water-pipe valve in tank through glass tube attached to it and closes water-pipe when boiler tank is filled with water to required level. Ensures that water level in indicator is always above minimum limit. Opens door of fire chamber of boiler, shovels fuel into fire box and rakes fire to obtain maximum heat or sets device which feeds gas, oil or other fuel automatically. Checks temperature and pressure of steam by reading gauges and feeds fuel or adjusts stoking accordingly. Operates different supply valves and ensures that steam is supplied to engine room at prescribed pressure. Controls air draught into boiler ensuring correct adjustment of air supply and preventing infiltration of extraneous air. Maintains water level and steam pressure as prescribed. Drains out excess water from drum by blowing down according to instructions or in presence of shift-in-charge. Undertakes cleaning of boiler tube ways and minor repairs, maintains general external cleanliness, lubricates mechanical parts of boiler and assists in commissioning, banking (reducing the rate of combustion in boiler furnace by covering fire with slack or fire coal) and shutting down boilers. Maintains prescribed records of readings in log book. May cut off automatic water feed and make direct connection to drum and blow off excess water in case of emergency. May remove ash from ash pan or slag from slag chamber. May clean boiler and flues. May operate boilers with different fuels such as gas, oils, coal and be designated accordingly.

Turbine Operator, Steam Turbine Operator, Steam; Turbo generator Operator, Steam operates steam powered turbine which drives generators for producing electricity. Starts turbine by opening valve for supply of steam into turbine to rotate turbine wheels; runs turbine at low speed for pre-determined length of time and notifies the Switch- Board Operator when ready to run turbine at full working speed; increases speed of turbine and ensures that automatic regulator maintains correct working speed; notifies Switch-Board Operator that turbine can be synchronised with other power units in plant. Observes gauges and meters to ensure proper handling of load by turbine and its proper functioning; alters power output of turbine and makes other adjustments as necessary. Cuts out unit evaporator to conduct blow down of turbine for periodic overhauling. May keep records of instrument readings. May repair and overhaul equipment and other auxiliaries.

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.

Perform TPM (Total Production Management), TQM (Total Quality Management) and record keeping system.

Reference NCO:

NCO-2015: -- 3131.0300, 8182.0200

5. GENERAL INFORMATION

1. **Name of the Trade** **: UTILITY OPERATOR**

2. **N.C.O. Code No.** : **NCO-2015:** -- 3131.0300, 8182.0200

3. **Duration of Apprenticeship Training (Basic Training + Practical Training):** 15Months

4. **Duration of Basic Training**: -

a) Block –I : 3 months

Total duration of Basic Training: 3 months

5. **Duration of Practical Training (On -job Training): -**

a) Block–I: 12 months

Total duration of Practical Training: 12 months

6. **Entry Qualification** : Passed 10th class examination under 10+2 system of education or its equivalent

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

8. **Rebate for ITI passed trainees** : 03 months - Broad Based Basic Training in Process Plant Maintenance Sector under Centre of Excellence Scheme and Advanced module of Centre of Excellence Scheme in Operation and Maintenance of Boiler and Steam Turbine.

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	4-15
Basic Training	Block– I	-----
Practical Training (On - job training)	----	Block – I

Components of Training ⬇	Duration of Training in Months ➡														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Basic Training Block - I															
Practical Training Block - I															

7. SYLLABUS

7.1 BASIC TRAINING

(BLOCK – I)

DURATION: 03 MONTHS

GENERAL INFORMATION

1) **Name of the Trade** : **UTILITY OPERATOR**
2) **Hours of Instruction** : 500 Hrs.
3) **Batch size** : 20
4) **Power Norms** : 3.51 KW for Workshop
5) **Space Norms** : 70 Sq. m.
6) **Examination** : The internal assessment will be held 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 respectively in the relevant field.

OR

ii) NTC/NAC in the trade of **Utility Operator** with three year post qualification experience 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 DETAIL SYLLABUS OF CORE SKILL

A. Block– I
Basic Training

Topic No.	a) Engineering Drawing	Duration (in hours)	b) Workshop Science & Calculation	Duration (in hours)
		30		**20**
1.	Introduction to Engineering drawing, its importance and uses in engineering fields. Simple definitions of Points, Lines, Parallel straight lines.		Applied workshop problems involving simple addition, subtraction, multiplication, division and common fractions.	
2.	Geometrical construction of Square, Rectangle, Triangle, Circle, Polygons, etc.		Science- Definition, Nomenclature, various branches, significance and definitions of important terms.	
3.	Drawing different types of lines.		Rounding of decimal values, use of approximation.	
4.	Free hand sketch of Hand tools used in the trade.		Units – Definition, fundamental & derived units, system of units- FPS, CGS, MKS and SI units of some important parameters- Length , mass, time, density, current, voltage, pressure etc. Unit conversion.	
5.	Screw Threads – Forms of Various Screw threads used in general in the industry – Nomenclature, convention		Workshop problems related to average.	
6.	Fastening Devices – Temporary and Permanent. Meaning and difference. Temporary Device – Hexagonal Bolt, Nut, Check Nut, Washer.		Workshop problems related to percentage.	
7.	Different Methods of Preventions of rotation of Bolts - Check nut, Square headed bolt, Square headed bolt with square neck, cup headed bolt, Eye bolt, counter sunk headed bolt, rag bolt, etc.		Workshop problems related to ratio and proportion.	
8.	Different Methods of locking of nuts :- a) Lock nuts, b) Split pin, c) Slotted nut , d) Symmonds nut, e) Castle nut**, f**) Wings nut, etc.		Workshop problems related on time & work.	
9.	Permanent Fastening Devices- Rivets – different parts and their types Different types of rivet heads.		Profit & Loss and problems concerning to workshop practices.	

10.	Rivets Joints – Lap joint and Butt or Strap joint. Lap Joint – a) Single Riveted, b) Double riveted, i) Chain, ii) zig – zag Butt Joint – a) Single plate or strap, b) Double plate or strap		Properties of Matter- Different types of Properties of Matter e.g. Mechanical, Electrical, Chemical, Magnetic.	
11.	Keys and Cotter Joints, Difference between Keys and Cotters, Different types of Keys.		Properties of Matter (Mechanical) - Tenacity, Toughness, Malleability, Ductility, Elasticity, Plasticity, Brittleness, Hardness (concept & definition)	
12.	---		Properties and uses of copper, zinc, lead, tin, aluminum, brass, bronze, solder, bearing metals, timber, and rubber.	
13.	---		Engineering Material- Introduction, classification, Metallic- Non metallic material, physical and mechanical properties,	
14.	---		Heat & temperature- Definition and its importance. Scales of Temperature, e.g. Fahrenheit, Centigrade, Kelvin- relationship between them.	
15.	---		Transmission of heat- Conduction, Convection and Radiation. Examples from Industries (concept & definition)	
16.	---		Transmission of Power and motion of Belt and Pulleys:- Driver and Follower – Open and Cross belt system of belt drives. Velocity ratio. Power Transmission by belt – Problems	

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. Safety regarding working with different types of steam and its First-Aid.	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 e.g.; 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, sound noise pollution, thermal pollution, radiation. Global warming its causes and remedies. Industrial Waste its types, sources and waste Management. Types of water (DM, RO, drinking treatment)
2.	Filling a flat surface of mild steel & cast iron . Filing flat & square to size to an accuracy of +0.1mm. Marking & punching of stepped & angular components & finishing of stepped & angular components & finishing the part to the required shape & size to an accuracy of +0.1mm.	Units of measurements –MKS,CGS,FPS, SI & its Conversation. Physical introduction to measuring instruments- Handling of Instruments- Exercise in the use of liner measuring instruments Such as steel rule of different ranges. Out side calipers, in side Calipers for measuring inside. Outside measurement, in side measurement, depth gauge. Check for flatness straightness & square ness. Marking & punching tools. & their uses. Hacksaw- types, specification & their uses.

		Classification & specification of files, shapes, sizes and grades. Bench vice constructional details. Introduction to lathe description. Lathe-types of lathe machine, parts of centre lathe and function, lathe operation.. Lathe cutting tools- Types & tools, angle cutting speed feed depth of cut for different lathe operation
3.	Holding the Job in 3jaw and 4 Jaw chuck Facing and plain turning operations use of measuring tools required for turning. method. center drilling, boring ., parting off knurling ,grooving. chamfering operation.	Introduction of special machine tools such as , Turret lathe, capstan lathe its working and maintenance. Basic of CNC.
4.	Use of hand tools, join practice with single and multi - stand conductors of different wires. Joining practice of bare conductors - soldering practice on printed circuit boards- Demonstration & practice on soldering the aluminum conductor, cable joints. Use of aluminum flux and Alca 'p' solder. Demonstration and practice of crimping of various wires.	General care & maintenance of common hand tools, wires & cable - conductors, insulators & semiconductors- their shapes, sizes with respect to low, medium & high voltage. Soldering printed circuit boards &its uses- different fluxes for different purpose on metal's- crimping equipment- joining of conductors by soldering. Importance of preventive maintenance and routine tests Earthing and its importance Resistance, voltage, current, open circuit and short circuits-ohm's law- voltage drop - series & parallel circuits-power & energy relations - electrical measuring instruments-millimeters common electrical accessories used in industries- bus-bars, replays, contactors, circuit breakers, etc.. Fuses tube light and its rating - materials used.
5.	Making of a simple circuit with a lamp and battery. Simple wiring practice with distribution boards, junction boxes, main switches two way and intermediate switches. Study and use of multi maters - measurement of current, voltage, resistance in DC\AC circuits. Demonstration & verification of ohm's law - series circuits - parallel circuits. Demonstration in circuits -use of tong tester and megger .	Fundamental of measuring instruments & systems: Safety and precautions in handling of electrical and electronics equipment's Principle of M. C. & M. I. meters, measurement value, shunt constructions & connection, voltage measurements, instrument sensitivity, meter accuracy, changing meter range. Using of AC/ DC meters. The purpose of process measurement, use of measurement, display& error in measurements & study of different types of measuring instruments. Remote vs. local display. Errors in measurement systems, calibration, noise response time

6.	Electrical measurement & measuring instruments Testing and calibration of ammeters & volt meters of various types & construction of M. C. & M. I. Measurement of power by watt meter & calibration of watt meter, KWH meter.	Maintenance Introduction safety precaution in maintenance Vernier Bevel protector, Combination set, Sinebar, Dial Test Indicator, Slip Gauge, Introduction of different types pumps, Maintenance of Pump repairing, Pump shaft multistage pump & mechanical seal coupling and motor shaft coupling alignment, Pipe line. Preventive maintenance and breakdown maintenance. Iinstallation, New machine installation factor and preventive maintenance advantage& there uses. Maintenance of hydraulic system, Maintenance of pneumatic system, principal and working procedure of hydraulic and pneumatic system.
7.	Practical on Instrumentation trainer/ simulator, computerized instrumentation simulator. Principle of transducer operation	Introduction of special machine maintenance such as thread cutting, boring, spline cutting on NC & CNC machine Demonstration of different metals, ferrous and nonferrous metals. Limit, Fit , Tolerance , types of limit, types of fit, types of tolerance , Allowance ,types of allowance ,Tolerance, system.
8.	Practice of Measuring by using of instruments. Pipe thread cutting, maintenance of pump & pipeline	Gauge necessity of gauge, Types of gauge there use. Pluge gauge, ring gauge, snap gauge, thread gauge, wire gauge, radius gauge, filler gauge. Surface finish terminology , roughness , roughness value, Roughness grade and roughness symbol, grinding and grinding process Metal physical and mechanical properties of metal, Iron removing process from ORE, Ferrous Metal, Non Ferrous Metal, Ferrous and non ferrous allow its advantage.
9.	Practice on cutting thread. Sift & bush bearing turning & fitting	Heat treatment, Necessity, Terminology of Heat Treatment, Hardening, Tempering, Annealing, Normalizing, Case Hardening different types of case hardening methods. Power Transmission, Necessity , Advantage, Types of power Transmission belt , types of (V & flat belt) belts and there size and specification pulley and there kinds Introduction of different of types joints. Coupling & there types, use chain, chain sprockets, wire

		rope and clutch for power transmission system.
10.	Grinding of different job as per specification. Hardening on punch by using of heat treatment Pulley boring according to shaft.	Gear specification of Gear, Types of Gear and there use key and there types and there use. Lubricant and coolant , Necessity of lubricant and coolant, types of lubricant and there use types of collant & there use different types of lubricating system. Bearing, Introduction, Necessity types of bearing its construction and there use according to work. Gear Box, Different types of gear box and there uses Oil seal its use and there kinds gas kits. Welding introduction , Welding types of welding Different b/w transformer and rectifier welding machines its uses in maintenance shop. Specification of welding rods.
11.	Coupling boring and fitting Keyway cutting and shift pulley fitting	Basic concept of effective matching, Requirement of good machining practice factors affecting the performance of machining. Tool life and factor affecting it tool failure problem due to heat generation Jig, Fixtures templates roll of jig and fixture in mass production, types of jig and types of fixture factor to be considered for selecting and designing jig or fixture. Template and there use.
12.	Boring and bushing	Introduction of valves types of valves such as gate valve, diaphragm, globe, butterfly and safety valve, safety valve setting, needle valve, non return valve.
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	
	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)
DURATION: 12 MONTHS

GENERAL INFORMATION

1) **Name of the Trade** : **UTILITY OPERATOR**

2) **Batch size** : a) Apprentice selection as per Apprenticeship guidelines.
b) Maximum 20 candidates in a group.

3) **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.

4) **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 **Utility Operator** with three year post qualification experience in the relevant field.

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

5) **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
DURATION: 12 MONTHS

PRACTICAL

1. Over hauling of Hydraulic jack
2. Preventive maintenance of machine.
3. Gear Box overhauling, weared shaft welding, Broken bolt remove by welding etc.
4. Maintenance of anyone type of Valve
5. Operation of fans and blowers like forced draft fans, induced draft fans etc. cooling tower fans (CT fan) including starting, stopping capacity adjustment etc. (fixing of blades of CT fans)
6. Operation of steam driven equipments like feed water pumps, fans, etc. including starting, stopping and capacity adjustment & CEP (condenser extraction pump)
7. (a) Operation of Fuel (i.e. Coal/oil/Gas) feeding mechanism including adjustment of flow of coal, Grate drive and draft regulation for proper combustion. Use of mechanical stoker.
   (b) Study of burners for oil and gas and also filters.
4. Normal level control in Boilers: Operation and reading of gauge glass etc. Level control during the emergency operations and use of blow down valves. (three element control)
5. Operation of water, waster water disposal, softener equipment including feed water softener. Clarificulators precipitators, filters, chemical dosing etc. Pre and post chlorination system. Reactivation of Ion exchanges etc.
6. Working and management of steam Boiler and economizer. (Evaporator, super heater chambers.)
7. Firing and raising, steam and blow down in Boilers - precautions to be taken -procedure to be observed before starting, firing and when raising steam.
8. Internal conditioning of Boiler water by checking the TDS and alkalinity by blow down to prevent sealing, priming, carry over and caustic gauging.
9. Periodical inspection of Boilers - preparation of boilers for testing - Hydraulic test and steam test. (steam blowing test)
10. Routine and Emergency operations of boilers in the event of:
    a) Loss of fire, b) Failure of F.D. fan. c) Failure of I.D. Fan d) Failure of one Air pre-heater. e) Fire in coal mill. f) Fire in air pre-heater. g) Boiler tube failure. h) Failure of economizer tube, furnace tube and super heater tube. i) Failure of boiler feed pump and sudden less of read. J) Blocking of coal passage, k) Failure of lagging, l) Jamming of the grate. Failure of gauge glass.
11. Study of different parts & fitting of a boiler such as steam and water drums, stoker gauge, water tubes and flow tubes, high and low water level alarm, gauge glasses, soot blowers, safety valves etc. forced draught induced draft and secondary draught fans, chimney, water walls, super heater & economiser, boiler controls, etc
12. Study of different parts of turbine; study the features of construction of blades, nozzles, governor parts, condensers, ejectors etc. Study of different types of pumps, compressors and their parts. Different types of valves.
13. Study of turbine - construction of different parts.

14. Process of DP test (Dry penetrant)
15. Study of steam cylinder, steam chest, diaphragms rotor blades, discs, glands, coupling, bearing etc.
16. Method of gland sealing - steam seals, water seals, clearances, sealing pressure regulators and controls.
17. Turbine auxiliaries such as condensers, ejectors extraction pumps, C.W. pumps etc.
    a) Types of Condensers - water flow, steam flow, constant water level control starting a condensing plant or stopping it, care and precautions to prevent loss of vacuum, causes of loss of vacuum, remedies, air leakages, condenser cleaning methods.
    b) Pumps - centrifugal and reciprocating, starting a centrifugal pump. Different methods of priming, putting the pumps on load, starting a reciprocating pump, care and maintenance of running pumps.
    c) Air ejectors - different types, steam, hydraulic, starting ejectors, sequence of operation, stopping it, starting an ejector in conjunction with a condensing plant.
    d) Function and use of evaporators, drain coolers and feed heaters, putting them into operation and taking them out of operation, maintenance of proper feed water temperature.
    e) Atmospheric relief valve and other safety devices.
    f) Familiarization with different types of Compressors and DG sets, their operation, care and maintenance.
    g) Cooling water system.
    h) Reheat and regenerative system.

18. **Turbine plant operation -** starting an condensing plant, starting a steam turbine from cold condition, method of running up to speed necessity of slow and uniform heating, critical speed avoiding, vibration at critical speeds, care to be taken when removing and applying load on turbo-alterations, stopping a turbine, sequence of operations, stopping the condensing plant and other auxiliaries. Study of feed water and steam cycle. Turning gear.

18. **Instrumentation and control -** necessity of different instruments for measuring and recording temperature, pressure, flow etc. Co-relation of different date as recorded by various instruments. Study of these in relation to load. Turbine supervisory instrumentation.
19. Operation of steam pressure reducing station and H.P., L.P. by pass, station.
20. Preparation of Project report.
21. Process of plant light up
22. Process of plant shut down.

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:

- demonstration of good operational skills while executing the assigned job.
- different accuracy achieved while undertaking different skills demanded by the job.
- a fairly good level of neatness and consistency in handling controls.
- 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 operation while executing the assigned job.
- the majority of the accuracy achieved while undertaking different skills demanded by the job.
- a good level of neatness and consistency in handling controls.
- little support in completing the 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 operation while executing the assigned job.
- accuracy while undertaking different work being substantially in line with those demanded by the 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 FOR APPRENTICE

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.

8. FURTHER LEARNING PATHWAYS

Employment opportunities:

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

1. Manufacturing & Process industries like steel plant and other related industries etc.

ANNEXURE – I

TOOLS & EQUIPMENT FOR BASIC TRAINING

INFRASTRUCTURE FOR PROFESSIONAL SKILL & PROFESSIONAL KNOWLEDGE

TRADE: UTILITY OPERATOR

LIST OF TOOLS & EQUIPMENTS FOR 20 APPRENTICES

A. TRAINEES TOOL KIT (For each additional unit trainees tool kit sl. 1-18 is required additionally)

Sl. no.	Name of the Tool &Equipments	Specification	Quantity
1	Steel Rule with metric & British graduation	150 mm, Stainless steel	16 nos.
2	Try Square.	150 mm blade	16 nos.
3	Caliper inside spring type.	150 mm	16 nos.
4	Caliper hermaphrodite spring type	150 mm	16 nos.
5	Caliper outside spring type	150 mm	16 nos.
6	Divider spring type	150 mm	16 nos.
7	Scriber	150 mm	16 nos.
8	Centre Punch	10 mm and Length - 120 mm	16 nos.
9	Screw driver	150mm insulated flat type	16 nos.
10	Chisel cold flat	20 mm X 150 mm High carboon steel	16 nos.
11	Hammer ball peen With handle	450 grams (1 lb)	16 nos.
12	Hammer ball peen With handle.	220 grams (1/2 lb)	16 nos.
13	File flat - second cut	250 mm	16 nos.
14	File flat smooth	250 mm.	16 nos.
15	File half round second cut	150 mm.	16 nos.

16	Hacksaw frame fixed type	300 mm	16 nos.
17	Safety goggles.		16 nos.
18	Dot punch	100 mm	16 nos.

B. INSTRUMENTS AND GENERAL SHOP OUTFIT - For 2 (1+1) units no additional items are required

INSTRUMENTS			
19.	Steel Rule Graduated both in Metric and English Unit	300 mm Stainless steel	4 nos.
20.	Straight edge steel	300 mm or above	2 nos.
21.	Spirit Level metal Type - 2	300 mm Basic Length Accuracy 0.1mm/Meter	1 no.
22.	Stud Extractor EZY - out	Set of 8	2 sets
23.	Combination Set	300 mm	2 nos.
24.	Micrometer outside.	25 - 50 mm	2 nos.
25.	Vernier caliper	150 mm	4 nos.
26.	Wire gauge, metric standard.		1 no.
27.	'U' tube manometers		1 no.
28.	Bourdon tube type gauges of various ranges.		5 nos.
29.	Aneroid barometers		1 no.
30.	Dead weight tester		1 no.
31.	Differential pressure transmitter (pneumatic)		1 no.
32.	Differential pressure transmitter (electronic-HART/ field bus type)		
33.	Pressure transducers training kits. Potentiometer Capacitive Reluctive Strain gauge LVDT load Cell servo Type		1 no. each
34.	Orifice type flow meter		1 no.
35.	Ventury tube flow meter		1 no.
36.	Rotameter		1 no.
37.	Level transmitter (inter face)(HART/ field bus/ profibus compatible)		1 no. each
38.	Mercury in glass thermometer (various ranges)		1 no.

39.	Optical pyrometer with all accessories		1 no.
40.	Temperature transmitter, pneumatic		1 no.
41.	Pneumatic and electronic recorders (single point and multi point) both circular and strip chart types.		1 no. each
42.	PID controller trainer consisting of instrument panel, digital computer and interface system		1 no.
43.	Progmmable logic controller (micro PLC) trainer		1 no.
GENERAL SHOP OUTFIT			
44.	Surface plate C.I/Granite with Stand and Cover	600 x 600 mm	1 nos.
45.	Marking table (Mild steel)	900X900X900 mm	1 no.
46.	Universal scribing block.	220 mm	2 nos.
47.	V-Block pair with clamps	150 x 100 x 100 mm	2 nos.
48.	Angle plate	150 X 150 X 250 mm	2 nos.
49.	Punch letter set.	3 mm	1 no.
50.	Punch number set.	3 mm	1 no.
51.	Portable hand drill (Electric)	0 to 13 mm Capacity	1 no.
52.	Drill twist straight shank	3 mm to 12 mm by 0.5 mm H.S.S.	2 sets
53.	Drill twist Taper shank	8 mm to 20 mm by 0.5 mm H.S.S.	2 sets
54.			
55.	Taps and dies complete set	5, 6, 8, 10 & 12 mm set of 5	2 Sets
56.	File knife edge smooth	150 mm	4 nos.
57.	File feather edge smooth	150 mm	4 nos.
58.	File triangular smooth	200 mm	8 nos.
59.	File round second cut	200 mm	8 nos.
60.	File square second cut	250 mm	8 nos.
61.	Feeler gauge	Gauge Feeler / Thickness - 0.05 mm to 0.3 mm by 0.05 and 0.4 mm to 1 mm by 0.1 mm - 13 leaves	1 set
62.	File triangular second cut.	200 mm	8 nos.
63.	File hand second cut.	150 mm	8 nos.
64.	File card.	3"x5" size, brass or steel wire	8 nos.
65.	Oil Can	250 ml	2 nos.
66.	Pliers combination insulated	150 mm	2 nos.
67.	Wooden handle forged Soldering Iron copper bit.	230V, 250 W, 350 gm	2 nos.
68.	Blow Lamp	0.5 litre	2 nos.
69.	Spanner- Double Ended	6x7, 8x9, 10x11, 12x13, 14x15, 16x17, 18x19, 20x22	1 set each

70.	Spanner adjustable	150 mm	2 nos.
71.	Interchangeable ratchet socket set	12 mm driver, sized10-32 mm set of 18 socket & attachments.	1 set
72.	Double Ended tubular Box spanner set with Tommy bar.	A/F 6-25 mm set of 10 Tommy Bar Dia 6, 8, 10, 12, 14, 16	1 set
73.	Scraper flat	150 mm	8 nos.
74.	Chisel cold flat	9 mm X 100 mm	8 nos.
75.	Combination Plier Insulated	200 mm	4 Nos.
76.	Screw Driver Insulated	4mm X 150 mm, Diamond Head	4 Nos.
77.	Screw Driver Insulated	6mm X 150 mm	4 Nos.
78.	Electrician screw driver thin stem insulated handle	4mm X 100 mm	4 Nos.
79.	Neon Tester	500 V	4 Nos.
80.	Wire Cutter and Stripper	150 mm	4 Nos.
81.	Relay- a. Cut out Relays b. Reverse current c. Over current d. Under voltage	 a. 16A, 440V b. 16A, 440V c. 16A, 440V d. 360V-440V	1 No. each
82.	Series Test Lamp	230V, 60W	4 Nos.
83.	Miniature Breaker	16 amp	2 Nos.
84.	MCCB	100Amps, Triple pole	1 No.
85.	Fuses	HRC Glass Rewire Type	3 Each
86.	Digital Multi Meter	DC 200mv -1000v,0 – 10A & AC 200mv- 750v , 0-10A, resistance 0-20 MΩ and 3 1/2 digit	2 Nos.
87.	3- point D.C. Starter	For 2.5 KW DC motor	1 No.
88.	4- point D.C. Starter	For 2.5 KW DC motor	1 No.
89.	Vice bench	150 mm	20 nos.
90.	Bench working.	2400 x 1200 x 900 mm	4 nos.
91.	Almirah.	1800 x 900 x 450 mm	2 nos.
92.	Lockers with 8 drawers (standard size).	One locker for each trainee	3 nos.
93.	Metal rack	1820 x 1820 x 450 cm	1 no.

F. LIST OF ADDITIONAL TOOLS FOR ALLIED TRADE IN WELDING

Sl. no.	Name of the Tool &Equipments	Specification	Quantity
6	Oxy - acetylene gas welding set equipment with hoses, Oxygen & Acetylene cylenders, regulator and other accessories.		1 Set.
7	Gas welding table with positioner with Fire Bricks	900 X 600 X 750 mm	1 No

8	Welding torch tips of different sizes for Oxy - acetylene gas welding	To fit nozzel no. 1, 2, & 3	1 Set
9	Gas lighter.		2 Nos
10	Trolley for gas cylinders.		1 No
11	Chipping hammer.		2 Nos
12	Gloves (Leather)		2 Pairs
13	Leather apron.		2 Nos
14	Spindle key for cylinder valve.		2 Nos.
15	Welding torches.	Nozzles no. 1, 2, & 3	1 Set.
16	Welding goggles		4 Pairs.
17	Welding helmet with coloured flame retardent glass		2 Nos.
18	Tip cleaner		5 Sets.

G. LIST OF TOOLS & ACCESSORIES FOR PNEUMATICS AND HYDRULICS

Sl. no.	Name of the Tool &Equipments	Specification	Quantity
1	Compressor unit	suitable for Pressure: 8 bar, Delivery: 50 lpm (or more), Reservoir capacity: 24 Litres (or more), 230V, 50 Hz, with pressure regulator and water separator	1 No.
3	Pneumatic Workstation with 40 square mm aluminium profile legs, wooden work surface, and one pedestal drawer unit having 5 drawers, each with handles and individual locks, on metallic full panel drawer slide:	(1) Work Table – Size(Approx.) L1200mmXW900mmXH900mm, with four castor wheels including two lockable wheels at the front side, (2) Drawer – Size (Approx.) – L460mmxW495mm xH158mm each, and overall size of Drawer unit (Approx.) - L470mmxW495mmxH825mm and (3) Drawer slide height (Approx.) 85mm.	1 No
4	Carrier for mounting components, such as PB & relay boxes.		1 No
5	Cut section model for pneumatic components		1 set
6	Hydraulic Trainer Kit, each consisting of the following matching components and accessories:		01 set
	I. Hydraulic Power pack	with (1) external gear pump having a delivery rate of 2.5 lpm, (approx.) @ 1400 rpm operating pressure 60 bar, coupled to a single-phase AC motor	1 No.

			(230 V AC) having start capacitor and ON/OFF switch and overload protection, (2) pressure relief valve adjustable from 0 – 60 bar, (3) oil reservoir, ≥5 litres capacity having sight glass, drain screw, air filter, and P and T ports.	
	II.	Pressure relief valve	pilot-operated	1 No
	III.	Drip tray, steel	size 1160 mm x 760 mm.	1 No.
	IV.	Pressure Gauge	Glycerin-damped, Indication range of: 0 – 100 bar	1 No.
	V.	Four-Way distributor	with five ports, equipped with a pressure gauge	1 No.
	VI.	Double acting hydraulic cylinder	with a control cam, Piston diameter16 mm, Piston rod diameter10 mm, Stroke length 200 mm.	1 No.
	VII.	Suitable Weight	for vertical loading of hydraulic cylinder	1 No.
	VIII.	Mounting kit for weight	for realizing pulling and pushing load.	1 No.
	IX.	3/2-way directional control valve	with hand lever actuation.	1 No.
	X.	4/2-way directional control valve	with hand lever actuation.	1 No.
	XI.	4/3-way directional control valve	closed-centre position, with hand lever actuation.	1 No.
	XII.	Non-return valve.		1 No.
	XIII.	Pilot-operated check valve	pilot to open.	1 No.
	XIV.	One-way flow control valve	with integrated check valve.	1 No.
	XV.	T-Connector with self sealing coupling nipples (2 Nos.) and quick coupling socket (1 No.).		2 Nos.
	XVI.	Profile plate,	Anodised Aluminium, 1100x700 mm, with carriers, mounting frames and mounting accessories (To be fitted onto the Hydraulic workstation)	1 set
Machinery :				
1.	SS and SC centre lathe (all geared) with minimum specification		Centre height 150 mm and centre distance 1000 mm along with 3 & 4 jaw chucks, auto feed system, safety guard, taper turning attachment, motorized coolant system, lighting arrangement & standard accessories.	2 Nos.

INFRASTRUCTURE FOR WORKSHOP CALCULATION & SCIENCE AND ENGINEERING DRAWING

TRADE: UTILITY OPERATOR

LIST OF TOOLS & EQUIPMENTS FOR 20 APPRENTICES

1) **Space Norms** : 45 Sq. m.(For Engineering Drawing)

2) Infrastructure:

A : TRAINEES TOOL KIT:-

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

B : FURNITURE REQUIRED

Sl. No.	Name of the items	Quantity (indicative)
1	Drawing Board	20 Nos.
2	Models : Solid & cut section	as required
3	Drawing Table for trainees	as required
4	Stool for trainees	as required
5	Cupboard (big)	01
6	White Board (size: 8ft. x 4ft.)	01
7	Trainer's Table	01
8	Trainer's Chair	01

ANNEXURE – II

INFRASTRUCTURE FOR ON-JOB TRAINING

TRADE: UTILITY OPERATOR

For Batch of 20 APPRENTICES

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. 12 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.