CURRICULUM

FOR THE TRADE OF

MECHANIC (ELECTRICAL DOMESTIC APPLIANCES)

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

Co-ordinator for the course: Sh. B.N. Sridhar, Deputy Director , FTI, Bangalore

Sl. No.	Name & Designation Sh./Mr./Ms.	Organization	Expert Group Designation
1.	D.L.Meena, Asst. Director	RDAT Faridabad	Expert
2.	D.P.Rana, Training Officer	RDAT Faridabad	Expert

2. BACKGROUND

1.1 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.

1.2 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.

1.3 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 Mechanic (Electrical Domestic Appliances)

The electrical sector plays a very important role not only in GDP growth but also in providing employment in the country. It is estimated that it requires almost 80,000 to 90,000 skilled workers every year in Electrical Equipment Industry alone. A large number of skilled workers coming out of technical institutes do not possess the required skills and are not readily employable.

Home appliance repair technicians diagnose, repair and install small electrical appliances. Appliances may be gas or electric and include ranges, refrigerators, microwave ovens, washers, dryers and air conditioners. Repairs are usually done in the customer's home, so technicians must take their tools and appliance parts with them.

It is therefore needed to interact with the industry to provide on the job training to the Semi skilled workers and also make changes in the curriculum. So to supply the skilled manpower demand, the Apprenticeship Training approach with the revised, industrial friendly curriculum is required.

4. JOB ROLES: REFERENCE NCO

Brief description of Job roles:

Mechanic (Electrical Domestic Appliances) while repairing and Maintenance of Electrical Home Appliances . Electrical power installers and repairers tend to concentrate in specific areas. These areas include electric motor, power tools, transportation, commercial and powerhouse equipment repairs and maintenance

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

Apprenticeship course in the trade of **Mechanic (Electrical Domestic Appliances)** trade is necessary due to following reasons:

1. This course is meant for the candidates who aspire to become a professional Mechanic of Domestic Electrical Appliances.

2. It will enhance the ability to set up and basic maintenance of various Domestic Appliances.

Reference NCO

NCO Code- 7233.58

5. GENERAL INFORMATION

1. **Name of the Trade** **Mechanic (Electrical Domestic Appliances)**

2. **N.C.O. Code No. (**NCO-2004) :7233.58

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

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 in 10^{th} class examination under 10+2 system of education or its equivalent.

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

6. Rebate for ITI passed trainees:- **One year rebate** for those who have passed CTS-ELECTRICIAN trade and **One year rebate** for those who have completed Broad Based Basic Training and Advanced module in "Maintenance of Domestic Appliances" in Electrical Sector under Centre of Excellence Scheme. They will undergo One year On-the-job Training

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** :**Mechanic (Electrical Domestic Appliances)**
2) **Hours of Instruction** : 1000 Hrs. (500 hrs. in each block)
3) **Batch size** : 20 nos.
4) **Power Norms** : 5.2 KW for Workshop
5) **Space Norms** : 98 Sq.m. (For basic Training of Block-I & II)
6) **Examination** : The internal assessment will be held on completion of each Block.
7) **Instructor Qualification** :

i) Degree/Diploma in Electrical 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 "Electrician" / BBBT in Electrical Sector & Advanced module in "Repair and Maintenance of Domestic Appliances" / NAC in Mechanic- Electrical domestic appliances, With 3 years 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)
1	**Engineering Drawing: Introduction and its importance** - Viewing of engineering drawing sheets. Method of Folding of printed Drawing Sheet as per BIS SP:46-2003 **Drawing Instruments** : their Standard and uses - Drawing board, T-Square, Drafter (Drafting M/c), Set Squares, Protractor, Drawing Instrument Box (Compass, Dividers, Scale, Diagonal Scales etc.), Pencils of different Grades, Drawing pins / Clips.	**30**	**Unit**: Systems of unit- FPS, CGS, MKS/SI unit, unit of length, Mass and time, Conversion of units.	**20**
2	**Lines :** - Definition, types and applications in Drawing as per BIS SP:46-2003 - Classification of lines (Hidden, centre, construction, Extension, Dimension, Section) - Drawing lines of given length (Straight, curved) - Drawing of parallel lines, perpendicular line - Methods of Division of line segment		**Fractions & Simplification**: Fractions, Decimal fraction, Multiplication and Division of Fractions and Decimals, conversion of Fraction to Decimal and vice versa. Simple problems Simplification using BODMAS.	
3	**Drawing of Geometrical Figures**: Definition, nomenclature and practice of - - Angle: Measurement and its		**Square Root** : Square and Square Root, method of finding out square roots, Simple problem using	

	types, method of bisecting. - Triangle -different types - Rectangle, Square, Rhombus, Parallelogram. - Circle and its elements.		calculator	
4	**Lettering and Numbering** as per BIS SP46-2003: - Single Stroke, Double Stroke, inclined, Upper case and Lower case.		**Ratio &Proportion:** Simple calculation on related problems.	
5	**Free Hand sketch:** Hand tools and measuring instruments used in electronics mechanics trades		**Percentage:** Introduction, Simple calculation. Changing percentage to decimal and fraction and vice-versa.	
6	**Free hand drawing :** - Lines, polygons, ellipse, etc. - geometrical figures and blocks with dimension . - Transferring measurement from the given object to the free hand sketches.		**Material Science** : properties -Physical & Mechanical, Types –Ferrous & Non-Ferrous, difference between Ferrous and Non-Ferrous metals, introduction of Iron, Cast Iron, Wrought Iron, Steel, difference between Iron and Steel, Alloy steel, carbon steel, stainless steel, Non-Ferrous metals, Non-Ferrous Alloys.	

B. Block- II
Basic Training

Topic No.	a) Engineering Drawing	Duration (in hours)	b) Workshop Science & Calculation	Duration (in hours)
1	**Symbolic Representation** (as per BIS SP:46-2003) of : - Fastener (Rivets, Bolts and Nuts) - Bars and profile sections - Weld, brazed and soldered joints. - Electrical and electronics element - Piping joints and fittings	30	**Mass ,Weight and Density** : Mass, Unit of Mass, Weight, difference between mass and weight, Density, unit of density, specific gravity of metals	20
2	**Construction of Scales and diagonal scale**		**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.	
3	**Three phase Induction motor** Free hand sketching of Slip-ring and Squirrel cage Induction motor. Typical wiring diagram for drum controller operation of A.C. wound rotor motor.			
4	Drawing the schematic diagram of Autotransformer starter, DOL starter and Star Delta Starter. Drawing the schematic diagram of A.C. motor speed control by SCR /AC Drive.		**Algebra:** Addition, Subtraction, Multiplication, Division, Algebraic formula, Linear equations (with two variables).	
5	**Distribution of Power** Types of insulator used in over head line. (Half sectional views) Different type of distribution systems and methods of connections. Layout diagram of a substation. Single line diagram of substation feeders.		**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.	

7.1.2 DETAIL SYLLABUS OF PROFESSIONAL SKILLS & PROFESSIONAL KNOWLEDGE

A. Block –I
Basic Training

Week No.	PROFESSIONAL SKILL (275 Hours)	PROFESSIONAL KNOWLEDGE (120 Hour)
1	Maintain Safety measures/precautions. Preventive measures for electrical accidents & steps to be taken in such accidents. Demonstration of Types of Fire extinguishers and use of Fire extinguishers. Demonstration of artificial respiration	**Occupational Safety & Health** Basic safety introduction, Personal protection:- Basic injury prevention, Basic first aid, Hazard identification and avoidance, safety signs for Danger, Warning, caution & personal safety message. Use of Fire extinguishers. Visit & observation of sections. Artificial Respiration.
	Identification of Trade Hand Tools, proper use, care and maintenance	Demonstration of Trade Hand Tool. Identification of Clamps, Saw, Rivets, Bolts and maintenance of various hand tools.
2.	Familiarization with signs and symbols of Electrical accessories.	Fundamental of electricity: Fundamental terms- Current, Voltage definitions, AC, DC, Phase, Neutral, Earth. Units & effects of electric current.
	Practice to connect Cut outs in line & uses of Fuses.	Use of Cut outs & Fuses
	Skinning the cables Demonstration & Practice on bare conductors joints--such as rat tail, Britannia, straight, Tee, Western union Joints Practice in soldering & brazing Practice on crimping thimbles, Lugs. Demonstration and identification of types of cables. Demonstration & practice on using standard wire gauge & micrometer.	Solders, flux and soldering technique. Resistors types of resistors & properties of resistors. Introduction of National Electrical Code. Explanation, Definition and properties of conductors, insulators and semi-conductors. Types of wires & cables, standard wire gauge. Specification of wires & Cables-insulation & voltage grades- Low , medium & high voltage
3.	Verification of Ohm's Law, Measuring unknown resistance Verification of laws of series and parallel circuits.	Ohm's Law - Simple electrical circuits and problems. Reading of simple Electrical Layout. **Resistors -**Law of Resistance. Series and parallel circuits & related calculation. **Alternating Current -**Comparison and Advantages

	Experiment on poly phase circuits. Current, voltage, power and power factor measurement in single & poly- phase circuits. Measurement of energy in single and poly-phase circuits. - Use of phase sequence meter. Practice on three phase four wire system for understanding phase and line voltage & current.	D.C and A.C. Related terms Frequency, Instantaneous value, R.M.S. value Average value, Peak factor, form factor, sine wave, phase and phase difference. Inductive and Capacitive reactance, Impedance (Z), power factor (p.f). Active and Reactive power. Single Phase and three-phase system etc. Power consumption in series and parallel, P.F. etc. Concept three-phase Star and Delta connection. Line and phase voltage, current and power in a 3 phase circuits with balanced and unbalanced load. Three phase four wire system Use of power analyzer, measurement of THd, Harmonics due to digital switching.
4	Practice on installation and overhauling common electrical accessories as per simple Electrical circuit / Layout. Make test board.	Common Electrical Accessories, their specifications in line with NEC 2011-Explanation of switches lamp holders, plugs and sockets. Developments of domestic circuits, Alarm & switches, with individual switches, Two way switch .Security surveillance, Fire alarm, MCB, ELCB, MCCB. Series –parallel testing board & use.
5	Identification of parts of battery. Practice on Battery Charging, Preparation of battery charging, Testing of cells, Installation of batteries, Charging of batteries by different methods. Routine care & maintenance of Batteries	**Chemical** effect of electric current-Principle of electrolysis. Faraday's Law of electrolysis Lead acid cell-description, methods of charging-Precautions to be taken & testing equipment, Different types of lead acid cells. Sealed Maintenance free Batteries, Solar battery. Load & back up time calculation
6	**Practice on Earthing**-different methods of earthing. Measurement of Earth resistance by earth tester. Testing of Earth Leakage by ELCB and relay.	**Earthing**- Principle of different methods of earthing & selection. i.e. Pipe, Plate, etc Importance of Earthing. Improving of earth resistance Earth Leakage circuit breaker (ELCB).
7	**Diodes**-symbol - Tests - Construct & Test Half wave rectifier ckt. Full wave rectifier ckt. Bridge rectifier ckt. Measurement & calculation of electrical parameters using C.R.O. Different wave shapes of rectifiers and their values using C.R.O.	**Basic electronics**- Semiconductor energy level, atomic structure 'P' type and 'N' type. Type of materials –P-N-junction. Classification of Diodes – Reverse and Forward Bias, Heat sink. Specification of Diode PIV rating. Explanation and importance of D.C. rectifier circuit. Half wave, Full wave and Bridge circuit. Filter circuits-passive filter. Working principle and uses of an oscilloscope.

	Identification of terminals, construction & Testing of transistor. Operation, maintenance & troubleshooting of inverter, Voltage stabilizer, DC regulated power supply, UPS, etc	Types of transistors & its application. Specification and rating of transistors.
8	Practice in casing, Capping and Conduit wiring . Testing of wiring installation by meggar. -Fixing of calling bells/buzzers. Identification & demonstration on conduits and accessories & their uses, cutting , threading & laying Installation, Testing, Maintenance and Repairing of wiring. Application of fuses, relay, MCB, ELCB.	**Electric wirings**, I.E. rules. Types & selection of wirings both domestic and industrial. Specifications for wiring. Grading of cables and current ratings. Principle of laying out in domestic wiring. Estimate the cost of wiring system Voltage drop concept. **Wiring system -** P.V.C., concealed system. Specifications, standards for conduits and accessories - Power Wiring - Control Wiring - Information Communication - Entertainment Wiring. Testing of wiring installation by meggar Study of Fuses, Relays, Miniature circuit breakers (MCB), ELCB, etc.
9	Prepare simple electromagnet and find the polarity Identification of the parts of a D.C. machine. No load & Load performance of a different type of DC generator. Connect, start, run and reverse a different type of DC motor. load performance test on different type of DC motor& calculation of efficiency. Maintenance, troubleshooting & servicing of DC machines. Overhaul a DC machine.	**D.C. Machines –** **Magnetism**- classification of magnets, methods of magnetizing, magnetic material **Electromagnetism-** Solenoid, field around conductors carrying current, polarity, screw-rule, right- hand grip rule, advantages and application of electromagnet. General concept of Electrical Machines. **Principle of D.C. generator.** Use of Armature, Field Coil, Polarity, Yoke, Cooling Fan, Commutator, slip ring Brushes, Laminated core. Explanation of **D.C. Generators**-types, parts- Practical uses. Description of series, shunt and compound generators and their selection. Types of speed control of DC motors in industry. Application of D.C. motors. Care, Routine & preventive maintenance.

10	- Connection & maintenance of protective devices for home appliance i.e. ELCB, MCB, Power stabilizers, Fuses etc.	- Types of protective devices used for domestic appliance, functions & operation.
11	Identification of types of transformers. Connection of transformers, Transformation ratio, testing of transformer, calculate the losses & efficiency. Use of Current Transformer (C.T.) and Potential (Voltage) transformer (P.T.) Testing of single phase and Three Phase Transformers - Cleaning, maintenance, testing and changing of oil.	Working principle of **Transformer,** losses & efficiency. classification C.T., P.T. Instrument and Auto Transformer(Variac), Construction, Single phase and Poly phase. Type of Cooling for transformer. Protective devices. Components, Auxiliary parts i.e. breather, Conservator, buchholz relay, other protective devices. Transformer oil testing and Tap changer (off load and on load). Dry type transformer. Bushings and termination.
12	To understand the domestic appliances manufacture in concern Industry. - Assembly & fitting of appliance at customer end.	Manufacturing Process of appliance in Industry -Assembly & fitting method appliances
13	Identify & select different type of Instruments. Use of **-P**MMC , MI meter, Multi-meter(Digital/Analog) , Wattmeter, P F meter, Energy meter, Frequency meter, Phase sequence meter, Digital Instruments, etc Range extension of meters.	**Electrical Measuring Instruments -** -types, indicating types PMMC & MI meter (Ammeter, Voltmeter) -Range extension -Multimeter(Digital/Analog) -Wattmeter - P.F. meter - Energy meter (Digital/analog) –Insulation Tester (Megger), Earth tester. -Frequency meter -Phase Sequence meter -Multimeter –Analog and Digital -Tong tester -Techometer.
	Assessment/Examination 03days	

B. Block –II
Basic Training

Week no.	PROFESSIONAL SKILL (275 Hours)	PROFESSIONAL KNOWLEDGE (120 Hour)
1	Identification of parts and terminals of AC motors. Connection, starting, running of AC motors using Starters. Load test & efficiency calculation. Rotor resistance starter, etc Speed control of Induction motors by various methods. Practical application of A.C. motors. Connection of single phase motor, identification, testing, running and reversing. Maintain, service and trouble shoot the single phase motor. Install a single phase motor. Overhauling of AC motors.	**Three phase Induction motor** – Working principle –Production of rotating magnetic field, Squirrel Cage Induction motor, Slip-ring induction motor. Control & Power circuit of starters D.O.L Starter, Forward /Reverse starter, Star /Delta starter, Autotransformer starter, Rotor resistance starter, etc Single phasing preventer. Application of Induction Motor Care, Routine & preventive maintenance. **Single phase induction motor-** Working principle, different method of starting and running (capacitor start, permanent capacitor, capacitor start & run, shaded pole technique). FHP motors, Repulsion motor, stepper motor, Application of single phase motor.
2	Demonstration of Heating Appliances and their applications.	**Heating Appliances** –type, Working Principle, Uses.
	Demonstration of Magnetic Appliances and their applications	**Magnetic Appliances-** Type, working principle, uses.
3	Practice on fixing and connection of plugs, sockets, Lamp holder, regulator , tube light fixture	Fixing & Connecting switches.
4-	Repairing & maintenance of Heater, Hotplate, Iron, Toasters, Oven, Microwave, Geyser etc	**Heater-Types & construction** **Iron - types & construction** **Oven --- types & construction** **Microwave-- types & construction** **Geysers- types & construction**
5	Repairing & maintenance of **Fans, Mixer ,blenders & wet grinder**	Constructions & types of Fans, Mixer ,blenders & wet grinder Circuit connection & Testing of these.
6	Repairing of Washing machine & dish washer	- Construction, Types & Circuit connection of Washing Machine. - Construction, Types & Circuit connection of dish washer.
7	Assemble different type of inverters circuit & its	DC to AC converter, Types of inverter, its different blocks &oscillators circuits.

	measurements. Assemble battery charger circuit used in inverter with protection circuit. Assemble Online/Offline UPS & its measurements. Test & measurements of given SCR power supply circuit. Test & measurements of given SMPS. Test, faultfinding & repair of given power supply.	Battery chargers & its protection circuit. UPS working principles of-line & On line UPS circuit used in UPS. Various circuits used in servo controlled voltage stabilizers. SCR power supply circuit. SMPS circuit and its types. Fault finding & their remedies.
8-9	- Installation of AC & refrigerator - Fault finding & rectification of Air Conditioners & Refrigerator. - Gas Charging of AC & Refrigerator. - Servicing of AC & refrigerator	**-Construction &** principle of compressor & controlling devices **-Faults, remedies& troubleshooting of Air Conditioner & Refrigerator**
10	**-Repair & maintenance of** Water Lifting Pump & motors.	- Construction, Function of Water Lifting Pump & motors.
	Repair & maintenance of Water cooler.	- Installation of Water coolers
11	-Demonstration of RO purifier and their applications -Repairing & Servicing of RO purifier	**Water Purifier**—RO water Filtration
12	Prepare layout plan, single line diagram of different type of power plant. Schematic of a overhead and domestic service line. Test the underground cables for open, short circuit & ground fault and also check insulation resistance. Prepare layout plan and single line diagram of transmission	**POWER GENERATION :** Generation sources of energy, Comparison of energy resources. Types of fuels. Advantages of liquid fuel & solid fuel. Various ways of electrical power generation. • Thermal • Hydro electric • Nuclear • Non-Conventional Overhead Lines: Main components of overhead lines-Types of power line Low voltage line medium Voltage line & high voltage line Voltage standard Conductor materials, line supports, Insulators, types of Insulators **Under Ground Cable :** Construction of cables. Types of cable faults and

	/Distribution system Test /Check different type of protection relay.	their location. **DISTRIBUTION OF POWER** Function and equipment used in substation. Classification of distribution system-AC distribution, Overhead v/s underground distribution system. Essential features of switchgears. Isolator, Switch gear equipments, bus-bar arrangement, Short circuit, faults in power system. **Circuit breakers** – Introduction & Classification of circuit breakers
13.	- Oiling, greasing & overhauling of rotating parts and their replacement	**-Preventing maintenance & overhauling schedule , lubrication of rotating parts.**
	Assessment/Examination 03days	

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	**10**
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	**10**
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 legislation of India. 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	**5**
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	
	Leadership and Team Building skills	**5**
	Leadership Discipline and Morale Team Work Case Study/ Exercise	
	Meet the Mentor **Role - play as a Supervisor**	**5**
	Organizing and Planning.	**5**
	Time Management Group Dynamics Case Study/ Exercise	

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** : **Mechanic (Electrical Domestic Appliances)**

2) **Duration of On-Job Training** : As per Apprenticeship Act amended time to time.

3) **Batch size** : 20

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 Electrical 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 "Electrician" / BBBT in Electrical Sector & Advanced module in "Repair and Maintenance of Domestic Appliances" / NAC in Mechanic-Electrical domestic appliances, With 3 years post qualification experience in the relevant field.

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

6) **Tools, Equipments & Machinery required** : - As per Annexure – II

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

A. BLOCK – I (09 months)

S. No.	Professional Skills
1	Observe & practice safety pre-cautions to be followed in the section/plant including need of special protective equipment. Practice providing First Aid.
2	Identify & use all hand tools.
3	Check the gauges of wire & select suitable wires for the required current rating. Practice wire joints & providing cable glands. Soldering practice.
4	Carryout fitting & carpentry jobs
5	Connect & measure voltage, current, resistance power & energy in DC & AC(1ph & 3ph) circuits
6	Electrical wiring: Repair / replace switches, sockets, light points. Provide new points in PVC casing capping & PVC conduits.
7	Charging & maintenance of different type of Batteries. Checking specific gravity, voltage, condition monitoring of Battery Bank, assessment of high spots, on line isolation precautions etc.
8	Install pipe & plate earth stations. Measure earth resistance, improve the same & maintain earth stations. Earth Monitoring systems with reference to various standards, familiarization with health monitoring equipment.
9	Providing power supply to motors, equipments& appliances. Crimping the lugs, providing cable glands & connections.
10	Attending to minor faults in machines, their controls & appliances.
11	Replacing the bulbs, tubes, trouble shooting, repair & maintenance. Wire up in PVC casing & capping.
12	Assisting in operation & maintenance of Transformer substation, circuit breakers, batteries etc
13	Trouble shooting rectifiers, filters, power supplies, voltage stabilizers, controlled rectifiers. Identifying faulty thyristors in circuits, replacing them.
14	Provide light/socket points, for various equipments and appliances.
15	Wiring for internal Lighting & External Lighting.
16	Testing the condition of DC motor Checking power input & output in DC drives. Replacing faulty components.
17	Use of Oxy-acetylene welding & cutting torch
	Project Work
	REVISION
	Examination

B. BLOCK – II (09 months)

S. No.	Professional Skills
1	Observe & practice safety pre-cautions to be followed in the section/plant including need of special protective equipment. Practice providing First Aid.
2.	Connect & measure voltage, current, resistance power & energy in DC & AC(1ph & 3ph) circuits.
3	Connection & testing of single & three phase motor. Checking power input & output in AC drives. Replacing faulty components
4	Installation, repairing & maintenance of fan, iron, tube lights, mixer, blenders, wet grinders, geysers microwaves, exhaust fan etc.
5	Electrical wiring: Repair / replace switches, sockets, light points. Provide new points in PVC casing capping & PVC conduits
6	Attend local fault in houses , repair & replacement of faulty parts.
7	Operation, maintenance and testing of heating appliance
8	Installation & repairing of water lifting pump and water cooler..
9	Working of LT and HT Switch- gears and protective relays. Maintenance of transformer equipment such as : Oil gauge, Tap Changer, Bushes, Breather, Earth fault relay, Protective relay, etc. Installation operation and maintenance of oil circuit breaker, Air circuit breaker, SF6 circuit breaker, Vaccum circuit breaker, etc.
10	Installation of RO Water purifier & maintenance of the same.
11	Repair & maintenance of inverters, choppers, converters and cyclo converters used in concerned industry. Understand & dismantle, repair and maintenance of 1 ph and 3 ph off- line and on-line UPS with the concerned industry.
12	Understand the motors used in concerned industry and its testing methods. Motor controllers (starters) used for various motors, its circuits. To understand AC & DC drives, uses, their applications, repair & maintenance.
13	Installation, repairing, dismantling & maintenance of Air Conditioner.
14	Operation, Installation ,testing & repairing of washing machine & dish washer
15	Operation, Installation ,testing & repairing of Air purifier.
16	**Project Work**
17	**REVISION**
	Examination

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)

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

Employment opportunities:

On successful completion of this course, the candidates shall be gainfully employed in the industries or self employed.

ANNEXURE – I

TOOLS & EQUIPMENT FOR BASIC TRAINING

INFRASTRUCTURE FOR PROFESSIONAL SKILL & PROFESSIONAL KNOWLEDGE

TRADE: Mechanic(Electrical Domestic Appliances)
LIST OF TOOLS & EQUIPMENTS FOR 20APPRENTICES

A: TRAINEES TOOL KIT:-

SI. No.	Name of the items	Quantity
1	Steel tape, 3 mt length	21 nos.
2	Plier insulated, 150mm	21 nos.
3	Plier side cutting 150mm	21 nos.
4	Nose plier, 150mm	21 nos.
5	Screw driver, 150 mm	21 nos.
6	Screw Driver Heavy duty 250mm	21 nos.
7	Electrician connector screwdriver, insulated handle thin stem, 100mm	21 nos.
8	Heavy duty screwdriver, 200mm	21 nos.
9	Electrician Screwdriver, thin stem, insulated handle, 250mm	21 nos.
10	Electrician knife, 50 mm blade	21 nos.
11	Neon tester	21 nos.
12	Steel rule, 300mm	21 nos.
13	Hammer, Cross peen with handle, 250 gm	21 nos.
14	Hammer, ball peen with handle, 750gm	21 nos.
15	Steel tape, 3 mt length	21 nos.
16	Digital multimeter	21 nos.
17	Soldering gun	02
18	Soldering iron	05
19.	De-soldering gun	05
19	Screw Driver Kit	21
20	Crimping Tool	04
21	Knife double blade	05

B: INSTRUMENTS& GENERAL SHOP OUTFIT: -

SI. No.	Name and Description of Tools	Quantity
1.	Pipe Cutter to cut 05 cm jaw	02
2.	Wheat stone bridge	01
3.	Washing Machine (Automatic)	01
4.	Drill Machine Electric portable 0-6mm	02
5.	Window Air Conditioner	01
6.	Split Air Conditioner	01
7.	Mixer	01
8.	Ceiling Fan	01
9.	Room Heater (all type)	01
10	Microwave	01
11	Induction oven	01
12	Water cooler	01
13	Water Pump	01
14	Water RO purifier	01
15.	Iron	01
16	Geyser up to 15 Litre	01
17	Dish Washer	01
18	Air Purifier	01
19	Spanner set	02
20	Monkey Plier	02
21	Capillary tube cutter	01
22	Light weight Hand Electrical Blower	01
23	Tube cutter	01
24	Tube Bender	01
25	Megger	**01**
26	Variable Auto Transformer	01
27	DC Motor 01 HP	**01**
28	AC Motor 01 KW	01
29	Motorised Bench grinder	01
30	AC Energy meter, single phase 5A, 3 ph 15 A	01
31	DC power supply 0-30V, 2 Amp	01
32	AC 3 ph wound slipring motor with starter & switch, 5HP,400V, 50Hz	01
33	Stepper Motor with digital controller,	01
34	Single phase capacitor motor with starter switch, 1 HP, 230 V, 50 Hz	01
35	Universal motor with starter / switch, 230 V, ¼ HP, 50 Hz	01
36	Inverter, 1 KVA with 12 V battery, input 12 V DC, Output 220V AC	01
37	Acetylene Gas Welding Set	01

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.

INFRASTRUCTURE FOR WORKSHOP CALCULATION & SCIENCE AND ENGINEERING DRAWING

TRADE: MECHANIC (Electrical Domestic Appliance)

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
2.	Set square celluloid 45^0 (250 X 1.5 mm)	20
3.	Set square celluloid 30^0-60^0 (250 X 1.5 mm)	20
4.	Mini drafter	20
5.	Drawing board (700mm x500 mm) IS: 1444	20

B : FURNITURE REQUIRED

Sl. No.	Name of the items	Quantity (indicative)
1	Drawing Board	20
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

TOOLS & EQUIPMENT FOR ON-JOB TRAINING

INFRASTRUCTURE FOR PROFESSIONAL SKILLS & PROFESSIONAL KNOWLEDGE

TRADE: MECHANIC (Electrical Domestic Appliance)

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. 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.