CURRICULUM

FOR THE TRADE OF

ELECTRONIC FITTER

UNDER

APPRENTICESHIP TRAINING SCHEME

सत्यमेव जयते
Government of India

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

CONTENTS

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

Sl. No.	Name & Designation Sh./Mr./Ms.	Organization	Remarks
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3.	N.M. Kajale, Principal,	Govt. ITI Velhe, Distt: Pune	Expert
4.	S. Bandypadhyay, T.O.	ATI, Kolkata	Expert

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.
- Establishments 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.

RATIONALE

(Need for Apprenticeship in **Electronic Fitter trade**)

1. It will help the trainees to be innovative and know about common things like performing routine maintenance and determining when and what kind of maintenance is needed as per the situation.

2. The training will develop the capability of installation like Installing equipment, Repairing, Testing & Tuning or programs to meet specifications.

3. The training will develop the listening skills such as listening to what other people are saying and asking questions as appropriate.

4. It will enhance the ability to work on dismantle and assemble, various tests of electronic components, assemblies of equipments used for various systems, PCB assemblies, the accuracy of parameters.

5. It will enhance the performance of repair of equipment at PCB & component level, and assemble with location of PCBs.

6. The training will develop the testing of various equipments: Factors affecting performance of various equipments such as Gyros, Sonar, Radar & Radio etc and its accessories, reasons for errors in performance in equipments.

7. The training will develop to understand the various types of foundations of electronics.

JOB ROLES: REFERENCE NCO

Brief description of Job roles:

Installation of Various equipments on various locations as per requirement.

Repair & align of Various equipments such as various types of Radio, Radar, Gyro ,Sonar etc on board and workshop.

Testing various equipments such as various types of Radio, Radar, Gyro, Sonar etc on board and workshop to meet the required parameter for their optimum performance.

To develop skill of repair on PCB and component level.

To read circuit diagram and develop skill for repair various PCBs on component level and assemble the repaired PCB again in the equipment and test, tune and proper align the equipment for optimum gain to meet its parameter.

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.

GENERAL INFORMATION

1. **Name of the Trade** **: ELECTRONIC** FITTER

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

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: - 03 months

Duration of Practical Training (On -job Training): **09 months**

4. **Entry Qualification**: Passed class 10th Exam Under 10+2 system of Education or its Equivalent.

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

6. **Rebate for ITI passed trainees**:

i) **One year** in the trade of Electronic Mechanic

(ii) **One year** in the trade of Mechanic Communication Equipment Maintenance

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.

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																								

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

GENERAL INFORMATION

1) **Name of the Trade** : **ELECTRONIC FITTER**

2) **Hours of Instruction** : 1000 Hrs. (500 hrs. in each block)

3) **Batch size** : 20

4) **Power Norms** : 17 KW for Workshop

5) **Space Norms** : 192 Sq. m.

6) **Examination** : The internal assessment will be held on completion of each Block.

7) **Instructor Qualification** :

i) Degree/Diploma in Electronics 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 (i) Electronic Mechanic (ii) Mechanic Communication Equipment Maintenance 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)
1.	Engineering Drawing: Introduction and its importance Different types of standards used in engineering drawing. Drawing Instruments: their 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**	**Units & Measurements-** FPS, CGS, MKS/SI unit, unit of length, Mass and time. Fundamentals and derived units Conversion of units and applied problems.	**20**
2.	Lines : types and applications in Drawing as per BIS SP:46-2003 Drawing geometrical object using all types of lines. **Drawing of Geometrical Figures:** Angle, Triangle, Square, Rectangle and Circle. **Letters: -** Lettering styles, Single stroke letters and numbers as per IS standard. Lettering practice		**Material Science** : properties - Physical & Mechanical, Types - Ferrous & Non-Ferrous, difference between Ferrous and Non-Ferrous metals	
3.	**Dimensioning**- Types of dimension, elements of dimensions, Methods of indicating Values, Arrangement, Alignment and indication of dimensions. **Scales**:-Types use and construction. Representative factor of scale.		**Mass .Weight and Density** : Mass, Unit of Mass, Weight, difference between mass and weight, Density, unit of density,	
4.	Method of presentation of Engineering Drawing - Pictorial View - Orthogonal View - Isometric view		**Speed and Velocity:** Rest and motion, speed, velocity, difference between speed and velocity, acceleration, retardation. Average Velocity, Acceleration & Retardation. Related problems. Circular Motion: Relation between circular motion and	

			Linear motion, Centrifugal force, Centripetal force	
5.	**Constructions: -** Draw proportionate free hand sketches of plane figures. Sketch horizontal, vertical and inclined line by free hand, Draw circles by free hand using square and radial line method, Draw arcs and ellipse by free hand		**Ratio & Proportion** : Simple calculation on related problems. **Percentage:** Introduction, Simple calculation.	
6.	Projections: Concept of axes plane and quadrant. Orthographic projections Method of first angle and third angle projections (definition and difference) Symbol of 1^{st} angle and 3^{rd} angle projection as per IS specification. Free hand Drawing of Orthographic projection from isometric/3D view of geometrical blocks		**Work, Power and Energy:** work, unit of work, power, unit of power, Horse power of engines, mechanical efficiency, energy, use of energy, potential and kinetic energy, examples of potential energy and kinetic energy. Meaning of H.P., I.H.P., B.H.P., and F.H.P. and CC and Torque.	

B. Block- II
Basic Training

Topic No.	a) Engineering Drawing	Duration (in hours)	b) Workshop Science & Calculation	Duration (in hours)
1.	**Screw :-** Its Types and Sizes, Screw thread, their standard forms as per BIS, external and internal thread.	**30**	**Algebra:** Addition, Subtraction, Multiplication, Division, Algebraic formula, Linear equations (with two variables).	**20**
2.	**Rivets and Joints:-** Prepare a drawing sheet on rivets nomenclature and Joints.		**Heat & Temperature:** Heat and temperature, their units, difference between heat and temperature, boiling point, melting point, scale of temperature, relation between different scale of temperature, Thermometer, pyrometer, transmission of heat, conduction, convection, radiation.	
3.	Free hand Sketches for simple pipe line with general fittings.		**Mensuration:** Area and perimeter of square, rectangle, parallelogram, triangle, circle, semi circle, Volume of solids - cube, cuboid, cylinder and Sphere. Surface area of solids -cube, cuboid, cylinder and Sphere. Volume of cut-out solids: hollow cylinders, frustum of cone, block section. Volume of simple solid blocks.	
4.	Reading of drawing. Simple exercises related to missing lines, dimensions. How to make queries.		**Basic Electricity:** Introduction, use of electricity, how electricity is produced, Types of current_ AC, DC, their comparison, voltage, resistance, their units. Conductor, insulator, Types of connections - series, parallel, electric power, Horse power, energy, unit of electrical energy. Concept of earthling.	
5.	Simple exercises related to trade related symbols. Basic electrical and electronic symbols		**Simple machines** **Transmission of power:** - Transmission of power by belt, pulleys & gear drive. **Heat treatment process: -** Heat treatment and advantages.	

			Annealing, Normalizing, Hardening, Tempering.	
6.	Free hand sketch of trade related components / parts /cutting tool indicating angles.		**Trigonometry:** Trigonometrical ratios, measurement of angles. Trigonometric tables. Finding the value of unknown sides and angles of a triangle by Trigonometrical method. Finding height and distance by trigonometry. Application of trigonometry in shop problems. (viz. taper angle calculation). Calculate the area of triangle by using trigonometry and application of Pythagoras theorem.	
7.			**Concept of pressure** - **Definition**:-Force, Pressure, and their units, atmospheric pressure, gauges used for measuring pressure, problems. Introduction to pneumatics & hydraulics systems.	
8.	**Simple exercises related to trade related Test Papers. Solution of NCVT test papers.**			

7.1.2 DETAIL SYLLABUS OF PROFESSIONAL SKILLS & PROFESSIONAL KNOWLEDGE

A. Block –I

Basic Training

Week No.	Professional Skills	Professional Knowledge
1.	Safety: - its importance, classification, personal, general, workshop and job safety. Occupational health and safety. Basic injury prevention, Basic first aid, Hazard identification and avoidance, safety signs for Danger, Warning, caution & personal safety message. Preventive measures for electrical accidents & steps to be taken in such accidents. Importance of housekeeping & good shop floor practices. Disposal procedure of waste materials like cotton waste, metal chips/burrs etc. Fire& safety: Use of Fire extinguishers.	Importance of safety and general precautions observed in the in the industry/shop floor. All necessary guidance to be provided to the new comers to become familiar with the working of Institute system including stores procedures. Introduction of First aid. Safety attitude development of the trainee by educating him to use Personal Protective Equipment (PPE). Response to emergencies eg; power failure, fire, and system failure. Accidents- Definition types and causes. First-Aid, nature and causes of injury and utilization of first-aid. Introduction to 5S concept & its application. Fire: - Types, causes and prevention methods. Fire Extinguisher, its types. Define environment, environment Pollution, Pollutants, type of Pollution (Air pollution, water pollution, soil pollution noise pollution, thermal pollution, radiation. Global warming its causes and remedies. Industrial Waste its types, sources and waste Management.
2.	Identification of tools & equipments as per desired specifications for marking & sawing(Hand tools , Fitting tools & Measuring tools) Selection of material as per application Visual inspection of raw material for rusting, scaling, corrosion etc. Uses of marking tools, Punch, Try square & basic measuring tools, caliper, steel rule. Marking out lines, gripping suitably in vice jaws, hacksawing to given dimensions, sawing different types of metals of different sections.	Hand tools and its importance, steel rule, Try square, chisel, surface gauge and care & maintenance, Hacksaw frame, blades. Classification and types of chisels, files & uses, vices - its constructions and uses. Hammers and its types. Related safety. Marking block, Steel rule, and calipers-different types and uses. Combination set-its components and uses. Hacksaw blade, Hacksaw frame and its types. Drill bits- parts, Types & uses.

B. Block –II
Basic Training

Week No	Professional skills (275 hrs)	Professional knowledge (120 hrs)
1	- Identifying and finding value of Resistors - Identifying and finding value of Capacitors - Measurement of AC & DC current - Testing of AC & DC Generator - Testing of AC & DC Motor - Testing of Transformer	**Introduction to Basic Electricity** Resistors, Capacitor, Battery, Magnetism, Meters, AC & DC Current, AC & DC Generator and Motors, Types and working of Generators and Motors, Types and working of Single and three Transformer.
2	- Testing of a Diode - Testing of a PNP and NPN Transistor - Testing of a Zener Diode - Testing FET transistor - Testing of gain of a amplifier - Testing of a Hartley oscillator - Make a multistage amplifier - -Identify sensors used in process industries such as RTDs, Temperature ICs, Thermocouples, proximity switches(Inductive, capacitive, load cells, strain gauge etc by their appearance. - Measurement of a lit fire using a thermocouple and record the readings referring to data chart. - Measure the strain of a given material using strain gauge. - Measure the DC voltage of a LVDT - Detect different objectives using capacitive, inductive and photoelectric proximity sensors.	**Basic Electronics** Introduction to electronics components such as Semi conductor Diode, Transistor, Zener Diode, Diac, Triac, FET ,MOSFET etc. Feed Back amplifier, Multistage amplifier, Tuned amplifier, **Sensors, Transducers and applications** Basics of passive and active transducers. Role, selection and characteristics. Working principles of Thermocouple, sensor voltage and current formats. Thermisters—salient features, operating range, composition, advantages and disadvantages. Thermocouples- basic principle, commonly used combinations, operating range, advantages and disadvantages. Principle of Inductive and capacitive transducers, advantages and disadvantages, Strain gauges, gauge factor, type of strain gauges, Proximity sensors-applications, working principles of eddy current, capacitive and inductive proximity sensors.
3	- Conversion from Decimal to Binary, Octa decimal and Hexa decimal - Conversion from Binary, Octa decimal and Hexa decimal to Decimal - Checking and verify truth	**Digital electronics** Introduction to Number system and codes, Decimal, Binary, Octa decimal, Hexa decimal code, Addition and subtraction of Binary, Octa decimal and Hexa decimal, conversion from decimal to Binary, octa decimal and hexadecimal and reverse, Boolean algebra, Digital logic families, Introduction to flip-flop,

	table of R-S Flip flop - Checking and verify truth table of J-K flip flap - Identify different Logic gates (AND, OR, NAND, NOR, X-OR, X-NOR, NOT ICs) by the number printed on them and draw I/O pin-out numbers. - Verify the truth tables of all logic gate ICs by connecting switches and LEDs. - Construct and verify the truth table of all the gates using NAND and NOR gates. - Using digital IC tester to test the various digital ICs. - Construct Half adder / Full adder circuit and verify the truth table - Construct the adder cum subtractor and verify the result	S-R Flip flop ,J-k flip flop, D type flip flop, T type flip flop, Master slave flip-flop and timing diagrams, Basic flip flop applications like data storage, data transfer and frequency division. Basic counters, Types of counters, Two bit and three bit, Asynchronous binary counters and decade counters with the timing diagrams. Types of seven segment display BCD display Combinational logic Design, Half adder, Full adder, Half and Full subtractor, Encoder and Decoder, Difference between analog and digital signals, Logic families and their comparison, Logic levels of TTL and CMOS.
4	- Checking of Transformer winding and housing the assembly	**Electronic Material and Components** Knowledge of Fabrication of Transistor, FET ,JFET and MOSFET and Transformer etc
5	-Draw half and fullwave rectifier -Draw a regulator circuit using Zaner diode -Use analog IC tester to test the various analog ICs - construction and testing of various OP-amp circuits Inverting, Non-inverting and summing amplifiers - construct and test differentiator and integrator	**Linear Integrated Circuits** Basic Op-amps circuit, Rectifiers-Half and Full wave rectifier, Block diagram Op amp, Comparators-basic operation, inverting and non-inverting configuration, Schmitt trigger, peak to peak detector.
6	Draw circuit diagram of an amplifier with various components and check its performance	**Applied Electronics** Introduction to FET,JFET,SCRMOSFET, Feedback amplifier – Negative and positive feedback
7	-Testing of a photo diode - Testing of Photo transistor	**Optical Fibre Communication** Introduction to Photo devices, Photo diode, Photo transistor, basic amplifier, Opto isolator, PIN diode etc Electronic switches such as relay and switches
8	-Draw circuit diagram of Bistable multivibrator - Construct and test astable timer circuit using IC555 Construct and test mono stable timer circuit using IC 555	**Advance Linear ICs** Study of IC 555,its specification, Block diagram of 555,functional description of 555 such as mono stable, astable and VCO operations for various application. Multivibrator - astable, monostable and bistable
9	- Draw circuit diagram of Single phase rectifier - Testing of Series regulator - Testing of Shunt regulators	**Rectifiers and Regulators** Single and Polyphase rectifiers with resistive load, ripple factor, series and shunt regulators, protection circuit for supply circuit, study of IC such as

		CA723,3085and 317,Dual tracking power supply
10	- Soldering of a transistor on PCB - De soldering of an IC on a PCB	**Techniques of PCB testing** Introduction to various techniques and equipment used for testing of PCBs for repairs, varying from components testing, test jigs, in – circuit testers, Introduction to static charger ,Handling of static charger, Introduction to non- soldering interconnection, conductive adhesives , chip on board, SMT components, Rework and repair of PCBs
11	Identify different parts of computer	Computer Technology Introduction to Hardware- Basic knowledge about mother board, interface card hard disk, mouse and their working printers HDD,CDD DVD
	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	**Behavioural Skills** **Organizational Behaviour** Problem Solving Confidence Building Attitude Decision making Case study/Exercise	

B. Block– II
Basic Training

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

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

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

GENERAL INFORMATION

1) **Name of the Trade** : **ELECTRONIC FITTER**

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) Final exam will be conducted at the end of 2nd year by the employer.

4) **Instructor Qualification** :

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

OR

ii) NTC/NAC in the trade of (i) Electronic Mechanic or (ii) Mechanic Communication Equipment Maintenance 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 (09 months)

1. Safety and best practices/Basic Industrial Culture (5S, KAIZEN, etc.)
2. Prepare different types of documentation as per industrial need by different methods of recording information.
3. Perform checking of electronic components like resistor, capacitor, diode, transistor .
4. Identify components on PCB
5. Application of hand tools and their applications, specifications e.g. soldering iron etc.
6. Understanding and practice of ISO tolerance system.
7. Carry out soldering / desoldering practice.
8. Dismantle, Repair and Assemble of components.
9. Mounting and demounting of components.
10. Conduct preventive & break down maintenance of equipments.

13. Conduct the preventive maintenance, Trouble shoots & test parameter of equipment periodically.

16. Identify and test basic electronic components of viz., resistor, capacitors & inductor using multimeter and assemble simple battery eliminator circuit, measure its Input & Output voltages. Basic understanding of sensors and their adjustments.

B. BLOCK – II (09 months)

1. Prepare equipment foundation for install, repair various electronics system.
2. Practice on repair of various equipments on components and PCB.
3. Conduct the maintenance of equipments timely testing and checking and testing its parameter periodically.
4. Overhaul and check the functionality of the Systems. Perform fault finding and attend breakdowns equipments in the shop floor.
5. Referring the system maintenance manual and retrieve the spare part details (for ordering purpose).
6. Specification systems for standard electronic / mechanical parts or components.
7. Interpretation and preparation of dismantling and assembly plan and sequence for Equipment.
8. Drawing and drafting of electronic parts as per requirement (in case of worn out/ modification).
9. Perform repairs of worn / damaged parts of system and check their function ability.
10. Perform Inspection & Condition Monitoring of different types of instruments / tools used in shop floor.
11. Trouble shooting of electronic/ electrical /mechanical elements of equipment or system with case studies.
12. Perform periodically checking performance of the equipment, trouble shooting on PCB or component level.
13. Conducting cleaning and changing of PCB connectors.
14. Perform TPM (Total Productive Maintenance), TQM (Total Quality Management) and record keeping system.

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, behavioural 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- FINAL EXAMS WILL BE CONDUCTED BY THE EMPLOYER

(SUMMATIVE ASSESSMENT FOR TWO YEARS TRADE)

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

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

FURTHER LEARNING PATHWAYS

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

Employment opportunities:

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

1. Production & Manufacturing industries.
2. Automobile and allied industries
3. Ship building and repair
5. Defence organisations

ANNEXURE – I

TOOLS & EQUIPMENT FOR BASIC TRAINING

INFRASTRUCTURE FOR PROFESSIONAL SKILL & PROFESSIONAL KNOWLEDGE

TRADE: ELECTRONIC FITTER

LIST OF TOOLS & EQUIPMENTS FOR 20 APPRENTICES

A1. TRAINEES TOOL KIT

Sl. No.	Name of tools and equipments	Quantity
1.	Multimeter	20 nos.
2.	Screw Driver Set	20 nos.
3.	Soldering Iron 25 Watt, 230 Volt	20 nos.
4.	Flat Pliers	20 nos.
5.	Cutter	20 nos.

A2. TRAINEE TOOL KIT (ONE FOR GROUP OF 5 TRAINEES)

Sl. No.	Name of tools and equipments	Quantity
1.	Multimeter	4 nos.
2.	Oscilloscope	1 nos.
3.	Hack Saw frame adjustable 250-300 mm with blades.	4 nos.
4.	Hammer ball peen 400 gm with handle.	4 nos.
5.	Flat Pliers	4 nos.
6.	Screw driver set	4 nos.
7.	Star head screw driver	4 nos.
8.	Allen keys 2 to 16 mm (Hexagonal)	4 nos.
9.	Round nose pliers	4 nos.
10.	File triangular smooth 200 mm	4 nos.
11.	File round smooth 200 mm	4 nos.
12.	File square smooth 200 mm	4 nos.
13.	Round nose pliers 200 mm	4 nos.
14.	Pliers	4 nos.

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ANNEXURE – II

INFRASTRUCTURE FOR ON-JOB TRAINING

TRADE: ELECTRONIC FITTER

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.