

SYLLABUS FOR THE TRADE

OF

WIREMAN

(SEMESTER PATTERN)

UNDER

CRAFTSMAN TRAINING SCHEME

YEAR – 2013

By

Government of India

*Central Staff Training and Research Institute
Directorate General of Employment & Training*

Ministry of Labour & Employment

EN-81, Sector-V, Salt Lake City,

Kolkata-700091

**List of trade members of Trade Committee meeting for the
Trade of “Wireman ” held on 18th October 2011 at FTI, Bangalore**

Sl. No.	Name & Designation	Representing Organisation	Remarks
1	Shri. B.S. Ravi Prasad, Joint Director, Director I/C	Foremen Training Institute, Bangalore	Chairman
2.	Shri. H. Madhava Rao, Joint Director	Apex Hitech Institute, Bangalore	Member
3.	Shri. B.V.S. Sessa chari, Deputy Director	Foremen Training Institute, Bangalore	-do-
4.	Shri. Shri. P. Joji, Deputy Director	Foremen Training Institute, Bangalore	Core Member
5.	Shri. K.R. Ganapathy, Deputy Director	Foremen Training Institute, Bangalore	Member
6.	Shri. B.N. Sridhar, Deputy Director	Foremen Training Institute, Bangalore	Member & Convenor
7.	Shri. Ketan Patel, Deputy Director	RDAT, Mumbai	Member
8.	Shri. C. Ramasubramanian, Deputy Director	Apex Hitech Institute, Bangalore	-do-
9.	Shri. R.N. Dohare, Deputy Director	Apex Hitech Institute, Bangalore,	-do-
10.	Shri. M.N. Renukaradhya, Principal	Govt. ITI. Peenya, Bangalore	-do-
11.	Shri. B.L. Chandrashekar Principal	Govt. ITI. Hosur Road, Bangalore	-do-
12.	Shri. D.M. Nagaraj,Principal	Govt. ITI. Bagur, Channarayapatna, Karnataka	-do-
13.	Shri. H.N. Prakash, Principal	Govt. ITI. Tiptur, Karnataka	-do-
14.	Shri. B. Paramashivaiah, Asst. Director (Retd)	DET, Karnataka	-do-
15.	Shri. A. Vijayakumar, Training Officer	Advanced Training Institute, Hyderabad	Member
16.	Shri. U.M. Prasad, Vocational Instructor	MITI, Calicut, Kerala	-do-
17.	Shri. P. Srinivasa Rao, Vocational Instructor	Advanced Training Institute, Hyderabad	-do-
18.	Shri. G. Kantharaja, JTO	Govt. ITI, Peenya, Bangalore	-do-
19.	Shri. V. Venugopala, JTO	Govt. ITI, Hosur Road, Bangalore	-do-
20.	Shri. N. Dharmachar, JTO (Retd)	Govt. ITI, Peenya, Bangalore	-do-
21.	Shri. G.A. Narayanaswamy, Executive Engineer (Retd),	Karnataka Electricity Board.	-do-
22.	Shri. B.N. Shreedhar, Chief Engineer	Karnataka power corporation ltd, Bangalore	-do-
23.	Shri. Champaka Rao, Chief- Human Resourse	HMT M/c tools Ltd, Bangalore	-do-
24.	Shri. C. Subbanna, Senior Manager	Kirloskar Electric Co. Ltd, Bangalore	-do-
25.	Shri. S. Biswas, Asst. General Manager	EDN, BHEL, Bangalore	-do-
26.	Shri. L. R. Venugopal, Asst. General Manager	HMT M/c tools Ltd, Bangalore	-do-
27.	Shri. Nagabhushana Rao, Manager	Training & Development, Bosch Ltd, Bangalore	-do-
28.	Shri. M.V. Srinivasaiah, Deputy Manager	Quality control, KAVIKA, Bangalore	-do-

29.	Shri. A. Srirama, Engineer	Hindustan Aeronautics Ltd, Bangalore	-do-
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List of members attended the Workshop to finalize the syllabi of existing CTS into Semester Pattern held from 6th to 10th May'2013 at CSTARI, Kolkata.

Sl. No.	Name & Designation	Organisation	Remarks
1.	R.N. Bandyopadhyaya, Director	CSTARI, Kolkata-91	Chairman
2.	K. L. Kuli, Joint Director of Training	CSTARI, Kolkata-91	Member
3.	K. Srinivasa Rao, Joint Director of Training	CSTARI, Kolkata-91	Member
4.	L.K. Mukherjee, Deputy Director of Training	CSTARI, Kolkata-91	Member
5.	Ashoke Rarhi, Deputy Director of Training	ATI-EPI, Dehradun	Member
6.	N. Nath ,Assistant Director of Training	CSTARI, Kolkata-91	Member
7.	S. Srinivasu, Assistant Director of Training	ATI-EPI, Hyderabad-13	Member
8.	Sharanappa, Assistant Director of Training	ATI-EPI, Hyderabad-13	Member
9.	Ramakrishne Gowda, Assistant Director of Training	FTI, Bangalore	Member
10.	Goutam Das Modak, Assistant Director of Trg./ Principal	RVTI, Kolkata-91	Member
11.	Venketesh. Ch. , Principal	Govt. ITI, Dollygunj, Andaman & Nicobar Island	Member
12.	A.K. Ghate, Training Officer	ATI, Mumbai	Member
13.	V.B. Zumbre, Training Officer	ATI, Mumbai	Member
14.	P.M. Radhakrishna pillai, Training Officer	CTI, Chennai-32	Member
15.	A.Jayaraman, Training officer	CTI Chennai-32,	Member
16.	S. Bandyopadhyay, Training Officer	ATI, Kanpur	Member
17.	Suriya Kumari .K , Training Officer	RVTI, Kolkata-91	Member
18.	R.K. Bhattacharyya, Training Officer	RVTI, Trivandrum	Member
19.	Vijay Kumar, Training Officer	ATI, Ludhiana	Member
20.	Anil Kumar, Training Officer	ATI, Ludhiana	Member
21.	Sunil M.K. Training Officer	ATI, Kolkata	Member
22.	Devender, Training Officer	ATI, Kolkata	Member
23.	R. N. Manna, Training Officer	CSTARI, Kolkata-91	Member
24.	Mrs. S. Das, Training Officer	CSTARI, Kolkata-91	Member
25.	Jyoti Balwani, Training Officer	RVTI, Kolkata-91	Member
26.	Pragna H. Ravat, Training Officer	RVTI, Kolkata-91	Member
27.	Sarbojit Neogi, Vocational Instructor	RVTI, Kolkata-91	Member
28.	Nilotpal Saha, Vocational Instructor	I.T.I., Berhampore, Murshidabad, (W.B.)	Member
29.	Vijay Kumar, Data Entry Operator	RVTI, Kolkata-91	Member

GENERAL INFORMATION

1. Name of the Trade : WIREMAN
2. N.C.O. Code No. :
3. Duration : 2 Years (4 Semesters having duration of six months each)
4. Power norms : 4.38 KW
5. Space norms : 64 Sqr meter
6. Entry Qualification : Passed 8th Class examination
7. Unit size : 16
8. Instructors/Trainers Qualification : (a) Degree in Electrical / Electrical & Electronics Engineering from recognized engg. college/university with one year experience in the relevant field OR
Diploma in Electrical / Electrical & Electronics Engineering
From recognized board of technical education with two years experience in the relevant field OR
10th class passed and NTC/NAC in the Trade of “Electrician/Wireman”
With 3 years post qualification experience in the relevant field.
- (b) Desirable qualification : Preference will be given to a candidate with CIC (Crafts Instructor Certificate.)

* **Note:** At least one Instructor must have Degree/Diploma in the relevant field.

Syllabus for the Trade of “Wireman”
Duration : Six Month

First Semester

Semester Code: WMN: SEM I

Week No.	Trade Practical	Trade Theory	Engineering Drawing	Workshop Calculation & Science
1	Safety measures and DO's and DON'T's to be observed & followed in the electrical workshop. Demonstration on elementary first aid. Artificial Respiration. Visit to the different sections of the Institute.	SCOPE OF THE TRADE, INTRODUCTION TO ELECTRICITY & SAFETY PRECAUTIONS- Basic concept of electricity, Explanation of the terms phase, neutral and earth. Various safety measures required in industry. Elementary First Aid for electrical hazards. Concept of Standardisation.	Engineering Drawing- Introduction, Definition & uses of drawing equipments. Freehand sketching of straight lines, rectangles, squares, circle, polygons etc.	Introduction to Workshop science & calculations.
2&3	Demonstration of Trade hand tools. Use, care & maintenance of various hand tools. Practice in using cutting pliers, screw drivers etc. Identification of simple types of screws, nuts, bolts, clamps, rivets etc. Skinning the cables and jointing practice on single strand wire. Demonstration & Practice on bare conductors joints-such as Britannia, straight, Tee & Western union. Demonstration and identification of different types of cables.	COMMON HAND TOOLS, CLASSIFICATION OF ELECTRICAL MATERIALS- Hand tools used in Electrical trades- Identification, specifications, uses, care & maintenance. Classification of electrical materials - Electron theory- free electrons, Definition and properties of conductors, semiconductors and insulators. Classification of insulating materials- Voltage grading & Permissible temperature rise. Standard	Drawing of different types of lines. Free hand sketch of hand tools related to the trade.	GENERAL SIMPLIFICATIONS- Applied workshop problems involving Addition, Subtraction, Multiplication and Division. Applied workshop problems involving common fractions, decimal fractions.

	Demonstration & practice on using standard wire gauge. Practice on crimping thimbles & Lugs. Examination and checking of cables and conductors.	wire gauge, Types and specifications of wires & cables, Insulation & voltage grades. -low , medium & high voltage, Types of wire joints & their uses. Precautions in using various types of cables		
4 &5	Practice on installation and repairing common electrical accessories. Fixing of switches, holder plugs etc. in T.W. boards and gang boxes. -Identification and use of wiring accessories. Verification of Ohm's Law. Verification of Kirchoff's Laws. Verify the characteristics of series and parallel resistive circuits. Measurement of resistance by different methods- a) Using Wheatstone Bridge b) By voltage drop method. Experiment to demonstrate the variation of resistance of a metal with the change of temperature. -use of Multimeter. Verification of open circuit and closed circuit network. Identification of different types of Capacitors. Charging & discharging of capacitors, Testing of Capacitors. Grouping of capacitors.	BASIC ELECTRICAL TERMS, WORK, POWER & ENERGY. Fundamentals of electricity – Terms & definitions, effects of electric current, EMF, voltage, P.D, resistance & conductance. Their units. Ohm's Law - Simple electrical circuits and problems. Kirchoff's Laws, applications & simple problems. Wheatstone bridge, working principle and its applications. Definition of electric circuit, requirements to construct a simple circuit, types of circuits such as open, close, short & earth/leakage circuit. Resistors -Laws of Resistance. Series, parallel and combination circuits, Different Types of resistors & their properties. Specifications of resistors and tolerances. Effect of variation of temperature on resistance. Different methods of measuring values of resistance, Explanation of Mechanical work, power & energy. Electrical power & energy. Capacitor - Construction details, charging, discharging, types, grouping & uses.	Geometrical construction of ellipse, ovals, spiral, Cycloidal curves, Polygons, etc. Lettering practice- Specification of letters, single stroke, vertical letters & numbers (gothic). Drawing the typical diagram of D-type cartridge fuse, H.R.C. & kit-kat types of fuses. Fuse curve graphics as per relevant IS standard, Symbols indicating the method of operation of electrical instruments and accessories as per relevant IS Standard. Dimensioning techniques- aligned & unidirectional system. Scales (Enlarged & reduced)	Addition, Subtraction, Multiplication & Division of fractions. -Laws of Indices.

		Factors on which capacitance depends. Formulae & simple problems.		
6 & 7	ELECTRICAL MEASURING INSTRUMENTS- Measurement of voltage, current & resistance in different circuits. Direct & indirect measurement of electrical power & energy. Calibration of energy meters. Insulation resistance test by megger. Measurement of earth resistance by earth tester.	Type of measuring instruments – MC & MI, Construction & working principles of Ammeter, Voltmeter, Ohm-meter Wattmeter, Energy meter, P.F. meter, frequency meter, multimeter, clamp meter, megger & earth tester.	Projection, type, 1 st angle & 3 rd angle. Introduction isometric drawing. Isometric axis, isometric scale. Simple isometric drawings, isometric views of simple objects- cubes, rectangular blocks etc. Sketch of panel board with voltmeter, ammeter, wattmeter etc.	UNITS- Metric & British system of units – Fundamental units, Derived units, SI units, Conversions of quantities from one system to another such as length, mass, time and area.
8-10	FITTING HAND TOOLS, CARPENTRY HAND TOOLS AND THEIR USE & MAINTENANCE- ALLIED TRADE WORK: Marking use of chisels and hacksaw on flats, sheet metal filing practice, filing true to line. Sawing and planing practice. Practice in using firmer chisel and preparing simple half lap joint. Drilling practice in hand drilling & power drilling machines. Grinding of drill bits. Practice in using taps & dies. Threading hexagonal & square nuts etc. Cutting external threads on stud and on pipes. Riveting practice. Practice in using snips, marking & cutting of straight & curved pieces in sheet metals. Bending the edges of	Introduction to fitting work. Safety precautions to be observed, Types of files, hammers, chisels, hacksaw frames, blades, steel rule, try square - their specifications, grades, care & maintenance. Description of taps & dies, Use of thread gauge, Marking tools description & use. Types of drills, drilling machines, proper use, care and maintenance. Introduction to carpentry work- Description of carpenter's common hand tools such as saws, planers, chisels, mallet, marking, dividing & holding tools- their specifications, grades, care & maintenance. Introduction to sheet-metal work Description of marking & cutting tools such as snubs, shears, punches & other	Isometric views.	Conversions of quantities from one measuring system to another such as volume, pressure, temperature etc. METALS- Mechanical Properties Of metals- Tenacity, Malleability, Elasticity, Brittleness, Hardness, Compressibility & Ductility.etc. Properties and uses of Tin Copper, Zinc, Lead, Aluminium, Brass, Bronze, Solder, Bearing metals, Timber & Rubber.

	<p>sheets metals. Riveting practice in sheet metal. Practice in making different joints in sheet metal and soldering the joints.</p>	<p>tools like hammers, mallets etc., Use of different bench tools used in sheet metal works. Soldering materials, fluxes and process.</p> <p>Types of rivets & riveted joints.</p>		
11	<p>COMPUTER AWARENESS: Switching ON/ OFF of PC, Safety Precautions, Installation of O/S & Application Soft wares -Identification of Computer Parts, Connecting ,Installing & Using them. -Identifying and using Windows Parts, Components- Like Files, Folders, Editing, Saving, Windows Explorer, Notepad, Paint, Calculator.</p>	<p>Block diagram of computer, main parts inside the system unit, ports & connectors of PC parts &peripherals associated with PC like- keyboard, Mouse, Printers, Scanners, Camera, Modem, External Storage Devices & UPS .</p> <p>-Features of Operating System like M.S. Windows, Components of Windows- Calculator, Notepad, Paint, Windows Explorer.</p>	-do-	-do-
12	<p>OFFICE PACKAGE & INTERNET: -Using / Practicing WORD, EXCEL, POWER POINT for documentation. -Internet Practicing- Browsing / Creating Email, Downloading, Communication .</p>	<p>-Features of Office Package Like-Word, Excel, Power Point -INTERNET: Websites, Browsing, Downloading, Creating and Using E-Mail ID's, Using it for Communications</p>	<p>Conversion of isometric into orthographic projection.</p> <p>Free hand sketch of I.C.T.P & I.C.D.P. switch with neutral and their symbols.</p>	<p>HEAT & TEMPERATURE- definitions, units, temperature scales (Centigrade, Fahrenheit, Kelvin Scale conversions) Names and uses of temperature measuring instruments used in work shop. Principle of Calorimetry, latent heat, specific heat – their related problems. Transmission of heat- Conduction, Convection & Radiation. Expansion of Solid, Liquid & Gases-their related problems.</p>
13 &14	COMMON ELECTRICAL ACCESSORIES,	Common Electrical Accessories, their	-do-	-do-

	<p>ELECTRICAL BASIC CIRCUITS- Construction & testing of various electrical circuits with different accessories. Connection of Calling Bell, Buzzer, Electric Iron, Heater, Light & Fan etc.</p> <p>Practice in soldering and brazing</p>	<p>specifications-Explanation of switches, lamp holders, plugs and sockets etc. Development of domestic ckts using switches, fuse, MCB, sockets, lamp, fan, calling bell/buzzer, Two way switch, I.C.T.P, I.C.D.P, MCCB, ELCB, RCCB etc. Circuits of common domestic equipments & appliances. Importance of Neutral, effect of opening of neutral wire Soldering- Solders, flux and soldering techniques. Types of soldering irons-their proper use. Brazing method</p>		
15	<p>DOMESTIC WIRING - METHODS, INSTALLATION & TESTING- Demonstration & Practice on connecting common electrical accessories in circuits and testing them in series board. Demonstration on Testing & replacement of different types of fuses.</p>	<p>Introduction and explanation of electrical wiring systems, cleat wiring, casing & Capping, CTS, Conduit and concealed etc., I. E. Rules. Related to wiring, National Building codes for house wiring, specification and types, rating & material.</p>	<p>Free-hand sketch switches HRC fuse and megger.</p>	<p>Simple problems on metric system of weight and measurement.</p>
16	<p>Identification of different wiring materials and their specifications. Removing of insulation from assorted wires and cables. Demonstration and practice crimping thimbles/lugs of various sizes. Jointing practice with single and multi-stranded conductors of different wires and cables.</p>	<p>Branching of circuits with respect to loads such as lighting and power. CTS/PVC Conduit-surface and concealed/metal conduit/PVC casing and capping. IE rules regarding clip distance. Fixing of screws, cable bending etc.</p>	<p>Drawing of schematic diagrams of plate and pipe earthing as per I.S. Preparation of simple working drawings of different conduit joints as per I.S. Symbols.</p>	<p>Simple problems on metric system of weight and measurement. Effects of alloying metals</p>
17	<p>Layout on wiring boards. Practice in P.V.C. insulated cable wiring on wood buttons with distribution board and number of circuits.</p>	<p>Description of different electrical fittings and accessories such as lamp holders, switches, plugs brackets, ceiling rose, cut out etc. IS 732-1963.</p>	<p>Sketching details of Lamp holder, ceiling rose.</p>	<p>-do-</p>

18	Practice of wiring: A) One lamp controlled by one SP switch, (B) Two lamps controlled by two independent switches, (C) One lamp controlled by two 2way switches (Staircase wiring), (D) One lamp controlled by intermediate switch from three different locations, (E) Hospital wiring, (F) Tunnel/Godown wiring, (G) Hostel wiring, (H) Bell Buzzer Indicator wiring (I) Domestic wiring practice	Wiring materials used for P.V.C. cables I.E. rules, Indian standards regarding the above wiring such as-clip distance fixing of screws, cable bending etc.	Schematic diagram of bell and indicator wiring circuit. Diagram of different domestic and industrial equipment.	Square root of perfect square of a whole number and a decimal
19	Demonstration and practice of using Rowel tools, Demonstration and practice of casing and capping wiring.	Description of Rowel tools and Rowel plugs, their sizes, plugging, compound, plugs- wall jumper and their sizes and uses. Introduction to estimation procedure, P.V.C. casing and capping materials, sizes and grades etc.	Free hand sketching of nuts & bolts with dimensions from samples.	-do-
20	Demonstration and practice in cutting and threading conduit pipes. Cold and hot bending of pipes. Fitting of conduit accessories.	Conduit pipe wiring materials and accessories, types and sizes of conduit.	Free hand sketching of rivet and washers with dimensions from samples.	Mass & weight- Definition, units, interrelation & shop calculation.
21	Preparation of conduit threads using different fittings and use of running threads wiring in conduit, using metal clad 3 pin plug, earthing the conduit using earth clips and earth wire.	Layout of Light points, fan points etc. Layout of heating leads etc.- their controls, main switches, distribution boards as per I.E. rules. I. E. Rules for earthing conduits using earth clips and earth wire as per IS 732-1963.	Free hand sketching of screws threads with dimensions from samples. Drawing schematic diagram of plate & pipe earthing as per I.S. 3943 – 1966	-- do ---
22	Earthing Plate and pipe earthing, Improvement of earth resistance, Measurement of earth resistance, Testing of different wiring installations by megger., Insulation, polarity, earth continuity tests.	: Importance. Types of earthing: Plate and Pipe earthing, Methods of making good earthing, Earth resistance. Protection of building, and electrical machines and devices. Explanation of Megger & types,.	Explanation of simple orthographic projection 1 st angle.	C.G.S. & F.P.S. system of units for force, weight etc. and simple problems.
23	ILLUMINATION:- Installation of - Neon Sign tube, Mercury vapour (H.P. & L.P.), Sodium	Introduction of Illumination- Terms & definitions, laws of illumination, illumination factors, intensity of light –	Schematic & connection diagram of Florescent lamp, Sodium vapour lamp,	Rotational motion. Angular velocity and acceleration.

	vapour, Halogen Lamps, single tube, double tube, Metal halide lamps. Practice on decoration lighting	importance of light, Direct & indirect lighting-efficiency in lumens per watt, colour available. Construction, working & applications of –Incandescent lamp, Carbon arc lamp, Fluorescent tube, CFL, Neon sign, Halogen, Mercury vapour, sodium vapour, Metal halide lamps etc. Decoration lighting, Drum Switches etc. Numerical problems.	Mercury vapour lamp etc.	Moment of Inertia, Radius of gyration.
24	PLANNING, ESTIMATION & COSTING OF WIRING- Preparation of Layout for domestic, commercial & workshop electrical installation. Estimation & costing of materials & accessories as per layout.	Concept & principles of plan, estimation & cost. Preparation of complete House-wiring layout- Lighting & AEH, Industrial wiring, Commercial wiring for office, lodge, hospital, bank etc. I.E. Rules for Multistoried buildings. .	Types of nuts, bolts, studs & washers. Prepare domestic layout diagram of Lighting & power circuit.	LOGARITHMS-Definition, Applications of logarithms. Reference to Log, Anti logarithms tables, Finding of CHARACTERISTIC and MANTISSA.
25		I) Project Work II) Industrial visit (optional)		
26.		Examination		

Syllabus for the Trade of “Wireman”
Duration : Six Month

Second Semester

Semester Code: WMN: SEM II

Week No.	Trade Practical	Trade Theory	Engineering Drawing	Workshop Calculation & Science
1-2	INTRODUCTION, SAFETY PRECAUTIONS Familiarize with Fire fighting equipments, artificial respiration, Working at height ladder, Method of isolating supply.	Safety precautions to be observed in the commercial establishments and industries	Practice in reading panel diagrams as per IS	Problems on Standard algebraic formula. (a) $(a + b)^2$ (b) $(a - b)^2$ etc.
3-4	INDUSTRIAL TYPE COMMON HAND TOOLS Demonstration & Practice in using Trade power /hand tools. Identification of insulating materials.	Industrial hand tools, specification, care & maintenance. Specific uses & Classification of insulating materials on the basis of thermal stability. IE rules pertaining to commercial establishments and industries.	Practice in reading panel diagrams.	-do-
5-8	INDUSTRIAL WIRING- Tests on insulating materials. Measurement of insulation resistance, of commercial and industrial installation Additional practice in conduit	Connections of different types of motors used in industry, their normal methods of wiring, Control & starting devices-their connections, layouts and earthing Code practice for earthing of Industrial Wiring.	Sketching the details I.C.D.P. & I.C.T.P. switches.	Meaning and example of friction. Explanation of centre of gravity Explanation of specific gravity.

	wiring. Industrial power wiring involving single phase & 3phase motors with switches & starters.	Wiring methods & types in workshop & factories.		
9	COMMERCIAL WIRING- Inverter wiring./ Control panel wiring / multi-storeyed building wiring.	Wiring in commercial building- their special precautions as per I.E. rules.	Sketching of panel board arrangement for A.C. poly phase motor circuit.	Simple problems on straight and bell crank levers. Calculation of Volume and weight of simple solid bodies, cubes, parallelopoid, prism and shop problems
10-11	Wiring and installation of power drives. Installation of 1 ph. And 3 ph. On line / off line UPS wiring	Power drives – Introduction, types, advantages & disadvantages UPS- Introduction, types, Load calculation, Backup time calculation.	Practice in reading schematic diagrams for A.C. Squirrel cage motor starter & slip ring motor starter	Shop problems on determination of volume and weight of simple bodies.
12	Straight and cross crimping of RJ-45 cable. Installation of dish Antenna at proper angle, crimping of co-axial cable, proper installation of co-axial cable from dish antenna to Television set.	Computer networking – Identification of network hardware / component. CAT-6 cable, RJ-45. DTH- Introduction of direct to home system, Music channel wiring/interconnecting couplers.	Practice in drawing schematic diagram of an A.C. motor starter (DOL, Star-delta etc).	Head, temperature-thermometric scales- Fahrenheit. Centigrade scales, their conversion. Types and nature of temperature measuring instrument normally used in workshop.
13-14	Industrial wiring installations for mixed load, both light and power. Layout of L.V. AC/DC machines and their panels. Wiring of Low power A.C./ D.C. machines in metal conduit system as per I.E. Rules.	General idea of fixing meter boards & taking service connection. Sealing of I.C. cut out & meters as per I.E. Rules, General Electric Appliances using heating effect – their capacities, voltage ranges, Calculation of current	Views of simple hollow and solid bodies with dimensions. Use of different types of lines and symbols for drawing. Drawing symbols and conventions as used in simple circuit. Symbols used in circuit elements.	Meanings of stress, strain, modulus of elasticity and ultimate strength.
15 - 16	Wiring of different circuit using Single core cable use for 2 ways, intermediate master switches etc.	Explanation of inter connection wiring circuits in the main building and auxiliary blocks, meter boards and its locations. Study of layout symbols in the preparation of layout diagrams.	-do-	-do-
18-19	Demonstration & practice on the	Explanation of earth meggar. Use of	Simple Isometric views of	Geometry-properties of lines,

	<p>use of earth meggar. Demonstration and practice in the use of earth leakage tester. Trouble shooting of different types of wiring. Practice in servicing fans, regulators.</p> <p>Practice of cutting & threading of conduit/PVC. Practice in fitting conduit frames using coupling, bends, tees and junction boxes to correct dimensions, Practice in conduit wiring</p>	<p>earth meggar in testing domestic and industrial installation. Use of earth leakage circuit breaker. Causes & remedies for fault in different types of wiring system. Servicing of electrical fans & regulators.</p> <p>Description of threading devices & their correct use.</p>	<p>simple objects such as square Rectangular Cubes etc.</p>	<p>angles, triangles and circles etc.</p>
20	<p>Identification of P.V.C. conduit spares with specification. Practice on P.V.C. conduit wiring for domestic purpose.</p>	<p>Discussion for charts and tables for size and number of cable to be drawn through conduits of various sizes as per I.E. rules.</p> <p>Earthing of conduit for both surface and concealed wiring systems as per I.E. rules. Methods of drawing cables through conduit.</p>	<p>Simple Isometric views of simple objects such as square Rectangular Cubes etc.</p>	<p>Different types of stresses with examples.</p>
21-24	<p>PLANNING, ESTIMATION & COSTING- Preparation of Layout for domestic, commercial & workshop electrical installation.</p> <p>Estimation & costing of materials & accessories as per layout.</p>	<p>Concept & principles of plan, estimation & cost of industrial and commercial wiring, I.E. Rules for Multi-storeyed buildings.</p>	<p>-do-</p>	<p>Simple problems on lines, angles, triangles and circles.</p>
25	<p>i)Project work</p> <p>ii) Industrial Visit(optional)</p>			
26	<p>Examination</p>			

Syllabus for the Trade of “Wireman”

Duration : Six Month

Third Semester

Semester Code: WMN: SEM III

Week No.	Trade Practical	Trade Theory	Engineering Drawing	Workshop Calculation & Science
1	MAGNETISM & ELECTROMAGNETISM Winding/Rewinding of E.M. Coils, and testing	Introduction to magnetism and its properties. Explanation of electro-magnetism –advantages & uses. Principles of electro magnetism, cork screw rule. Magnetic field of current carrying conductor loop, solenoid.	Symbols used in rotating machines and transformers IS-2032 (Part-IV) 1908.	Trigonometry – Trigonometric function, use of trigonometric tables and applied problems.
2	Testing of electric bell/ buzzers and repairs.	Principle of Electro-magnetic induction, Faraday’s Laws. Fleming’s right hand rule, Left hand rule, Lenz’s,	-do-	Definition of mechanical advantage-velocity ratio related to shop problem.
3&4	D.C. GENERATORS, Identification of the parts of D.C. Generators. Testing and measuring the field and Armature resistances. Dismantle the D.C. Generator.	Introduction to D.C Generators and working principle, parts of D.C. Generator. Classification of Generators- Self excited and separately excited- their application in practical field.	-do-	Useful work of a machine-mechanical efficiency of a machine.
5	Identification of different parts of generators testing fields & Apparatus. Insulation resistance measurements. Building up of	Types and characteristics of D.C. Generators – Series, Shunt and compound, their applications. Explanation of Armature reaction,	Layout arrangement of D.C. Motor panel with controlling devices	

	voltage and loading generators.	interlopes, commutation and EMF equation of DC generators. Parallel operation of Generators		
6	MOTORS & STARTER Practice in connecting generators- Generators- Testing of D.C. Machines by Megger. General maintenance of D.C. machines.	Introduction to D.C. Motor-Working principle, types of motors Explanation of terms used Torque, speed, Back E.M.F. etc. Characteristics, Speed control of DC motors	-do-	Use of trigonometric Functions and tables.
7&8	Testing of D.C. Motors – connect run and change direction of rotation. Study of DC starters- 2 point 3 point and 4 point speed control of D.C. Motors and speed measurement. Use Revolution counter. Trouble shooting and fault rectification.	Necessity of starter- Types of starters, 2 point 3 point and 4 point starters, Protective devices used. Methods of speed control, advantages, disadvantages & Industrial applications. Trouble shooting and fault rectification.	Draw D.C Motor starters	Determination of efficiency of simple machines like winch, pulley blocks & compound axles.
9	A.C. FUNDAMENTALS, 1- Ø & 3Ø CIRCUITS Construction of purely resistive circuit, inductive circuit, capacitive circuit and various combinations. Determination of current, voltage, power and power factor in RLC series circuit. Power factor measurement by using PF meter. Determination of inductive reactance, capacitive reactance and impedance in an AC circuit.	Single phase AC circuit: - Purely resistive, inductive and capacitive circuit. Inductive reactance and capacitive reactance. Combination circuit viz RL, RC, LC and RLC circuits and vector diagrams. Power measurement, Power factor, Lagging and leading power factor. Effects of low power factor and remedies.	-do-	-do-
10-12	Tests on 3 phase circuit. – Current and voltage measurement in star and delta connections. Measurement A.C. 3 ph. Power.	Introduction to A.C. Poly phase systems-advantages, 3 phase star delta. Terms used in 3Ø systems, connection and their relations w.r.t. current and voltage. Principle of measurement of A.C. 3 ph. Power. Simple calculation of	-do-	Expl. Of Factor of safety and types of stresses. Calculation of volume weight of simple bodies.

		A.C. 3 phase circuit parameter – I, V, Z & P.F. etc.		
13&14	A.C. GENERATORS, MOTORS & STARTERS Identification of Alternator of parts. Running of Alternator by prime mover and loading it to find out regulation at different loads.	Introduction to Alternators, principle of working, types of Alternators, EMF equation, parts and construction.	The schematic diagram of an A.C. & phase reversing	Logarithm-Use of Log tables for multiplication and division.
15	-do-	General idea of loading and regulation of Alternator.Parallel operation of Alternators, synchronising methods	-do-	Practice in the use of log tables.
16-18	Constructional details of three phase squirrel cage induction motor and slip ring induction motor. Determination of slip and efficiency. Familiarisation of DOL starter, Star- delta starter, Autotransformer starter and slip ring IM starter. Phase sequence test on three phase IM motors, Single phasing preventer.	Three phase Induction motor: - Construction, Principle of operation of Three phase induction motor. Squirrel cage induction motor and slip ring induction motor. Rotor slip, rotor frequency and rotor torque. Factors affecting torque. Effect of variation in applied voltage. Starting methods. DOL starter, Star – delta starter and Auto transformer starter. Speed control methods. Importance of phase sequence in three phase induction motor. Single phasing preventer.	Wiring diagram of A.C. multi-speed motors D.O.L. Starter. Star/Delta starter.	-do-
19	Demonstration and practice on A.C. Single phase motors starting / running for specific need.	Introduction to A.C. Single phase motors – Types characteristics and starting devices. Applications of single phase motors.	Free hand sketching of plan and elevation of simple objects like hexagonal bar, square bar, circular bar, hollow bar etc	Reading of simple graphs.
20	A.C. motor panel wiring (slip ring Induction type)	Description of starter delta starter (manual semi and Auto). Internal arrangement of a motor resistance starter for slip ring induction motor. Motor control circuit and starting devices.	-do-	- do -

21& 22	<p>POWER WIRING FOR DC & AC MOTORS Practice power and control circuits on boards. Assembly & testing of the frame for a panel – suitable for motor generator set. I.S. 3072 Part-II of 1961. Erection of panel board, fixing of controlling and starting equipment, necessary meters.</p>	Power and control wiring circuits of AC motors	Free hand sketching of simple objects related to trade. Simple working drawings for casing and capping.	Meaning of horse power & brake horse power. Simple problems as work, power & energy.
23&24	<p>TRANSFORMERS - Test a single-phase transformer for its Continuity and insulation.</p>	Introduction to transformers, working principle, EMF equation and construction, Parts of transformer Types of transformers- Auto transformer, Instrument transformers,	-do-	-do-
25	<p>i)Project Work ii) Industrial visit(optional)</p>			
26	Examination			

Syllabus for the Trade of “Wireman”

Duration : Six Month

Fourth Semester

Semester Code: WMN: SEM IV

Week No.	Trade Practical	Trade Theory	Engineering Drawing	Workshop Calculation & Science
1-4	<p>Identification of types of transformers.</p> <p>To test / check the polarity of single phase transformer.</p> <p>Insulation Testing of single phase and Three Phase.</p> <p>Conducting No-load/O.C. & short circuit tests.</p> <p>Connection of transformers, efficiencies of transformers, parallel operation of transformer.</p> <p>Maintenance of transformer equipments such as: - Oil gauge, Tap changer, Bushes, Breather, Earth fault relay, Protective relay etc.</p> <p>Replacement of oil and testing of its die-electric.</p> <p>Recharge the silica gel in breather.</p>	<p>TRANSFORMERS –</p> <p>Power Transformer – Its construction, working, performance, parallel operation of transformer, their connections. Cooling of transformer, S.C. & O.C. tests. Regulation and efficiency,</p> <p>Specifications, problems on e.m.f. Equation, transformation ratio.</p> <p>Characteristics of ideal transformer.</p> <p>Construction of core, winding shielding, auxiliary parts breather, conservator. Buchholz’s relay, other protective devices.</p> <p>Transformer oil testing and Tap changing off load and on load.</p> <p>Transformer bushings and termination. Auto transformer- Its construction, working, performance & uses.</p>	<p>Free hand sketching of simple object related to trades. Preparation of simple working drawings from sketches. Details sketching of conduit, fittings.</p> <p>Drawing of the methods of termination of different types of cables.</p>	<p>Calculation of volume, weight of simple solid bodies by using logarithm. Problems on menstruation.</p> <p>Practice in using log tables for multiplication division etc.</p> <p>Brief description of manufacturing process of cast iron-properties uses of cast iron.</p> <p>Plotting of points, graphs</p> <p>Simple equations. Reading and plotting of graphs.</p>

5	Familiarize and practice operation of OH line components.	OVERHEAD LINES & DISTRIBUTION OF LT POWER General idea about overhead distribution (L.V. & M.V.) and their types of accessories used. General arrangement and maintenance of outdoor type of substation.	Draw the typical rating plate of a transformer.	Use of Log tables.
6	-do-	Explanation of over head bus bar, side by bar. Bus trunking and rising mains. I.E. rules regarding panel erection, bus bar, spacing bus bar chamber, danger boards. Connection of high voltage metering equipment used with bus bar.	Drawing of the typical terminal plates of transformers up to 100 K.A.	Use of Log tables.
7	Demonstration, testing and use of line protecting devices as per I.E. Rules.	Explanation of line protecting devices and their general principle. Brief description of connection of places of use.	Drawing the diagram of current transformer.	Properties of insulating oil. (net)
8-12	Familiarization and operation of various CBs ACB, VCB, HF6, OCB etc. Demonstration and Tests on Multi range switches, Rotary switches. Cooker control Panel, Power circuit switches Thermostats. Mercury switches,	SUBSTATION EQUIPMENTS Switchgear-CBs – ACB, VCB, HF6, OCB etc. protection schemes, CT/PT-Protective relays, lightning arrestors, Explanation of different types of switches and switches gears multi Range switches, rotary switches, cooker control panels, power circuit switches, thermostat, mercury switches etc.	Reading of Panel board wiring. Drawing of the current transformer. Layout diagram of typical substation equipment. IS 2274-1963	Calculation on area, volume and weight of simple solid bodies such as cubes, parallelepiped etc., Application to shop problems. Properties and uses of lead, tin, zinc, brass, bronze, high carbon steel and alloy steel. Properties of matter, molecules, atom, Difference between mass and weight.
13-14	Familiarize the parts of substations low and high	TYPES OF SUBSTATIONS – INDOOR, OUTDOOR & POLE MOUNTING	Single line diagram of substation feeder.	Problems on mensuration

	voltages	Substation construction: 2 Outdoor and Indoor substation. ii. E.H.T. substation iii. H.T. substation iv. Medium & low voltage substation (Pole mounting type)		
1516	Demonstration and practice in terminating an U.G. cable to a bus bar chamber. Crimping lugs to the conductors of U.G. cable and connection to bus bar Loop connection for other ckt	U.G. CABLE Construction of cable, Types , Application & methods of jointing UG cable & testing	Drawing the diagram showing Aluminium sleeve for jointing copper and aluminium conductors' compression method.	Specific gravity-Principle of Archimedes relations between sp. Gravity & density.
17	-do-	General idea of laying method and jointing precautions to be observed and different accessories used for medium voltage termination.	Connection of typical over current relay. Wiring of controlling Panel for passenger lift.	Heat-specific heat of solids, liquids and gas and heat gained. Further problems of menstruation as area vol. etc.,
18-20	Assembly of a Dry cell- Electrodes-Electrolytes. Grouping of Dry cells for a specified voltage and current, Practice on Battery Charging, Preparation of battery charging circuit, Testing & Installation of batteries. Charging of a Lead acid & Nickel iron batteries, filling of electrolyte- Testing of discharged and fully charged battery. Routine care & maintenance of batteries	BATTERIES-TYPES, TESTING & MAINTENANCE- Chemical effect of electric current- Principle of electrolysis. Faraday's Laws of electrolysis. Electro chemical equivalents. Explanation of Anodes and cathodes. Primary cell & secondary cell such as voltaic, leclanche, Daniel & dry cell. Lead acid & Nickle iron cell- construction, discharging & methods of charging-Precautions to be taken & testing equipment, Rechargeable dry cell, description advantages and disadvantages. Care and maintenance of cells Grouping of cells of specified voltage & current, Sealed Maintenance free Batteries,	Draw different types of lamp circuits	Problems on Trigonometry. Trigonometric functions. Use of Trigonometric tables. Applied problems such as Calculation of area of triangles etc., Resolution of composition of forces. Problems on menstruation.

		Lead Acid & Nickel iron batteries, general defects & remedies. Power & capacity of batteries. Efficiency of batteries.		
21-22	Preventive maintenance and routine tests.	Importance and advantages of maintenance. Points to be observed to maintain the installation, preventive maintenance and routine tests.	Schematic diagram of magnetically operated A.C. motor starter with push button control.	Representation of forces by Vectors, simple problems on lifting tackles.
23-24	Fault location and remedy practice both in domestic and industrial wirings. Practice in fixing conduit along with the girder, steel structures station etc.	Common faults, causes and remedies in domestic and industrial wiring installation, Methods of Locating faults.	Revision	Problems on menstruation. Load calculations for both domestic and industrial system.
25	Revision			
26	Examination			

TRADE: WIREMAN

LIST OF TOOLS & EQUIPMENT

A. TRAINEES TOOL KIT FOR 16 TRAINEES +1 INSTRUCTOR

Sl. No	Description	Broad Specification	Qty
1	Steel rule 300mm		17 Nos.
2	Screw Driver 200mm		17 Nos.
3	Screw Driver 100mm		17 Nos.
4	Terminal screw Driver 75 mm (Connector)		17 Nos.
5	Knife Electrician D.B.		17 Nos.
6	Hammer Ball peen. 0.25 Kg		17 Nos.
7	Plumb bob 115grams		17 Nos.
8	Combination pliers 200 mm insulated		17Nos
9	Neon Tester 500 volts pencil bit type		17Nos
11	Try Square 200 mm		17 Nos
12	Small crimping tools 100 mm		17Nos
13	Spanner set DE 6X7,8X9,10X11,12X13,14X15,16X17, Set of 6		17 Nos
14	Screw driver set 100mm,150mm,200mm,300mm, Set of 4		17 Nos
15	File half round 2 nd cut 250 mm		17Nos
16	File round 150 mm		17 Nos

SHOP TOOLS, INSTRUMENTS & GENERAL OUTFIT (per unit)

Sl.No	Description	Broad Specification	Qty
1.	Melting pot		1No
2.	Forge with hand blower		1 No
3.	Conduit die set suitable ,for 9mm, 18mm, 25mm and 30mm		4 sets
4.	Conduit pipe cutting and threading machines adjustable for 15mm to 30mm.		1 No
5.	Conduit pipe bending machine, suitable for 15mm,18mm, 25mm and 30mm Pipe		1 No
6.	Bar magnet		1 No
7.	Horse shoe magnet		1 No
8.	Wheatstone Bridge		1 No
9.	Crimping tool		1 No
10.	Crimping tool for telephone/LAN cable		1 No
11.	Rubber matting 2 meter x 1 meter x 9mm		2 Nos.
12.	Wiring board on stand 3 meter x1 meter with 0.5 meter projection on the top		4 Nos
13.	Work bench 2.5 x 1.20 x 0.75 meter		2 Nos
14.	Rawal tool holder & Bit No.8, 10, 14, & 16		2 set
15.	Set of Wall jumper octagonal 37mm X 450mm and 37 X 600mm		4 sets
16.	Central punch		2 Nos
17.	Pliers side cutting		5 Nos
18.	Pliers flat nose		5 Nos
19.	Pliers round nose		5 Nos
20.	Pliers long nose		5 Nos
21.	Screw driver heavy duty		2 Nos
22.	Cold chisel flat 18mm X 200mm		5 Nos
23.	Firm chisel 1”		10 Nos
24.	Firm chisel ½ ”		10 Nos
25.	Wire stripper		5 Nos
26.	Hammer Ball Peen		5 Nos
27.	Hammer cross Peen		5 Nos
28.	Rawal tool holder & Bit No.8, 10, 14, & 16		2 set
29.	Set of Wall jumper octagonal 37mm X 450mm and 37 X 600mm		4 sets
30.	Central punch		2 Nos
31.	Scriber		2 Nos

32.	File flat 300mm rough	5 Nos
33.	File flat 300mm 2 nd cut	5 Nos
34.	File flat 250mm Bastard	5 Nos
35.	File flat 250mm smooth	5 Nos
36.	File flat round 150mm 2 nd cut	5 Nos
37.	File flat round 150mm smooth	5 Nos
38.	File round 300mm 2 nd cut	5 Nos
39.	File round 150mm smooth	5 Nos
40.	File triangular 150mm 2 nd cut	5 Nos
41.	Adjustable spanner 300mm	1 No
42.	Foot print Grip 250mm	2 Nos
43.	Allen keys Set 5 to 11	1 set
44.	Spirit level 300mm	1 No
45.	Electric soldering iron 125 watts 230-250 V	2 Nos
46.	Blow lamp 1 liter capacity	2 Nos
47.	Bench vice 150mm	5 Nos
48.	Hand vice 50mm jaw	5 Nos
49.	Rubber gloves 5000volts	2 pairs
50.	Safety belt with provision for keeping tools	10 Nos
51.	Tower ladder on type wheels Min 10ft-Max 30ft	2 Nos
52.	Portable extension ladder aluminium 6 to 9 meters	1 No
53.	Iron pen 450 mm	2 Nos
54.	All types C.F.L. lamp sets 5watt,15watt,25watt	2each
55.	Demonstration table 2.5 x 1.25 x 0.75 meter	2 Nos
56.	Fire extinguishers Dry chemical	2 Nos
57.	Set of Rowel punch 8,10mm	10 Nos
58.	Personal computer system with printer	1 No
59.	Laser printer	1 No
60.	Digital multimeter	8 Nos
61.	Earth meggar 0-10 ohms, 500V, with all accessories	2 Nos
62.	Hot wire Ammeter 0-15 Amps.	1 No
63.	Hammer type Hand drill machine 12mm capacity universal type 250 Volts	2 Nos
64.	Electrical drill machine 12mm, capacity 250 volts universal type	1 No
65.	Meggar cum continuity tester 500 volts	2 Nos
66.	Single phase K.W.H meter digital 5A, 250 V A. C	2 Nos

67.	Single phase K.W.H meter analog 5A, 250 V A. C	2 Nos
68.	Lux meter	1 No
69.	Lead Acid battery 75Ah 12V	1No
70.	Battery Charger 15V,Current controlled	1No
71.	Hydraulic crimping tool for UG cable crimping with bits 20 sq mm to 250sq mm	1 No
72.	Transformer single phase 1 K.V.A. 250/100 v	1 No
73.	Transformer Three phase 2 K.V.A. 440/220 v	1 No

EQUIPMENT & MACHINERY:

Sl. No	Description	Broad Specification	Qty
1.	D.C. compound motor 3 H.P 250 V with 3 point starter and field regulator (Laboratory type)		1 No
2.	a. D.C. shunt motor, 3 H.P 250 v with 3 point starter and speed regulator (Laboratory type)		1 No
3.	b. D. C. series motor with 2 point starter		1 No
4.	Capacitor motor 1/4 H.P. single phase 250 V		1 No
5.	Split phase motor 1/4 H.P. single phase 250 V		1 No
6.	Universal motor 1 H.P.AC/DC 250 V		1 No
7.	M.G. Set consisting of squirrel cage induction motor 5 H.P. 400 V cycle with directly coupled compound generator 3K.W. 250 V with built in panel board consisting of :	1. 3 phase air circuit breakers 2. Star Delta starter (contact type 8 point) & Automatic type 3. D.C circuit breaker 4. Suitable voltmeter on A.C. & D.C. side 5. Sunk field regulators 6. Suitable line ammeters on A.C. and D.C. side 7. Field circuit ammeter 8. Indicating lamps on both the sides (AC &DC)	1set 1 no 1 No 1 No 1 No 1 No 1 No
8.	Squirrel cage induction motor 3 H.P. 400 V with D.O.L. starter		1 No
9.	Squirrel cage induction motor 5 H.P. 400 V with star delta starter		1 No
10.	Soft starter 1ph		1 No
11.	Tachometer digital type 0-6000 RPM		1 No

C.WORKSHOP FURNITURE:

Sl. No.	Name of the items	Quantity
1	Instructor's table	1 No
2	Instructor's chair	2 Nos
3	Metal Rack 100cm x 150cm x 45cm	4 Nos
4	Lockers with 16 drawers standard size	1 No
5	Steel Almirah 2.5 m x 1.20 m x 0.5 m	2 Nos
6	Black board/white board	1 No
7	Computer table	1 No.
8	Computer chair	2 Nos.
9	Printer table	1 No