

SYLLABUS FOR INSTRUCTOR
(ELECTRICIAN/WIREMAN)

Unit 1.0	Various Electrical Safety rules and safety Signs / Symbols, Types and working of fire extinguishers, First aid safety practice, personal safety and factory safety, Response to emergencies e.g. power failure, system failure and fire. Trade tools specifications. Introduction to National Electrical Code-2011, Safety precautions, Description of files, hammers, chisels, hacksaw frames, sheet metal tools, carpenter's tools their specification and grades, care and maintenance of tools. Types of drills, description and use. Various wooden joints. Marking tools-calipers, dividers, surface plates, Angle plates, scribes, punches, surface gauges-types, uses, Care and maintenance, types of rivets and riveted joints, use of thread gauge.
Unit 2.0	Fundamentals of electricity, definitions, units and effects of electric current. Conductors and Insulators, various conducting and insulating materials. Joints in electrical conductors, techniques of soldering, Types of solders and flux. Underground cabled-Description, types, various joints and testing procedure, cable insulation. Ohm's law, Kirchhoff's law, series and parallel electrical circuits, open, closed and short circuits. Resistance, various types of Resistors, effect of temperature on Resistance, colour coding of Resistors, different methods of measuring resistances. Self and mutually induced emf, Faraday's laws of electromagnetic Induction, Lenz's law, Inductor, and their functions, capacitor, different types of capacitors and their functions. Comparison of DC and AC systems, concept of frequency, Instantaneous value, RMS value, Average Value, form factor, peak factor, power factor and Impedance, Active, Reactive and Apparent Power, concept of Single phase and three phase A.C. Systems. Three phase Star and Delta connection, Line and phase voltage, current and power in three phase A.C. Circuits. Laws of Electrolysis, Types of cells, Types of battery charging, safety precautions, test equipment and maintenance, Electroplating.
Unit 3.0	I.E. rules of electric wiring, Types of domestic and Industrial Wirings, wiring accessories-switches, fuses, relays, MCB, Layout of simple domestic wiring. PVC, Conduit and Casing-Capping wiring system, wiring circuits planning, permissible load in sub-circuit and main circuit. Estimation of load, cable size, bill of material and cost. Study of special wiring circuit-godown, tunnel and workshop. Importance of Earthing, Plate earthing and pipe earthing, Earth resistance, Neutral and Earth.
Unit 4.0	Laws of Illuminations, Types of Illumination system, Illumination factors, intensity of Light, Types of lamps, calculation of lumens and efficiency. Various types of electrical measuring Instruments-Ammeter, Voltmeter, wattmeter, Energy meter, frequency meter, Multimeter, phase-sequence meter-Analog and Digital process to measure these parameters in D.C., Single phase A.C. and three phase A.C. Systems. Errors and corrections in measurement, Extension of range and calibration of measuring instruments. Working principles and circuits of common domestic equipment and appliances.
Unit 5.0	Working Principle, construction and classification of Transformer, Turn ratio, emf equation. Auto Transformer and Instrument Transformer (CT and PT), Methods of cooling, protection and testing of Transformer. Materials used for winding small Transformer.

Unit 6.0	Principle and working of D.C. generator, Various parts of D.C. generator, various types of D.C. generator, Applications, Losses and efficiency in D.C. generator. Construction, working principle and types of D.C. Motors, Losses and efficiency in D.C. Motors, Types of D.C. Motor starters, Methods of speed control in D.C. Motors. Construction and working principle of three phase Induction motor, Types of Induction motor, Types of Induction Motor starters. Domestic and industrial applications of different single phase A.C. Motors, Construction and working principle of Alternator. Working principle of synchronous motor, starting and application of synchronous motor.
Unit 7.0	Symbol, Construction and Working of P-N Junction Diode and Zener Diode, P-N Diode and Zener Diode Characteristics, Construction and Working of Half-Wave Rectifier, Construction and working of Full-wave Rectifier. Symbol, Types and Construction of Bipolar Junction Transistor, Working of NPN and PNP Transistor. Binary, Octal, Decimal and Hexadecimal number systems. AND, OR, NOT, NAND, NOR, XOR Logic Gates with symbol, Truth Table, Logic expression.
Unit 8.0	Voltage stabilizer, emergency light, battery charger, inverter and UPS. Conventional and Non-Conventional energy sources. Power generation by thermal and hydel power plants. Line Insulators, overhead poles and method of joining aluminium conductors. Substations.

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Prepare profile with an appropriate accuracy as per drawing following safety precautions.	Scope of the electrician trade.
	Safety rules and safety signs. Types and working of fire extinguishers.
	First aid safety practice. Hazard identification and prevention.
	Personal safety and factory safety.
	Response to emergencies e.g. power failure, system failure and fire etc.
Prepare electrical wire joints, carry out soldering, crimping and measure insulation resistance of underground cable.	Concept of Standards and advantages of BIS/ISI.
	Trade tools specifications.
	Introduction to National Electrical Code-2011.
	Allied trades: Introduction to fitting tools, safety precautions. Description of files, hammers, chisels hacksaw frames, blades, their specification and grades.
	Marking tools description and use.
	Types of drills, description & drilling machines.
	Various wooden joints.
	Marking tools; calipers Dividers, Surface plates, Angle plates, Scribers, punches, surface gauges Types, Uses, Care and maintenance.
	Sheet metal tools: Description of marking & cutting tools.
	Types of rivets and riveted joints. Use of thread gauge.
Verify characteristics of electrical and magnetic circuits.	Description of carpenter's tools Care and maintenance of tools.
	Fundamentals of electricity, definitions, units & effects of electric current. Conductors and insulators. Conducting materials and their comparison.
	Joints in electrical conductors.
	Techniques of soldering. Types of solders and flux.
	Underground cables: Description, types, various joints and testing procedure. Cable insulation & voltage grades
	Precautions in using various types of cables.
	Ohm's Law; Simple electrical circuits and problems.
	Kirchoff's Laws and applications.
	Series and parallel circuits. Open and short circuits in series and parallel networks.
	Laws of Resistance and various types of resistors.
	Wheatstone bridge; principle and its applications.
	Effect of variation of temperature on resistance.
	Different methods of measuring the values of resistance.
	Series and parallel combinations of resistors.
	Magnetic terms, magnetic materials and properties of magnet.
	Principles and laws of electro-magnetism.
Self and mutually induced EMFs.	
Electrostatics: Capacitor-	
Different types, functions, grouping and uses.	
	Inductive and capacitive reactance, their effect on AC circuit and related vector concepts.
	Comparison and Advantages of DC and AC systems.
	Related terms frequency, Instantaneous value, R.M.S. value Average value, Peak factor, form factor, power factor and Impedance etc.
	Sine wave, phase and phase difference.
	Active and Reactive power. Single Phase and three-phase system.
	Problems on A.C. circuits.
	Advantages of AC poly-phase system.
	Concept of three-phase Star and Delta connection.
Line and phase voltage, current and power in a 3 phase circuits with balanced and unbalanced load.	
Phase sequence meter.	

Install, test and maintenance of batteries and solar cell.	<p>Chemical effect of electric current and Laws of electrolysis. Explanation of Anodes and cathodes. Types of cells, advantages / disadvantages and their applications. Lead acid cell; Principle of operation and components. Types of battery charging. Safety precautions, test equipment and maintenance. Basic principles of Electroplating and cathodic protection Grouping of cells for specified voltage and current. Principle and operation of solar cell.</p>
Estimate, Assemble, install and test wiring system.	<p>I.E. rules on electrical wiring. Types of domestic and industrial wirings. Study of wiring accessories e.g. switches, fuses, relays, MCB, ELCB, MCCB etc. Grading of cables and current ratings. Principle of laying out of domestic wiring. Voltage drop concept.</p> <p>PVC conduit and Casing- capping wiring system. Different types of wiring - Power, control, Communication and Entertainment wiring.</p> <p>Wiring circuits planning, permissible load in sub- circuit and main circuit.</p> <p>Estimation of load, cable size, bill of material and cost. Inspection and testing of wiring installations. Special wiring circuit e.g. godown, tunnel and workshop etc.</p>
Plan and prepare Earthing installation.	<p>Importance of Earthing. Plate earthing and pipe earthing methods and IEE regulations. Earth resistance and earth leakage circuit breaker.</p>
Plan and execute electrical illumination system and test.	<p>Laws of Illuminations. Types of illumination system. Illumination factors, intensity of light. Type of lamps, advantages/ disadvantages and their applications. Calculations of lumens and efficiency.</p>
Select and perform measurements using analog / digital instruments	<p>Classification of electrical instruments and essential forces required in indicating instruments. PMMC and Moving iron instruments. Measurement of various electrical parameters using different analog and digital instruments. Measurement of energy in three phase circuit.</p>
Perform testing, verify errors and calibrate instruments.	<p>Errors and corrections in measurement. Loading effect of voltmeter and voltage drop effect of ammeter in circuits. Extension of range and calibration of measuring instruments.</p>
Plan and carry out installation, fault detection and repairing of domestic appliances.	<p>Working principles and circuits of common domestic equipment and appliances. Concept of Neutral and Earth.</p>
Execute testing, evaluate performance and aintenance of transformer.	<p>Working principle, construction and classification of transformer. Single phase and three phase transformers. Turn ratio and e.m.f. equation. Series and parallel operation of transformer. Voltage Regulation and efficiency. Auto Transformer and instrument transformers (CT & PT).</p>

	<p>Working principle of synchronous motor. Effect of change of excitation and load. V and anti V curve. Power factor improvement.</p>
	Rotary Converter, MG Set description and Maintenance.
Assemble simple electronic circuits and test for functioning.	<p>Resistors – colour code, types and characteristics. Active and passive components. Atomic structure and semiconductor theory.</p> <p>P-N junction, classification, specifications, biasing and characteristics of diodes. Rectifier circuit - half wave, full wave, bridge rectifiers and filters. Principle of operation, types, characteristics and various configuration of transistor. Application of transistor as a switch, voltage regulator and amplifier.</p> <p>Basic concept of power electronics devices. IC voltage regulators Digital Electronics - Binary numbers, logic gates and combinational circuits.</p> <p>Working principle and uses of oscilloscope. Construction and working of SCR, DIAC, TRIAC and IGBT. Principle, types and applications of various multivibrators.</p>
Assemble accessories and carry out wiring of control cabinets and equipment.	<p>Study and understand Layout drawing of control cabinet, power and control circuits. Various control elements: Isolators, pushbuttons, switches, indicators, MCB, fuses, relays, timers and limit switches etc.</p> <p>Wiring accessories: Race ways/cable channel, DIN rail, terminal connectors, thimbles, lugs, ferrules, cable binding strap, buttons, cable ties, sleeves, gromats and clips etc. Testing of various control elements and circuits.</p>
Perform speed control of AC and DC motors by using solid state devices.	<p>Working, parameters and applications of AC / DC drive. Speed control of 3 phase induction motor by using VVVF AC Drive.</p>
Detect the faults and troubleshoot inverter, stabilizer, battery charger, emergency light and UPS etc.	<p>Basic concept, block diagram and working of voltage stabilizer, battery charger, emergency light, inverter and UPS. Preventive and breakdown maintenance.</p>
Erect overhead domestic service line and outline various power plant layout.	<p>Conventional and non-conventional sources of energy and their comparison. Power generation by thermal and hydel power plants. (09hrs.)</p>
Plan, assemble and install solar panel.	<p>Various ways of electrical power generation by non-conventional methods. Power generation by solar and wind energy. Principle and operation of solar panel. (08 hrs.)</p>
Erect overhead domestic service line and outline various power plant layout.	<p>Transmission and distribution networks. Line insulators, overhead poles and method of joining aluminum conductors.</p> <p>Safety precautions and IE rules pertaining to domestic service connections. Various substations. Various terms like – maximum demand, average demand, load factor, diversity factor, plant utility factor etc.</p>
Examine the faults and carry out repairing of circuit breakers.	<p>Types of relays and its operation. Types of circuit breakers, their applications and functioning. Production of arc and quenching.</p>

	<p>Method of connecting three single phase transformers for three phase operation. Types of Cooling, protective devices, bushings and termination etc. Testing of transformer oil. Materials used for winding and winding wires in small transformer.</p>
<p>Plan, execute commissioning and evaluate performance of DC machines.</p>	<p>General concept of rotating electrical machines. Principle of DC generator. Use of Armature, Field Coil, Polarity, Yoke, Cooling Fan, Commutator, slip ring and Brushes, Laminated core etc. E.M.F. equation Separately excited and self-excited generators. Series, shunt and compound generators.</p>
<p>Execute testing, and maintenance of DC machines and motor starters.</p>	<p>Armature reaction, Commutation, inter poles and connection of inter poles. Parallel Operation of DC Generators. Load characteristics of DC generators. Application, losses & efficiency of DC Generators. Routine & maintenance.</p>
	<p>Principle and types of DC motor. Relation between applied voltage back e.m.f., armature voltage drop, speed and flux of DC motor. DC motor Starters, relation between torque, flux and armature current. Changing the direction of rotation. Characteristics, Losses & Efficiency of DC motors. Routine and maintenance.</p>
<p>Distinguish, organise and perform motor winding.</p>	<p>Methods of speed control of DC motors. Lap and wave winding and related terms.</p>
<p>Plan, Execute commissioning and evaluate performance of AC Motors. Execute testing, and maintenance of AC motors and starters.</p>	<p>Working principle of three phase induction motor. Squirrel Cage Induction motor, Slip-ring induction motor; construction, characteristics, Slip and Torque. Different types of starters for three phase induction motors, its necessity, basic contactor circuit, parts and their functions.</p>
	<p>Single phasing prevention. No load test and blocked rotor test of induction motor. Losses & efficiency. Various methods of speed control. Braking system of motor. Maintenance and repair.</p>
<p>Distinguish, organise and perform motor winding.</p>	<p>Concentric/ distributed, single/ double layer winding and related terms.</p>
<p>Plan, Execute commissioning and evaluate performance of AC motors. Execute testing, and maintenance of AC motors and starters.</p>	<p>Working principle, different method of starting and running of various single phase AC motors. Domestic and industrial applications of different single phase AC motors. Characteristics, losses and efficiency.</p>
<p>Distinguish, organise and perform motor winding.</p>	<p>Concentric/ distributed, single/ double layer winding and related terms. Troubleshooting of single phase AC induction motors and universal motor.</p>
<p>Plan, execute testing, evaluate performance and carry out maintenance of Alternator / MG set. Execute parallel operation of alternators.</p>	<p>Principle of alternator, e.m.f. equation, relation between poles, speed and frequency. Types and construction. Efficiency, characteristics, regulation, phase sequence and parallel operation. Effect of changing the field excitation and power factor correction.</p>

maintenance of AC motors and starters.	three phase induction motors, its necessity, basic contactor circuit, parts and their functions.
	Single phasing prevention. No load test and blocked rotor test of induction motor. Losses & efficiency. Various methods of speed control. Braking system of motor. Maintenance and repair.
Distinguish, organise and perform motor winding.	Concentric/ distributed, single/ double layer winding and related terms
Plan. Execute commissioning and evaluate performance of AC motors. Execute testing, and maintenance of AC motors and starters.	Working principle, different method of starting and running of various single phase AC motors. Domestic and industrial applications of different single phase AC motors. Characteristics, losses and efficiency.
Distinguish, organise and perform motor winding.	Concentric/ distributed, single/ double layer winding and related terms. Troubleshooting of single phase AC induction motors and universal motor.
Plan, execute testing, evaluate performance and carry out maintenance of Alternator / MG set. Execute parallel operation of alternators.	Principle of alternator, e.m.f. equation, relation between poles, speed and frequency. Types and construction. Efficiency, characteristics, regulation, phase sequence and parallel operation. Effect of changing the field excitation and power factor correction.
	Working principle of synchronous motor. Effect of change of excitation and load. V and anti V curve. Power factor improvement.
	Rotary Converter, MG Set description and Maintenance.
Assemble simple electronic circuits and test for functioning.	Resistors – colour code, types and characteristics. Active and passive components. Atomic structure and semiconductor theory.
	P-N junction, classification, specifications, biasing and characteristics of diodes. Rectifier circuit - half wave, full wave, bridge rectifiers and filters. Principle of operation, types, characteristics and various configuration of transistor. Application of transistor as a switch, voltage regulator and amplifier.
	Basic concept of power electronics devices. IC voltage regulators Digital Electronics - Binary numbers, logic gates and combinational circuits.
	Working principle and uses of oscilloscope. Construction and working of SCR, DIAC, TRIAC and IGBT. Principle, types and applications of various multivibrators.
Assemble accessories and carry out wiring of control cabinets and equipment.	Study and understand Layout drawing of control cabinet, power and control circuits. Various control elements: Isolators, pushbuttons, switches, indicators, MCB, fuses, relays, timers and limit switches etc.
	Wiring accessories: Race ways/ cable channel, DIN rail, terminal connectors, thimbles, lugs, ferrules, cable binding strap, buttons, cable ties, sleeves, gromats and clips etc. Testing of various control elements and circuits.

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Perform speed control of AC and DC motors by using solid state devices.	Working parameters and applications of AC / DC drive. Speed control of 3 phase induction motor by using VVVF/AC Drive.
Detect the faults and troubleshoot inverter, stabilizer, battery charger, emergency light and UPS etc.	Basic concept, block diagram and working of voltage stabilizer, battery charger, emergency light, inverter and UPS. Preventive and breakdown maintenance.
Erect overhead domestic service line and outline various power plant layout.	Conventional and non-conventional sources of energy and their comparison. Power generation by thermal and hydel power plants.
Plan, assemble and install solar panel.	Various ways of electrical power generation by non-conventional methods. Power generation by solar and wind energy. Principle and operation of solar panel.
Erect overhead domestic service line and outline various power plant layout.	Transmission and distribution networks. Line insulators, overhead poles and method of joining aluminum conductors. Safety precautions and IE rules pertaining to domestic service connections. Various substations. Various terms like – maximum demand, average demand, load factor, diversity factor, plant utility factor etc.
Examine the faults and carry out repairing of circuit breakers.	Types of relays and its operation. Types of circuit breakers, their applications and functioning. Production of arc and quenching.
2. Wireman- 30Marks	
Apply safety precautions and prepare profile with an appropriate accuracy as per drawing using basic jobs of marking components, filing, drilling, riveting, fitting, joining etc.	Occupational Safety & Health: Scope of the Wireman trade and career progression. Power sector scenario in India. Safety rules and safety signs for Danger, Warning, caution & personal safety messages. Basic injury prevention, Basic first aid, Hazard identification, avoidance and PPEs. Personal safety and factory safety. Effects of electric current on human being. Reasons for shock. Disposal procedure of waste materials. Response to emergencies e.g. power failure, fire, and system failure.
	Concept of Standards and advantages of BIS/ISI. Familiarization with signs and symbols of electrical accessories Introduction to 5S concept. Introduction to fitting tools, safety precautions. Description of files, hammers, chisels hacksaw frames, blades, their specification and grades. Marking tools description and use. Types of drills, description & drilling machines. Various wooden joints. Marking tools; calipers Dividers, Surface plates, angle plates, scribes, punches, surface gauges, Types, Uses, Care and maintenance. Sheet metal tools: Description of marking & cutting tools. Types of rivets and riveted joints. Use of thread gauge. Description of carpenter's tools Care and maintenance of tools.
Prepare terminations, make good quality of electrical wire joints for single and multi-strand conductors and carry out crimping, soldering and brazing.	Wire Joints: Trade tools specifications. Properties of conductors, Fundamental of electricity. Electron theory; free electron, fundamental terms, definitions, units & effects of electric current. Types of wires & cables, standard wire gauge.

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	<p>Current carrying capacity of different conductors. Specification of wires & Cables- insulation & voltage grades -Low, medium & high voltage Precautions in using various types of cables / Ferrules. Types of Wire joints & their application. Insulators, semi-conductors and resistors. Voltage grading of different types of Insulators, permissible temperature rise. Solders, flux and soldering techniques.</p>
<p>Draw and set up DC and AC circuits, involving R-L-C components, perform measurement of various electrical parameters with due care and safety. Carry out Sealing of energy meters and Monitor meter readings using MRI.</p>	<p>Basic Electricity: Introduction of National Electrical Code 2011. Ohm's Law, Kirchoff's Laws Series and parallel circuits. Open and short circuits in series and parallel networks. Laws of Resistance and various types of resistors. Series and parallel combinations of resistors. Wheatstone bridge; principle and its applications. Different methods of measuring the values of resistance. Magnetism; Magnetic terms, magnetic materials and properties of magnet. Principles and laws of electro-magnetism.</p>
	<p>Self and mutually induced EMFs. Electrostatics: Capacitor- Different types, functions, grouping and uses. Inductive and capacitive reactance, their effect on AC circuit and related vector concepts. Comparison and Advantages of DC and AC systems. Related terms frequency, Instantaneous value, R.M.S. value, Average value, Peak factor, form factor, power factor and Impedance etc. Sine wave, phase and phase difference. Active and Reactive power. Single Phase and three-phase system. Advantages of AC poly-phase system. Problems on A.C. circuits. Concept of three-phase Star and Delta connection. Line and phase voltage, current and power in a 3 phase circuits with balanced and unbalanced load. Measuring instruments; Classification of electrical instruments and essential forces required in indicating instruments. PMMC and Moving iron instruments. Measurement of various electrical parameters using different analog and digital instruments viz., multi-meter, Wattmeter, Energy meter, Phase sequence meter, Frequency meter, etc. Measurement of energy in three phase circuit. Important common applicable IE rules. Meter Reading; - Description of MRI - Reading of Meter by MRI</p>
<p>Explain basic concepts of generation, transmission and distribution of electrical power including renewable energy. (Mapped NOS: PSS/N7001)</p>	<p>Power system: Generation, transmission and distribution of electrical power General idea about overhead transmission, distribution (LV, MV & HV) and their types and accessories used. Types of Distribution system Line protecting devices Types of substations - indoor, outdoor & Pole mounted, etc. Substation Equipment Switchgear; CBs – ACB, VCB, SF6, OCB etc. protection schemes,</p>
	<p>current transformer, Potential transformer, Protective relays, lightning arrestors, Different types of switches and switch gears, multi Range switches, rotary switches, cooker control panels, power circuit switches, thermostat, mercury switches etc. (10 hrs)</p>

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<p>Plan and prepare Plate and Pipe earthing installations and ensure safe and effective earthing.</p>	<p>Earthing: Importance of Earthing. I. E. Rules for earthing conduits using earth clips and earth wire as per IS 732-1863. Plate earthing, pipe earthing grid/mesh earthing. Earth resistance, earth leakage current and circuit breaker. Difference between grounding and earthing. Awareness of circuit main earth (CME) and portable earth.</p>
<p>Carry out wiring, testing, and maintenance of DC machines including DC motor starters.</p>	<p>DC Machines; General concept of rotating electrical machines. Principle of DC generator. Use of Armature, Field Coil, Polarity, Yoke, Cooling Fan, Commutator, slip ring and Brushes, Laminated core etc. E.M.F. equation Separately excited and self- excited generators. Series, shunt and compound generators. Armature reaction, Commutation, interpoles and connection of interpoles. Parallel Operation of DC Generators. Application, losses & efficiency of DC Generators. Principle and types of DC motors. Changing the direction of rotation. Methods of speed control of DC motors.</p>
<p>Carry out wiring, testing, and maintenance of small transformers, 1ϕ& 3ϕ AC motors and Alternators including AC motor starters.</p>	<p>Transformers, AC motors, starters and Alternators: Working principle, construction and classification of transformers. Single phase and three phase transformers. Testing of transformers. General concept of rotating electrical machines. Principle of operation of AC motors and generators, components and various types. Motor Starters: Different types of starters for AC motors, its necessity, basic contactor circuit, parts and their functions. Basic knowledge of soft starter.</p>
<p>Read, understand and draw electrical Schematic drawings of power and control circuits using industry standard symbols.</p>	<p>Different control elements and equipment, their symbols. Power and control schematic drawings with interlocks. Relay ladder logic. Relay and control panel wiring. Circuits of various electrical appliances and controls. Power Distribution network drawings.</p>
<p>Plan, draw, assemble and perform various domestic wiring. Carry out Testing, maintenance and repair/ replacement of domestic wiring.</p>	<p>Domestic Wiring: Introduction and explanation of electrical wiring systems, cleat wiring, Casing-capping, CTS, Conduit and concealed etc. IE Rules related to wiring, National Building codes for house wiring, specification and types, rating & material. Minimum load capacities (W/m²) of various buildings. Electrical load categories. Terms; Maximum demand, Load factor and Diversity factor, etc.</p> <hr/> <p>Various wiring accessories/ electrical fittings e.g. switches, fuses, lamp holders, plugs, brackets, ceiling rose, cut out relays, sensors, voltage regulators, MCB, ELCB, MCCB etc. Grading of cables and current ratings.</p> <hr/> <p>Principle of laying out of domestic wiring. Selection of switchgear. Voltage drop concept.</p> <hr/> <p>Wiring materials used for PVC cables, Indian standards regarding the above wiring such as clip distance fixing of screws, cable bending etc. Introduction to estimation procedure, PVC casing and capping materials, sizes and grades etc.</p> <hr/> <p>Conduit pipe wiring materials and accessories. types and sizes of conduit.</p>

	<p>Branching of circuits with respect to loads such as lighting and power. Layout of Light points, fan points, heating loads etc., their controls, main switches, distribution boards as per IE rules. Difference between MCCB, MCB, ELCB, RCCB, MPCB. Different types of wiring; PVC conduit; Surface and concealed (PVC Conduit;/ metal conduit) Casing-capping wiring system. Power, control, Communication and entertainment wiring. Wiring circuits planning, permissible load in sub-circuit and main circuit.</p>
<p>Carry out wiring of control panels, assemble accessories and equipment.</p>	<p>Control Panel Wiring; Control panel components; DIN rails, trunking, connector blocks, screw terminals, relays, contactors, protective units, fuses, fuse holders; chassis mounted, fuse-links, resistors; fixed, variable, capacitors, switches, lamps, labelling grommets and clips etc. Cable forming; template, wiring schedule, run out sheet, binding, continuous lacing, loop tie, lock stitch, finish knot, breakouts, lacing breakouts, spot ties, laying of wires, twisted pair, Cable markers and colour codes etc. Connections and routing of cables. Consideration of EMI/EMC Conductors of different circuits. Symbols and use of relay contacts: NO, NC, changeover, make/break after delay. Testing of various control elements and circuits.</p>
<p>Install, test and carry out maintenance of batteries and solar cell with due care and safety.</p>	<p>Battery and solar cell: Chemical effects of electric current and Laws of electrolysis. Explanation of Anodes and cathodes. Types of cells, advantages/ disadvantages and their applications. Lead acid cell; Principle of operation and components. Types of battery charging, Safety precautions, test equipment and maintenance. Grouping of cells for specified voltage and current. Principle and operation of solar cell, Types of solar cell.</p>
<p>Plan, draw, install and test different types of Commercial wiring including advanced systems. Install temporary electrical wiring at construction site.</p>	<p>Commercial Wiring: Wiring in commercial building- their special precautions as per I.E. rules. Different types of wiring - Power, control, Communication and entertainment wiring. Wiring circuits planning, Cabling in healthcare facilities; importance of grounding, shielding and routing in accordance with life safety codes to minimize interference with medical equipment. GFCI (Ground-fault circuit interrupter) receptacles.</p>
<p>Plan, draw, estimate material/ cost, install and test different types of industrial wiring system as per IE rules. Lay out cables for various purposes including cable management.</p>	<p>Industrial Wiring: Adverse conditions likely to affect the installation. Degree of mechanical and electrical protection necessary. Peak-Non-peak Loads in Office Buildings Lighting Design; lighting power density, Estimation of load, cable size, bill of material and cost. Inspection and testing of wiring installations. Special wiring circuit e.g. hospital, godown, tunnel and workshop. etc. Danger notice as per IE rules</p>
	<p>Cable Management: Types of cables, their use, Various cable glands Introduction to IP ratings (Ingress protection) and IP Codes format. Importance of Bonding and grounding, various types. Testing of cables, locating faults, open circuit, short circuit and leakage in cables.</p>
<p>Plan, install and test illumination system including domestic, commercial and industrial requirements. Connect, program and operate PAR light on DMX controller (Stage light control).</p>	<p>Illumination & Stage Light Control: Laws of Illuminations. Types of illumination system. Illumination factors, intensity of light. Type of lamps, advantages/ disadvantages and their applications. Calculations of lumens and efficiency. Spotlights, downlights, Strip lights Various reflectors; PAR (Parabolic aluminized reflector), MR (Multi-faceted reflector) LED video wall panel applications.</p>

<p>Assemble simple electronic circuits, repair CFL, LED lamps and DC regulated power supply.</p>	<p>CFL/LED Lamps & DC regulated power supply; Resistors; colour code, types and characteristics. Diode; P-N junction, classification, specifications, biasing and characteristics. Rectifier circuit; half wave, full wave, bridge rectifiers and filters. Active and passive components. Functioning of components used in CFL and LED circuits. CFL and LED lamp's circuit. Safety and disposal procedure</p>
<p>Assist in Installation and commissioning of small solar plant, solar pumps and construct</p>	<p>Solar Power Plant: Solar energy fundamentals. Study of Sun path (east to west, North to south and south to north movement).</p>
<p>Solar DC appliances.</p>	<p>Study of daily and seasonal changes of sunlight. Angle of inclination of radiant light and its relation with latitude and longitude of different locations on Earth. Solar DC domestic application: Making of solar lantern. Solar Day lighting. Solar Garden Lights. Safety in DC system. Quality standards List out the inventory list of equipments. Solar DC industrial application: Solar street light. Solar home lighting system. Solar Security system. Solar DC water pump. Differentiate AC and DC solar pumps and their PV requirements for various HP capacities. Solar PV e-learning software.</p>
<p>Plan, prepare and carry out jointing of LT/HT underground cables with due care and safety. (Mapped NOS: PSS/N2512)</p>	<p>Underground cable joints: Need of cables, advantages and disadvantages, various types viz., PVC, XLPE, PILC, oil filled, etc. Cable insulation & voltage grades. Joints and terminations; pre- moulded, heat shrinkable, extrusion molded joints Slip on, cold shrink terminations. Types of connectors used in the cable, current path. Methods of conductor connection, contact resistance. Galvanic corrosion and use of bimetals. Connectivity for cable screen and armour, mechanical protection Kits for joints and terminations. Cable termination to equipment Standards and testing: type, routine, field test, Stress control</p>
<p>Install Electric Vehicle charging stations and carry out preventive/breakdown maintenance.</p>	<p>EV scenario in India and EV Charging basic theory. EV Charging safety requirements.</p>
<p>Install and repair domestic appliances viz., electric kettle, food processor, fan, washing machine, geyser, water pump etc. including repair of electrical faults in refrigerator, window and split AC. (Mapped NOS: PSS/N6003, PSS/N6004, PSS/N6005)</p>	<p>Domestic appliances: Working principles and circuits of common domestic electrical appliances; Bell, buzzer, electric iron, kettle, cooking range, geyser, induction heater, mixer, grinder, juicer, food processor, fan, pump set, washing machine, refrigerator and air conditioner etc. Concept of Neutral and Earth.</p>
<p>Perform winding of small transformers and motors viz., ceiling fan, table fan, mixer/grinder, submersible pump, etc.</p>	<p>Winding: Concentric/ distributed, single/ double layer winding and related terms. Troubleshooting of single-phase AC induction motors and universal motor.</p>
<p>Carry out Estimation & costing for different wiring systems and ready to adopt structured / smart wiring concept for automation and IoT applications.</p>	<p>Concept and Principles of estimation and costing. Different wiring layouts and Bill of material; domestic, commercial, and industrial wiring. Smart wiring concept Procedure for taking wireman permit and competency certificate.</p>
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