

## 10. SYLLABUS CONTENT WITH TIME STRUCTURE

### 10.1 SYLLABUS CONTENT FOR PROFESSIONAL SKILL & KNOWLEDGE

**First Semester**  
**(Semester Code no. ELE - 01)**

**Duration: Six Month**

#### **LEARNING OBJECTIVES OF 1<sup>ST</sup> SEMESTER**

1. Apply safe working practices.
2. Comply environment regulation and housekeeping
3. Interpret & use Company terminology and technical communication
4. To make simple wiring circuit with common electrical accessories with domestic electrical appliances for a specified voltage and current.
5. To carry out the necessary test for charging secondary battery individually, installation and grouping of batteries, care and maintenance of batteries.
6. To make a job profile according to the drawing.
7. Able to carry out earthing installation.

Week No.	Professional Skills	Professional Knowledge
	Trade Practical	Trade Theory
1	<p>Implementation in the shop floor of the various safety measures. Visit to the different sections of the Institute Demonstration on elementary first aid. Artificial Respiration. Practice on use of fire extinguishers.</p> <p><b>Occupational Safety &amp; Health Importance of housekeeping &amp; good shop floor practices.</b></p> <p>Health, Safety and Environment guidelines, legislations &amp; regulations as applicable. Disposal procedure of waste materials like cotton waste, metal chips/burrs etc. Basic safety introduction, Personal protective</p>	<p><b>Occupational Safety &amp; Health</b></p> <p>Basic safety introduction, Personal protection:- Basic injury prevention, Basic first aid, Hazard identification and avoidance, safety signs for Danger, Warning, caution &amp; personal safety message.</p> <p>Use of Fire extinguishers. Visit &amp; observation of sections. Various safety measures involved in the Industry. Elementary first Aid. Concept of Standard <b>Soft Skills:</b> its importance and Job area after completion of training. Introduction of First aid. Operation of electrical mains. Introduction of PPEs. Introduction to 5S concept &amp; its application. Response to emergencies eg; power failure, fire, and system failure.</p>

	<p>Equipment(PPE):-  Basic injury prevention, Basic first aid, Hazard identification and avoidance, safety signs for Danger, Warning, caution &amp; personal safety message.  Preventive measures for electrical accidents &amp; steps to be taken in such accidents.  Use of Fire extinguishers.</p>	
2	<p>Demonstration of Trade hand tools. Identification of simple types- screws, nuts &amp; bolts, chassis, clamps, rivets etc. Use, care &amp; maintenance of various hand tools. Familiarization with signs and symbols of Electrical accessories</p>	<p>Identification of Trade-Hand tools-Specifications</p>
3 - 4	<p>Practice in using cutting pliers, screw drivers etc. skinning the cables, and joint practice on single strand.  Demonstration &amp; Practice on bare conductors joints--such as rat tail, Britannia, straight, Tee, Western union. Joints</p>	<p>Fundamental of electricity. Electron theory- free electron, Fundamental terms, definitions, units &amp; effects of electric current</p>
5	<p>Practice in soldering &amp; brazing- Measurement of Resistant and Measurement of specific Resistant. Application of Wheatstone bridge in measurement of Resistance</p>	<p>Solders, flux and soldering technique. Resistors types of resistors &amp; properties of resistors.</p>
6	<p>Demonstration and identification of types of cables. Demonstration &amp; practice on using standard wire gauge &amp; micrometer. Practice on crimping thimbles, Lugs.  Examination and checking of cables and conductors and verification of materials according to the span.</p>	<p>Introduction of National Electrical Code 2011  Explanation, Definition and properties of conductors, insulators and semi-conductors. Voltage grading of different types of Insulators, Temp. Rise permissible  Types of wires &amp; cables standard wire gauge  Specification of wires &amp; Cables-insulation &amp; voltage grades  -Low , medium &amp; high voltage  Precautions in using various types of cables / Ferrules</p>

7	<p>Verification of Ohm's Law, Verification of Kirchoff's Laws.</p> <p>Verification of laws of series and parallel circuits.</p> <p>Verification of open circuit and closed circuit network.</p> <p><b>Measuring unknown resistance using Wheatstone bridge, voltage drop method.</b></p> <p>Experiment to demonstrate the variation of resistance of A metal with the change in temperature.</p>	<p>Ohm's Law - Simple electrical circuits and problems. Reading of simple Electrical Layout. <b>Resistors</b> -Law of Resistance. Series and parallel circuits.</p> <p><b>Kirchoff's</b> Laws and applications. Wheatstone bridge principle And its applications. Effect of variation of temperature on resistance. Different methods of measuring the values of resistance</p>
8.	<p>Practice on installation and overhauling common electrical accessories as per simple Electrical circuit / Layout.</p> <p>Fixing of switches, holder plugs etc. in T.W. boards.</p> <p>-Identification and use of wiring accessories concept of switching.</p>	<p>Common Electrical Accessories, their specifications in line with NEC 2011-Explanation of switches lamp holders, plugs and sockets. Developments of domestic circuits, Alarm &amp; switches, with individual switches, Two way switch .Security surveillance, Fire alarm, MCB, ELCB, MCCB.</p>
9	<p>Assembly of a Dry cell- Electrodes-Electrolytes.</p> <p>Grouping of Dry cells for a specified voltage and current, Ni cadmium &amp; Lithium cell.</p> <p>Practice on Battery Charging, Preparation of battery charging,</p> <p>Testing of cells, Installation of batteries, Charging of batteries by different methods.</p> <p>Practice on Electroplating and anodising, Cathodic protection.</p>	<p><b>Chemical</b> effect of electric current-Principle of electrolysis. Faraday's Law of electrolysis. Basic principles of Electro-plating and Electro chemical equivalents. Explanation of Anodes and cathodes.</p> <p>Lead acid cell-description, methods of charging-Precautions to be taken &amp; testing equipment, Ni-cadmium &amp; Lithium cell, Cathodic protection.</p> <p>Electroplating, Anodising.</p> <p>Different types of lead acid cells.</p>
10	<p>Routine care &amp; maintenance of Batteries</p>	<p>Rechargeable dry cell, description advantages and disadvantages.</p> <p>Care and maintenance of cells</p> <p>Grouping of cells of specified voltage &amp; current, Sealed Maintenance free Batteries, Solar battery.</p>

11	Charging of a Lead acid cell, filling of electrolytes- Testing of charging checking of discharged and fully charged battery	Inverter, Battery Charger, UPS-Principle of working. Lead Acid cell, general defects & remedies. Nickel Alkali Cell-description charging. Power & capacity of cells. Efficiency of cells.
12-13	Marking use of chisels and hacksaw on flats, sheet metal filing practice, filing true to line. Sawing and planning practice. Practice in using firmer chisel and preparing simple half lap joint.	<b>ALLIED TRADES:</b> Introduction of fitting trade. Safety precautions to be observed Description of files, hammers, chisels hacksaw frames & blades-their specification & grades. Care & maintenance of steel rule try square and files. Marking tools description & use. Description of carpenter's common hand tools such as saws planes, chisels mallet claw hammer, marking, dividing & holding tools-their care and maintenance.
14	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.	Types of drills description & drilling machines, proper use, care and maintenance. Description of taps & dies, types in rivets & riveted joints. Use of thread gauge.
15	Practice in using snips, marking & cutting of straight & curved pieces in sheet metals. Bending the edges of sheets metals. Riveting practice in sheet metal. Practice in making different joints in sheet metal in soldering the joints.	Description of marking & cutting tools such as snubs shears punches & other tools like hammers, mallets etc. used by sheet metal workers. Types of soldering irons-their proper uses. Use of different bench tools used by sheet metal worker. Soldering materials, fluxes and process.
16-17	Trace the magnetic field. Assembly / winding of a simple electro magnet. Use of magnetic compass. Identification of different types of Capacitors. Charging and discharging of capacitor, Testing of Capacitors using DC voltage and lamp.	<b>Magnetism -</b> Classification of magnets, methods of magnetising, magnetic materials. Properties, care and maintenance. Para and Diamagnetism and Ferro magnetic materials. Principle of electro-magnetism, Maxwell's corkscrew rule, Fleming's left and right hand rules, Magnetic field of current carrying conductors, loop and solenoid. MMF, Flux density, reluctance. B.H. curve, Hysteresis, Eddy current. Principle of electro-magnetic Induction, Faraday's Law, Lenz's Law. Electrostatics: Capacitor- Different types, functions and uses.

18-19	Determine the characteristics of RL, RC and RLC in A.C. Circuits both in series and parallel. Experiment on poly phase circuits. Current, voltage, power and power factor measurement in single & poly- phase circuits. Measurement of energy in single and poly-phase circuits. - Use of phase sequence meter.	<b>Alternating Current</b> -Comparison and Advantages D.C and A.C. Related terms frequency Instantaneous value, R.M.S. value Average value, Peak factor, form factor. Generation of sine wave, phase and phase difference. Inductive and Capacitive reactance Impedance (Z), power factor (p.f). Active and Reactive power, Simple problems on A.C. circuits, single Phase and three-phase system etc. Problems on A.C. circuits. Power consumption in series and parallel, P.F. etc. Concept three-phase Star and Delta connection. Line and phase voltage, current and power in a 3 phase circuits with balanced and unbalanced load.
20	<b>Practice on Earthing</b> - different methods of earthing. Measurement of Earth resistance by earth tester. Testing of Earth Leakage by ELCB and relay.	<b>Earthing</b> - Principle of different methods of earthing. i.e. Pipe, Plate, etc Importance of Earthing. Improving of earth resistance Earth Leakage circuit breaker (ELCB). In absence of latest revision in respective BIS provision for Earthing it is recommended to follow IEC guidelines.
21	Determine the resistance by Colour coding Identification of active/passive components. <b>Diodes</b> -symbol - Tests - Construct & Test Half wave rectifier ckt. Full wave rectifier ckt. Bridge rectifier ckt.	<b>Basic electronics</b> - Semiconductor energy level, atomic structure 'P' type and 'N' type. Type of materials -P-N-junction. Classification of Diodes - Reverse and Forward Bias, Heat sink. Specification of Diode PIV rating. Explanation and importance of D.C. rectifier circuit. Half wave, Full wave and Bridge circuit. Filter circuits-passive filter.
22-23	(i) <b>Project work</b> (ii) <b>Industrial visit (optional)</b>	
24-25	<b>Examination</b>	
26	Semester Gap	

**Second Semester**  
**(Semester Code no. ELE - 02)**  
**Duration: Six Month**

**LEARNING OBJECTIVES OF 2<sup>nd</sup> SEMESTER**

1. Apply safe working practices.
2. Comply environment regulation and housekeeping
3. Interpret & use Company terminology and technical communication
4. Identify and trace the simple electronic circuits, test and troubleshoot.
5. To carry out wiring as per IE rule.
6. Identify DC machines and measure the resistance.
7. To build up voltage in a DC generator
8. Able to connect, test and run a DC motor.
9. To install and connect transformers, parallel connection, carryout necessary maintenance, able to connect and use CT and PT.
10. Able to install different measuring instruments with electrical circuits.

Week No.	Professional Skills	Professional Knowledge
	Trade Practical	Trade Theory
1-2	Different wave shapes of rectifiers and their values using C.R.O. Identification of terminals, construction & Testing of transistor. Assembly and testing of a single stage Amplifier and checking using an oscilloscope.	Working principle and uses of an oscilloscope. Explanation of principle of working of a transistor & configuration. Types of transistors & its application. Specification and rating of transistors. Explanation of transistor Amplifiers, Amplifiers. – class A,B and C Power amplifier
3-4	Measure Voltage, current & wave shape of oscillator using CRO. Simple circuits containing U.J.T. for triggering, FET as an amplifier and Power control circuits by S.C.R. and Diac, triac, I.G.B.T. Logic gates and circuits.	Explanation of oscillator-working principle Explanation of stages and types. Multivibrator – applications. Introduction of basic concept of ICs, U.J.T., F.E.T. Basic concept of power electronics devices e.g. S.C.R., Diac, Triac, power MOSFET, G.T.O and I.G.B.T. <b>Digital Electronics</b> -Binary numbers, logic gates and combinational circuits,
5-6	Practice in casing, Capping. Conduit wiring with minimum to more number of points. Use of two way switches.	<b>Electric wirings</b> , I.E. rules. Types of wirings both domestic and industrial. Specifications for wiring. Grading of cables and current ratings. Principle of

	<p>Testing of wiring installation by meggar.</p> <p>-Fixing of calling bells/buzzers.</p> <p>-Making of test boards &amp; extension boards</p> <p>Identification &amp; demonstration on conduits and accessories &amp; their uses, cutting , threading &amp; laying</p> <p>Installation, Testing, Maintenance and Repairing of wiring.</p>	<p>laying out in domestic wiring.</p> <p>Voltage drop concept.</p> <p><b>Wiring system</b> - P.V.C., concealed system.</p> <p>Maintenance and Repairing data sheet preparation.</p> <p>Specifications, standards for conduits and accessories</p> <p>- Power Wiring</p> <p>- Control Wiring</p> <p>- Information Communication</p> <p>- Entertainment Wiring.</p> <p>Testing of wiring installation by meggar.</p>
7	Application of fuses, relay, MCB, ELCB.	Study of Fuses, Relays, Miniature circuit breakers (MCB), ELCB, etc.
8-9	<p>Identification of the parts of a D.C. machine.</p> <p>Connection of shunt Generators</p> <p>Voltages build up in DC Shunt Generator (OCC) Measurement of voltages, Demonstration on field excitation.</p>	<p><b>D.C. Machines</b> - General concept of Electrical Machines.</p> <p><b>Principle of D.C. generator.</b> Use of Armature, Field Coil, Polarity, Yoke, Cooling Fan, Commutator, slip ring Brushes, Laminated core.</p> <p>Explanation of <b>D.C. Generators</b>-types, parts. <b>E.M.F.</b> equation-self excitation and separately excited Generators-Practical uses. Brief description of series, shunt and compound generators.</p>
10-11	<p>Connection of compound Generator, Voltage measurement, cumulative and differential –No Load and Load characteristics of Series, Shunt and Compound Generator.</p> <p>Controlling and protecting DC Generator.</p> <p>Practicing dismantling and assembling in D.C. Machine.</p>	<p>Explanation of Armature reaction, inter poles and their uses, connection of inter poles, Commutation. Losses &amp; Efficiency of D.C.Generator, Parallel Operation of D.C.Generator.</p> <p>Application of D.C. generators.</p> <p>Care, Routine &amp; preventive maintenance.</p>
12-13	<p>Identification of parts and terminals of DC motors.</p> <p>Connection, starting, running of DC motors using Starters.</p> <p>Characteristics curve of DC motors.</p> <p>Practical application of D.C. motors.</p>	<p><b>DC Motors</b> - Terms used in D.C. motor-Torque, Brake Torque, speed, Back-e.m.f. etc. and their relations, Types of D.C.Motor.</p> <p>Starters used in D.C. motors</p> <p>Related problems</p> <p>Characteristics of D.C.Motor, Losses &amp; Efficiency, Application of D.C. motors.</p> <p>Care, Routine &amp; preventive maintenance.</p>
14	Speed control of	Types of speed control of DC motors in industry.

	DC motors by voltage , field, armature & Word-Leonard system.	Control system. AC-DC, DC-DC control.
15-18	<p>Identification of types of transformers. Connection of transformers, Transformation ratio, OC (No-load) and SC (short circuit) tests, efficiencies of transformers, testing of transformer, parallel operation of transformer. Use of Current Transformer (C.T.) and Potential (Voltage) transformer (P.T.)</p> <p>Testing of single phase and Three Phase Transformers - Cleaning, maintenance, testing and changing of oil.</p> <p>Single and three phase connection.</p>	<p>Working principle of <b>Transformer</b>. classification C.T., P.T. Instrument and Auto Transformer(Variac), Construction, Single phase and Poly phase.</p> <p>E.M.F. equation, parallel operation of transformer, their connections.</p> <p>Regulation and efficiency.</p> <p>Type of Cooling for transformer.</p> <p>Protective devices.</p> <p>Specifications, simple problems on e.m.f. Equation, turn ratio, regulations and efficiency. Special transformers.</p> <p>Transformer –Classification of transformer. Components, Auxiliary parts i.e. breather, Conservator, buchholze relay, other protective devices. Transformer oil testing and Tap changer (off load and on load). Dry type transformer. Bushings and termination.</p>
19-21	<p>Identify the type of Instruments.</p> <p>Use of -PMMC , MI meter, Multi-meter(Digital/Analog) , Wattmeter, P F meter, Energy meter, Frequency meter, Calibration of - Multi-meter</p> <p>Phase sequence meter, Digital Instruments, etc</p> <p>Calibration of Energy meter.</p>	<p><b>Electrical Measuring Instruments -</b></p> <ul style="list-style-type: none"> <li>-types, indicating types. Deflecting torque, Controlling torque and Damping torque ,</li> <li>PMMC &amp; MI meter (Ammeter, Voltmeter)</li> <li>-Range extension</li> <li>-Multimeter(Digital/Analog)</li> <li>-Wattmeter</li> <li>- P.F. meter</li> <li>- Energy meter (Digital/analog)</li> <li>-Insulation Tester (Megger), Earth tester.</li> <li>-Frequency meter</li> <li>-Phase Sequence meter</li> <li>-Multimeter –Analog and Digital</li> <li>-Tong tester</li> <li>-Techometer.</li> </ul>
22-23	Implant training / Project work (work in a team)	
24-25	Revision	
26	Examination	

**Third Semester**  
**(Semester Code no. ELE - 03)**  
**Duration: Six Month**

**LEARNING OBJECTIVES OF 3<sup>rd</sup> SEMESTER**

1. Apply safe working practices.
2. Comply environment regulation and housekeeping
3. Interpret & use Company terminology and technical communication
4. Able to install different induction motors along with starters.
5. Able to carry out wiring, rewinding of single phase and three phase motors.
6. Able to install, start, running and maintenance of MG set.
7. To install different illumination system.

Week No.	Professional Skills	Professional Knowledge
	Trade Practical	Trade Theory
1-3	<p>Identification of parts and terminals of AC motors.            Connection, starting, running of AC motors using Starters.            Measurement of slip, P.F. at various loads.            Practice on connection of D.O.L Starter, Star /Delta starter, Autotransformer starter, Rotor resistance starter, etc            Speed control of Induction motors by various methods.            Practical application of A.C. motors.</p>	<p><b>Three phase Induction motor</b> –            Working principle –Production of rotating magnetic field, Squirrel Cage Induction motor, Slip-ring induction motor.            Construction , characteristics and Speed control, Slip &amp; Torque .            Control &amp; Power circuit of starters            D.O.L Starter, Star /Delta starter, Autotransformer starter, Rotor resistance starter, etc            Single phasing preventer.            Losses &amp; efficiency.            Application of Induction Motor            Care, Routine &amp; preventive maintenance.</p>
4-5	<p>Connection of single phase motor, identification, testing, running and reversing.</p> <p>Identification, connection, testing, running and reversing of universal motor. Repulsion motor, stepper motor.</p>	<p><b>Single phase induction motor-</b>            Working principle, different method of starting and running (capacitor start, permanent capacitor, capacitor start &amp; run, shaded pole technique).            FHP motors, Repulsion motor, stepper motor, Hysteresis motor, Reluctance motor.            Application of Single phase induction motor  <b>Universal motor</b>-advantages, Principle, characteristics, applications in domestic and industrial appliances,            Fault Location and Rectification.            Braking system of motor.</p>

		Application of Universal motor.
6-7	<p>Identification of parts and terminals of Alternator.            Connection, starting, running of Alternator.            Practical application of Alternator.            Practice on alternators, voltage Building, load characteristic, voltage regulation, Parallel operation.            Practice on installation, running and maintenance of Alternators.</p>	<p><b>Alternator</b>            Explanation of alternator, types of prime mover, efficiency, regulations, phase sequence, Parallel operation.            Specification of alternators and Brushless alternator.            Verify the effect of changing the field excitation and Power factor correction of Industrial load.</p>
8	<p>Identification of parts and terminals of Synchronous motor.            Connection, starting, running of Synchronous motor.            Plot V curve.            Practical application of Synchronous motor.</p>	<p><b>SYNCHRONOUS MOTOR -</b>            Working principle, effect of change of excitation and load.            V and anti V curve.              Cause of low power factor.            Method of power factor improvement.</p>
9	<p>Starting, running, building up voltage and loading of Motor Generator (MG) set.            Maintenance of MG Sets.            Solid state controller and Invertors- Operation and Use</p>	<p>Rotary Converter- Inverter, M.G. Set description, Characteristics, specifications-running and Maintenance.            Solid state controller and Invertors.</p>
10	<p>Practice on winding of small Transformers.</p>	<p><b>TRANSFORMER Winding</b> , Small Transformer winding techniques</p>
11-12	<p>Testing of burnt DC machine for rewinding – collection of data – developed diagram and connection – winding procedure            Making frame(forma), coil insulation, Slot insulation, Insertion of coils in slots, coil connection,            Practice on armature winding, Growler testing, Baking, Impregnation and Varnishing &amp; assembling.</p>	<p><b>DC machine Winding--</b> Armature winding terms, pole pitch, coil pitch, back pitch, front pitch , Lap and Wave winding , Progressive and retrogressive Winding, developed diagram.            Growler construction, working &amp; application.</p>
13-15	<p>Testing of burnt motor for rewinding – collection of data – developed diagram and connection – winding procedure</p>	<p><b>ACmachine Winding—</b>Motor winding terminology – classification of conducting and insulating materials used in winding – Types and methods of winding in single and three phase motors.</p>

	<p>Making frame(forma), coil insulation, Slot insulation, Insertion of coils in slots, coil connection, Practice on single &amp; double layer, concentric Winding, Winding of table &amp; ceiling fans, single phase and three phase motors – testing of wound motor Baking, impregnating and varnishing &amp; assembling.</p>	<p>Stator winding terms, coil side, end coil and grouping of coils. Connection to adjacent poles, connected stator winding, alternate pole connection, developed diagram.</p>
16-17	<p>Installation of - Mercury &amp; Sodium vapours (H.P. &amp; L.P.) Halogen Lamps Single FL tube and twin FL tube. Practice on decoration lighting Principle of layout of lighting installation. Practice on photo cells.</p>	<p><b>Illumination</b>, Laws of Illuminations, terminology used , Illumination factors, intensity of light – importance of light, human eye factor, , units. Types of illumination Type of lamps -Neon sign Halogen, Mercury vapour, sodium vapour, Fluorescent tube, CFL, LED, Solar lamp &amp; photo cell applications, Decoration lighting, Drum Switches, efficiency in lumens per watt, Calculations of lumens. Estimating placement of lights, fans and ratings.</p>
18-19	<p>Practice on wiring of electric motor, control panel, etc. Trace/Test of different circuit Breakers. Protective and control relays, contactors, etc. Operation and use of XLPE cables.</p>	<p><b>Industrial wiring</b>. Code of practice and relevant span. Wiring of electric motors, control panel, etc. Types, specifications, advantages of different types of circuit brackets construction and maintenance. Working principle and construction of domestic and agricultural appliances-their maintenance.</p>
20-21	<p>Practice of wiring Maintenance of institute, hostel, hotel, residential building. Layout and repairing of workshop electrical installation. Fault finding practice</p>	<p>Complete House-wiring layout. Splitting load wire in accordance with NEC I.E.E. Rules. Multi-storeyed system. Fault finding and trouble shooting.</p>
22-23	<p>Implant training/Project work/work in a team</p>	
24-25	<p>Revision</p>	
26	<p>Examination</p>	

**Fourth Semester**  
**(Semester Code no. ELE - 04)**  
**Duration: Six Month**

**LEARNING OBJECTIVES OF 4<sup>th</sup> SEMESTER**

1. Apply safe working practices.
2. Comply environment regulation and housekeeping
3. Interpret & use Company terminology and technical communication
4. Able to assemble and wire switch control cabinet for 3 phase induction motors.
5. Able to repair and maintenance of various domestic electrical appliances.
6. Able to prepare different types of power line diagram.

Week No.	Professional Skills	Professional Knowledge
	Trade Practical	Trade Theory
1-3	<p><b>Machine control cabinet /Control Panel Layout, Assembly &amp; Wiring:</b></p> <p>Practice Layout drawing of control cabinet , panel, power &amp; control circuits</p> <p>Preparing control cabinet / panel wiring for</p> <ol style="list-style-type: none"> <li>1. Local &amp; Remote control of Induction motor</li> <li>2. Forward &amp; Reverse operation of Induction motor</li> <li>3. Automatic Star Delta Starter</li> <li>4. Automatic star delta starter with change of direction of rotation</li> <li>5. Sequential control of three motors.</li> </ol> <p><b>Preparation of Control cabinet &amp; panel:</b> Necessary marking, cutting, filing, drilling, tapping etc.</p> <p><b>Mounting of control elements</b></p>	<p><b>Machine control cabinet /Control Panel Layout, Assembly &amp; Wiring:</b></p> <p>Layout of Control cabinet &amp; control panel</p> <p>Study &amp; Understand Layout drawing of control cabinet , panel, power &amp; control circuits.</p> <p><b>Control Elements:</b> Isolator, pushbutton switches, Indicating lamps, MCB, Fuse, Contactor, Relays, Overload Relay, Timers, Rectifier, Limit switches, control transformers.</p> <p>Wiring Accessories: Race ways/ cable channel, DIN Rail, Terminal Connectors, Thimbles, Lugs, Ferrules, cable binding strap &amp; buttons, nylon cable ties, sleeves, Gromats&amp; clips</p>

	<p><b>&amp; wiring Accessories:</b> Isolator, pushbutton switches, Indicating lamps, meters, MCB, Fuse, Contactor, Relays, Overload Relay, Timers, Rectifier, Limit switches, control transformers, Raceways/cable channel, Terminal connectors etc.</p> <p><b>Wiring of control cabinet/panel:</b> As per wiring diagram.</p> <p>Bunching of wires &amp; cables, channelling, tying etc.</p> <p>Checking / buzzing the wiring.</p> <p>Power connections &amp; motor connection &amp; testing.</p>	
4-6	<p>Repair &amp; Test of Calling Bell, Buzzer, Alarms, Electric Iron, Heater, Light.</p> <p>Maintenance and repair of domestic equipment – Electric Kettle, Heater / Immersion Heater, Hot Plate, Oven, Geyser, Cooking range, Mixer, Washing machine, , Motor Pump set, etc.</p>	<p><b>Domestic Appliances:</b> Working principles and circuits of common domestic equipment and appliances. – Calling Bell, Buzzer, Alarms, Electric Iron, Heater, Light.</p> <p>Electric Kettle, Heater / Immersion Heater, Hot Plate, Oven, Geyser, Cooking range, Mixer, Washing machine, , Motor Pump set, etc.</p> <p>Concept of Neutral and Earth.</p>
7	<p>Practice on Thermal power plant simulator (free version) or Plant visit.</p> <p>To prepare layout plan, single line diagram of the Thermal power system of generation.</p>	<p><b>POWER GENERATION :</b></p> <p>Generation sources of energy, Comparison of energy resources. Types of fuels. Advantages of liquid fuel &amp; solid fuel.</p> <p>Various ways of electrical power generation. • Thermal • Hydro electric • Nuclear • Non-Conventional</p> <p>Thermal</p> <p>Coal based, diesel based &amp; Gas based Turbine.</p> <p>Constituents in steam power station.</p>
8	<p>Practice on Hydro power plant simulator (free version) or Plant visit.</p> <p>To prepare layout plan, single line diagram of the Hydro</p>	<p><b>Hydro Electric:</b></p> <p>Schematic arrangement of Hydro-Electric Power Station. Constituents of Hydro Electric Plant. Types of Hydro Electric Power station. Advantages &amp;disadvantages.</p>

	electric power system of generation.	
9	Practice on Nuclear power plant simulator (free version) or Plant visit. To prepare layout plan, single line diagram of the Nuclear power system of generation.	<b>Nuclear:</b> Schematic arrangement of Nuclear Power Station. Composition of an atomic Nucleus. Advantages & disadvantages. Comparison of above Power Plant.
10-11	Practice on Non-conventional power plant simulator (free version) or Plant visit. To prepare layout plan, single line diagram of the non-conventional power system of generation.	<b>Non-Conventional</b> An introduction to Power generation through non-conventional power generation such as Solar, Bio-Gas, Wind energy and Micro-hydel, Tidal waves, etc. Basic principal, Advantages & disadvantages of each.
12	Identification and specification of different type of insulator used in HT line.  Binding of Pin type insulator, shackle type and suspension type insulators.  Fixing of jumper by crimping tool.	<b>TRANSMISSION OF ELECTRICAL POWER</b>  Electrical Supply System :  Comparison of AC and DC transmission. Advantages of High transmission voltage.  Introduction to Single phase , three phase-3 wire system in transmission lines  Overhead Lines:  Main components of overhead lines-Types of power line Low voltage line medium Voltage line & high voltage line Voltage standard Conductor materials, line supports, Insulators, types of Insulators
13	Skinning and dressing of cables.  Straight joint of different types of underground cables.  Test /check the insulation resistance of cables by using megger.  Locating the faults (open	<b>Under Ground Cable :</b>  Construction of cables. Material for cables, its insulation. Classification of cables, cables for 3-phase service, Laying of underground cable. Types of cable faults and their location.

	circuit, short circuit & leakage) in cables.	
14	To visit & prepare layout plan, single line diagram of Transmission /distribution Substation.  Installation of bus bar and bus coupler on LT line.  Replacement and testing of transformer oil.	<b>DISTRIBUTION OF POWER</b>  Function and equipment used in substation.  Classification of distribution system-AC distribution, Overhead v/s underground distribution system.  Essential features of switchgears. Isolator, Switch gear equipments, bus-bar arrangement, Short circuit, faults in power system.  <b>Circuit breakers</b> – Introduction & Classification of circuit breakers  lightening arrestors used in HT lines.
15-16	Speed control of DC motor : Connection, parameterization and speed control by Thyristor/ DC Drive.	Introduction, Construction & Working of power transistor, thyristor. Introduction, Construction, Working, Parameters & application of DC drive.
17-18	Speed control of AC motor : -Uses of SCR and other modern semiconductor devices in controlling speed of motors and in changing the direction of rotation of motors. Connection, parameterization and speed control by AC Drive.	Speed control of 3 phase induction motor by using VVVF/AC Drive. Introduction, Construction, Working, Parameters & application of AC drive
19-21	Break down, Routine & Preventive maintenance of DC/AC machines, Voltage stabilizer, Inverter, U.P.S. &Equipments.	Schedule of electrical preventive maintenance. Break down, Routine & Preventive maintenance of DC/AC machines, Voltage stabilizer, U.P.S. &Equipments.
22-23		Implant training / Project work (work in a team)
24-25		Revision
26		Examination