**SYLLABUS OF SEMESTER SYSTEM**

**FOR THE TRADE OF**

**E L E C T R I C I A N**

**UNDER**

**CRAFTSMEN TRAINING SCHEME (CTS)**

**(Two Years / Four Semesters)**

**Redesigned in**

**2014**

***By***

Government of India

Ministry of Labour and Employment (DGET)

**Syllabus for the *(TRADE: ELECTRICIAN)***

**Duration : Six Month**

**First Semester**

**Semester Code: EL: SEM I**

|  |  |  |  |  |  |
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| **Week** | **Trade Practical** |  |  | **Trade Theory** |  |
| **No.** |  |  |  |  |  |  |  |  |
| 1 | Implementation in the shop | **Occupational Safety and Health** |  |
|  | floor of the various safety | Basic safety introduction, |  |
|  | measures. |  |  |  |  | Personal protection. |  |
|  | Visit to the different |  | Basic injury prevention, Basic first aid, |  |
|  | sections of the Institute. |  | Hazard identification and avoidance, safety signs |  |
|  | Demonstration on |  |  | for Danger, Warning, caution and personal safety |  |
|  | elementary first aid. |  | message. |  |
|  | Artificial Respiration |  | Use of Fire extinguishers. |  |
|  | Practice on use of fire |  | Visit and observation of sections. |  |
|  | extinguishers. |  |  |  | Various safety measures involved in the |  |
|  |  |  |  |  |  |  | Industry. Elementary first Aid. Concept of |  |
|  |  |  |  |  |  |  | Standard. |  |
| 2 | Demonstration | of | Trade | Identification of Trade-Hand tools- |  |
|  | hand tools. Identification of | Specifications , Uses and their care maintenance. |  |
|  | simple types- screws, nuts & |  |  |
|  | bolts, chassis, clamps, rivets |  |  |
|  | etc. |  |  |  |  |  |  |  |
|  | Use, care and maintenance |  |  |
|  | of various hand tools. |  |  |  |
| 3 | Practice | in | using | cutting | Fundamental of electricity. Electron theory- |  |
|  | pliers, screw | drivers, | etc. | free electron, Fundamental terms, |  |
|  | skinning | the cables and | definitions, units and effects of electric |  |
|  | jointing | practice | on |  | current |  |
|  | single strand and multi |  | Explanation, Definition and properties of |  |
|  | stranded conductor. |  | conductors, insulators and semi-conductors~~.~~ |  |
|  | Demonstration | and |  | Wires/cable & its specification. |  |
|  | Practice on bare conductors | Types of wire joints & uses. |  |
|  | joints-- such as Britannia, |  |  |
|  | straight, T, Western union |  |  |
|  | Joints |  |  |  |  |  |  |  |
| 4 | Practice |  | on | soldering | Solders, flux and soldering technique. |  |
|  | & Brazing. |  |  |  |  | Brazing . |  |
|  | Measurement | of |  |  | Types & properties of resistors |  |
|  | Resistance. |  |  |  |  | Specific Resistance. |  |
|  | Determination | of |  |  |  |
|  | specific Resistance. |  |  |  |  |
| 5-6 | Verification of Ohm’s Law, | **Ohm’s Law -** |  |
|  | Verification of Kirchoff’s | Simple electrical circuits and problems. |  |
|  | Laws. |  |  |  |  |  |  |  |
|  | Verification | of laws | of | **Resistors -**Laws of Resistance. |  |
|  | series, parallel and |  |  | Series, parallel and combination circuits. |  |
|  | combination circuits. |  |  |  |
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|  | Verification of open circuit | **Kirchoff’s** Laws and applications. Wheatstone |  |
|  | and closed circuit network. | bridge principle and its applications. |  |
|  | Measuring unknown |  | Effect of variation of temperature on |  |
|  | resistance using different | resistance. |  |
|  | methods- |  |  | Different methods of measuring the values of |  |
|  | a) Using Wheatstone Bridge | resistance. |  |
|  | b) By voltage drop method. |  |  |
|  | Experiment to demonstrate |  |  |
|  | the variation of resistance of |  |  |
|  | a metal with the change in |  |  |
|  | temperature. |  |  |  |  |
| 7 | Demonstration and |  | Introduction of National Electrical Code |  |
|  | identification of types of | Voltage grading of different types of Insulators, |  |
|  | cables. |  |  | Temp. Rise permissible. |  |
|  | Demonstration and practice | Types of wires and cables standard wire gauge. |  |
|  | on using standard wire | Specification of wires and Cables-insulation and |  |
|  | gauge & micrometer. |  | voltage grades -Low , medium and high voltage |  |
|  | Practice on crimping |  | Precautions in using various types of |  |
|  | thimbles, Lugs. |  | cables / Ferrules |  |
| 8 | Identification | and | use | Common Electrical wiring Accessories, their |  |
|  | of wiring accessories |  | specifications in line with NEC - |  |
|  | Practice on | installation | Explanation of switches, lamp holders, plugs |  |
|  | and overhauling common | and sockets. Developments of domestic |  |
|  | electrical accessories. | circuits, Alarm & switches, |  |
|  | Fixing of switches, | holder | Use & specification of Fire alarm, MCB, ELCB, |  |
|  | plugs etc. in wooden/PVC/ | MCCB. |  |
|  | Metallic boards. |  |  |  |
|  |  |  |  |
| 9 - 11 | Grouping of Dry cells for a | Chemical effect of electric current- |  |
|  | specified voltage and |  | Principle of electrolysis. |  |
|  | current. |  |  | Faraday’s Law of electrolysis. |  |
|  | Practice on Battery |  | Basic principles of Electroplating |  |
|  | Charging, Preparation of | and Electro chemical equivalents. |  |
|  | battery charging, Testing of | Explanation of Anodes and Cathodes. |  |
|  | cells, Installation of |  | Cells - Primary & Secondary |  |
|  | batteries, Charging of |  | Lead acid cell-description, methods of |  |
|  | batteries by different |  | charging-Precautions to be taken & testing |  |
|  | methods. |  |  | equipment, |  |
|  | Charging of a Lead acid | Ni-cadmium & Lithium cell, Cathodic |  |
|  | cell, filling of electrolytes- | protection. |  |
|  | Testing of charging |  | Electroplating, Anodising. |  |
|  | .checking of discharged and | Different types of lead acid cells. |  |
|  | fully charged battery. |  | Application of battery/cell in Inverter, Battery |  |
|  | Care and maintenance of | Charger, UPS, etc. |  |
|  | Batteries |  |  | Lead Acid cell, general defects and |  |
|  |  |  |  | remedies. |  |
|  |  |  |  | Nickel Alkali Cell-description charging. |  |
|  |  |  |  | Power and capacity of cells. Efficiency of cells. |  |
|  |  |  |  | Rechargeable dry cell, description |  |
|  |  |  |  | advantages and disadvantages. |  |
|  |  |  |  | Care and maintenance of cells |  |
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|  |  |  |  | Grouping of cells of specified voltage and |
|  |  |  |  | current, Sealed Maintenance free Batteries, Solar |
|  |  |  |  | battery. |  |
| 12-13 |  | ALLIED TRADES: | Introduction of fitting trade. |
|  |  |  |  |  |  |
|  |  | Marking use of chisels and | Safety precautions to | be |
|  |  | hacksaw on flats, sheet | observed Description | of files, hammers, |
|  |  | metal filing practice, filing | chisels hacksaw frames and blades- their |
|  |  | true to line. | specification and grades. Care and maintenance |
|  |  | Sawing and planning | of steel rule, try square and files. Marking tools |
|  |  | practice. Practice in using | description and use. | Description of |
|  |  | firmer chisel and preparing | carpenter’s common hand tools such as saws |
|  |  | simple half lap joint. | planes, chisels mallet claw hammer, marking, |
|  |  |  |  | dividing and holding tools-their care and |
|  |  |  |  | maintenance. |  |
| 14 |  | Drilling practice in hand | Types of drills description and drilling machines, |
|  |  | drilling and power drilling | proper use, care and maintenance. Description of |
|  |  | machines. | taps and dies, types of rivets and riveted joints. |
|  |  | Grinding practice | Use of thread gauge. |  |
|  |  | Practice in using taps and |  |  |
|  |  | dies, threading hexagonal |  |  |
|  |  | and square nuts etc. cutting |  |  |
|  |  | external threads on stud |  |  |
|  |  | and on pipes, riveting |  |  |
|  |  | practice. |  |  |
| 15 |  | Practice in using snips, | Description of marking and |
|  |  | marking and cutting | cutting tools such as snubs shears punches and |
|  |  | of straight and curved | other tools like hammers, mallets, etc. used by |
|  |  | pieces in sheet metals. | sheet metal workers. Different types soldering |
|  |  | Bending the edges of | materials, fluxes and process. |
|  |  | sheets metals. Riveting | Types of different soldering irons and their |
|  |  | practice in sheet metal. | proper uses. |  |
|  |  | Practice in making different | Use of different bench tools used by sheet metal |
|  |  | joints in sheet metal in | worker. |  |
|  |  | soldering the joints. |  |  |
| 16-17 |  | Trace the magnetic field. | **Magnetism** - classification of magnets, |
|  |  | Assembly / winding of a | methods of magnetising, magnetic materials. |
|  |  | simple electro magnet. | Properties, care and maintenance. |
|  |  | Use of magnetic compass. | Para and Diamagnetism and Ferro magnetic |
|  |  | Identification of different | materials. |  |
|  |  | types of Capacitors. | Principle of electro-magnetism, Maxwell’s |
|  |  | Charging and discharging of | corkscrew rule, Fleming’s left and right hand |
|  |  | capacitor, Testing of | rules, Magnetic field of current carrying |
|  |  | Capacitors using DC voltage | conductors, loop and solenoid. |
|  |  | and lamp. | 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 | **Alternating Current -**Comparison and |
|  |  | characteristics of RL,RC and | Advantages D.C and A.C. Related terms |

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| --- | --- | --- | --- |
|  | RLC in A.C. Circuits both in |  | frequency |
|  | series and parallel. |  | Instantaneous value, R.M.S. value Average value, |
|  | Experiment on poly phase |  | Peak factor, form factor. |
|  | circuits. Current, voltage, |  | Generation of sine wave, phase and phase |
|  | power and power facor |  | difference. |
|  | measurement in single & |  | Inductive and Capacitive reactance Impedance |
|  | poly- phase circuits. |  | (Z), power factor (p.f). |
|  | Measurement of energy in |  | Active and Reactive power, Simple problems on |
|  | single and poly-phase |  | A.C. circuits, single |
|  | circuits. |  |  |  | phase and three-phase system etc. |
|  | - Use | of | phase |  | Problems on A.C. circuits. |
|  | sequence meter. |  | 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 | **Practice** | **on** | **Earthing** - |  | **Earthing** - Principle of different methods of |
|  | different methods of |  | earthing. i.e. Pipe, Plate, etc |
|  | earthing. |  |  |  | Importance of Earthing. |
|  | Measurement of Earth |  | Improving of earth resistance |
|  | resistance by earth tester. |  | Earth Leakage circuit breaker (ELCB). |
|  | Testing of Earth Leakage by |  | In absence of latest revision in respective BIS |
|  | ELCB and relay. |  | provision for Earthing it is recommended to |
|  |  |  |  |  | follow IEC guidelines. |
| 21 | Determine the resistance by |  | **Basic electronics**- Semiconductor energy level, |
|  | Colour coding |  |  | atomic structure ‘P’ type and ‘N’ type. |
|  | Identification of |  | Type of materials –P-N-junction. Classification of |
|  | active/passive components. |  | Diodes – Reverse and Forward Bias, |
|  |  |  |  |  | Heat sink. |
|  | **Diodes**-symbol - Tests - |  | Specification of Diode |
|  |  |  |  |  | PIV rating. |
|  | Construct & Test Half wave |  | Explanation and importance of D.C. rectifier |
|  | rectifier ckt. |  |  | circuit. Half wave, Full wave and Bridge circuit. |
|  | Full wave rectifier ckt. |  | Filter circuits-passive filter. |
|  | Bridge rectifier ckt. |  |  |
|  |  |  |  |  |
| 22-23 |  |  | Industrial visit / project work |
|  |  |  |  |  |
| 24-25 |  |  |  | NCVT EXAMINATION |
|  |  |  |  |  |  |
| 26 |  |  |  |  | Semester Gap |
|  |  |  |  |  |  |

**Syllabus for the Trade of “*Electrician”***

**Duration : Six Month**

**Second Semester**

**Semester Code: ELE: SEM II**

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| **Week** | **Trade practical** | **Trade Theory** |
| **No.** |  |  |  |
| 1-2 | Different wave shapes of | Working principle and uses of an |
|  | rectifiers and their values | oscilloscope. |
|  | using C.R.O. | Explanation of principle of working of a |
|  | Identification of terminals, | transistor & configuration. |
|  | construction & Testing of | Types of transistors & its application. |
|  | transistor. | Specification and rating of transistors. |
|  | Assembly and testing of a | Explanation of transistor Amplifiers, |
|  | single stage Amplifier and | Amplifiers. – class A,B and C |
|  | checking using an | Power amplifier |
|  | oscilloscope. |  |
| 3-4 | Measure Voltage, current & | Explanation of oscillator-working |
|  | wave shape of oscillator | principle |
|  | using CRO. | Explanation of stages and types. |
|  | Simple | circuits containing | Multivibrator – applications. |
|  | U.J.T. for triggering, FET as | Introduction of basic concept of ICs, U.J.T., |
|  | an amplifier and Power | F.E.T. |
|  | control circuits by S.C.R. | Basic concept of power electronics devices |
|  | and Diac, triac, I.G.B.T. | e.g. S.C.R., Diac, Triac, power MOSFET, G.T.O |
|  | Logic | gates and circuits. | and I.G.B.T. |
|  |  |  | **Digital Electronics** -Binary numbers, logic |
|  |  |  | gates and combinational circuits, |
|  |  |  |
| 5-6 | Practice in casing, Capping. | **Electric wirings**, I.E. rules. |
|  | Conduit wiring with | Types of wirings both domestic and |
|  | minimum to more number | industrial. |
|  | of points. | Specifications for wiring. |
|  | Use of two way switches. | Grading of cables and current ratings. |
|  | Testing of wiring | Principle of laying out in domestic wiring. |
|  | installation by meggar. | Voltage drop concept. |
|  | -Fixing of calling | **Wiring system -** P.V.C., concealed system. |
|  | bells/buzzers. | Maintenance and Repairing data sheet |
|  | -Making of test boards & | preparation. Specifications, standards for |
|  | extension boards | conduits and accessories |
|  | Identification & | - Power Wiring |
|  | demonstration on conduits | - Control Wiring |
|  | and accessories & their uses, | - Information Communication |
|  | cutting , threading & laying | - Entertainment Wiring. |
|  | Installation, Testing, | Testing of wiring installation by meggar. |
|  | Maintenance and Repairing |  |
|  | of wiring. |  |
| 7 | Application of fuses, relay, | Study of Fuses, Relays, Miniature circuit |
|  | MCB, ELCB. | breakers (MCB), ELCB, etc. |

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| 8-9 | Identification of the parts of | **D.C. Machines -** General concept of Electrical |
|  | a D.C. machine. | Machines. |
|  | Connection of shunt | **Principle of D.C. generator.** Use of |
|  | Generators |
|  | Armature, Field Coil, Polarity, Yoke, Cooling |
|  | Voltages build up in DC |
|  | Fan, Commutator, slip ring Brushes, |
|  | Shunt Generator (OCC) |
|  | Laminated core. |
|  | Measurement of voltages, |
|  |  |
|  | Demonstration on field | Explanation of **D.C. Generators**-types, parts. |
|  | excitation. |
|  | **E.M.F**. equation-self excitation and separately |
|  |  |
|  |  | excited Generators-Practical uses. Brief |
|  |  | description of series, shunt and compound |
|  |  | generators. |
|  |  |  |
| 10-11 | Connection of compound | Explanation of Armature reaction, inter poles |
|  | Generator, Voltage | and their uses, connection of inter poles, |
|  | measurement, cumulative | Commutation. Losses & Efficiency of |
|  | and differential –No Load | D.C.Generator, Parallel Operation of |
|  | and Load characteristics of | D.C.Generator. |
|  | Series, Shunt and Compound | Application of D.C. generators. |
|  | Generator. | Care, Routine & preventive maintenance. |
|  | Controlling and protecting |  |
|  | DC Generator. |  |
|  | Practicing dismantling and |  |
|  | assembling in D.C. Machine. |  |
| 12-13 | Identification of parts and | **DC Motors -** Terms used in D.C. motor- |
|  | terminals of DC motors. | Torque, Brake Torque, speed, Back-e.m.f. etc. |
|  | Connection, starting, | and their relations, Types of D.C.Motor. |
|  | running of DC motors using | Starters used in D.C. motors |
|  | Starters. | Related problems |
|  | Characteristics curve of DC | Characteristics of D.C.Motor, Losses & |
|  | motors. | Efficiency, Application of D.C. motors. |
|  | Practical application of | Care, Routine & preventive maintenance. |
|  | D.C. motors. |  |
| 14 | Speed control of | Types of speed control of DC motors in |
|  | DC motors by voltage , | industry. |
|  | field, armature & | Control system. AC-DC, DC-DC control. |
|  | Word-Leonard system. |  |
| 15-18 | Identification of types of | Working principle of **Transformer**. |
|  | transformers. Connection of | classification C.T., P.T. Instrument and |
|  | transformers, | Auto Transformer(Variac), Construction, |
|  | Transformation ratio, OC | Single phase and Poly phase. |
|  | (No-load) and SC (short | E.M.F. equation, parallel operation of |
|  | circuit) tests,efficiencies of | transformer, their connections. |
|  | transformers, testing of | Regulation and efficiency. |
|  | transformer, parallel | Type of Cooling for transformer. |
|  | operation of transformer. | Protective devices. |
|  | Use of Current Transformer | Specifications, simple problems on e.m.f. |
|  | (C.T.) and Potential | Equation, turn ratio, regulations and |

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| --- | --- | --- |
|  | (Voltage) transformer (P.T.) | efficiency. Special transformers. |
|  | Testing of single phase and | Transformer – Classification of transformer. |
|  | Three Phase Transformers - | Components, Auxiliary parts i.e. breather, |
|  | Cleaning, maintenance, | Conservator, buchholze relay, other |
|  | testing and changing of oil. | protective devices. Transformer oil testing |
|  | Single and three phase | and Tap changer (off load and on load). Dry |
|  | connection. | type transformer. |
|  |  | Bushings and termination. |
| 19-21 | Identify the type of | **Electrical Measuring Instruments -** |
|  | Instruments. | -types, indicating types. Deflecting torque, |
|  | Use of **-P**MMC , MI meter, | Controlling torque and |
|  | Multi-meter(Digital/Analog) | Damping torque , |
|  | , Wattmeter, P F meter, | PMMC & MI meter (Ammeter, Voltmeter) |
|  | Energy meter, Frequency | -Range extension |
|  | meter, | -Multimeter(Digital/Analog) |
|  | Calibration of **-** Multi-meter | -Wattmeter |
|  | Phase sequence meter, | - P.F. meter |
|  | Digital Instruments, etc | - Energy meter (Digital/analog) |
|  | Calibration of Energy meter. | –Insulation Tester (Megger), Earth tester. |
|  |  | -Frequency meter |
|  |  | -Phase Sequence meter |
|  |  | -Multimeter –Analog and Digital |
|  |  | -Tong tester |
|  |  | -Techometer. |
| 22-23 | Industrial visit / project work |
|  |  |
| 24-25 | NCVT EXAMINATION |
|  |  |  |
| 26 |  | Semester Gap |
|  |  |  |

**Syllabus for the Trade of “*Electrician”***

**Duration : Six Month**

**Third Semester**

**Semester Code: ELE: SEM III**

|  |  |  |  |
| --- | --- | --- | --- |
| **Week** | **Trade practical** | **Trade Theory** |  |
| **no.** |  |  |  |  |
| **1-3** | Identification of parts and | **Three phase Induction motor** – |  |
|  | terminals of AC motors. | Working principle –Production of rotating |  |
|  | Connection, starting, running of | magnetic field, Squirrel Cage Induction |  |
|  | AC motors using Starters. | motor, Slip-ring induction motor. |  |
|  | Measurement of slip, P.F. | Construction , characteristics and |  |
|  | at various loads. | Speed control, Slip & Torque . |  |
|  | Practice | on connection | Control & Power circuit of starters |  |
|  | of D.O.L Starter, Star /Delta | D.O.L Starter, Star /Delta starter, |  |
|  | starter, Autotransformer | Autotransformer starter, Rotor resistance |  |
|  | starter, Rotor resistance | starter, etc |  |
|  | starter, etc | Single phasing preventer. |  |
|  | Speed control of Induction | Losses & efficiency. |  |
|  | motors by various methods. | Application of Induction Motor |  |
|  | Practical | application of | Care, Routine & preventive maintenance. |  |
|  | A.C. motors. |  |  |
| **4-5** | Connection of single phase | **Single phase induction motor-** |  |
|  | motor, identification, testing, | Working principle, different method of |  |
|  | running and reversing. | starting and running (capacitor start, |  |
|  |  |  | permanent capacitor, capacitor start & |  |
|  |  |  | run, shaded pole technique). |  |
|  |  |  | FHP motors, Repulsion motor, stepper |  |
|  |  |  | motor, Hysteresis motor, Reluctance |  |
|  | Identification, connection, | motor. |  |
|  | testing, running and reversing | Application of Single phase induction |  |
|  | of universal motor. Repulsion | motor |  |
|  | motor, stepper motor. | **Universal motor**-advantages, Principle, |  |
|  |  |  | characteristics, applications in domestic |  |
|  |  |  | and industrial appliances, |  |
|  |  |  | Fault Location and Rectification. |  |
|  |  |  | Braking system of motor. |  |
|  |  |  | Application of Universal motor. |  |
| **6-7** | Identification of parts and | **Alternator** |  |
|  | terminals of Alternator. | Explanation of alternator, types of prime |  |
|  | Connection, starting, running of | mover, efficiency, regulations, phase |  |
|  | Alternator. | sequence, Parallel operation. |  |
|  | Practical | application of | Specification of alternators and Brushless |  |
|  | Alternator. | alternator. |  |
|  | Practice on alternators, voltage | Verify the effect of changing the field |  |
|  | Building, load characteristic, | excitation and Power factor correction of |  |
|  | voltage regulation, Parallel | Industrial load. |  |
|  | operation. |  |  |
|  | Practice on installation, |  |  |
|  | running and maintenance of |  |  |
|  | Alternators. |  |  |
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| **8** | Identification of parts and | **SYNCHRONOUS MOTOR -** |
|  | terminals of Synchronous | Working principle, effect of change of |
|  | motor. | excitation and load. |
|  | Connection, starting, running of | V and anti V curve. |
|  | Synchronous motor. |  |
|  | Plot V curve. | Cause of low power factor. |
|  | Practical application of | Method of power factor improvement. |
|  | Synchronous motor. |  |
|  |  |  |
| **9** | Starting, running, building up | Rotary Converter- Inverter, M.G. Set |
|  | voltage and loading of Motor | description, Characteristics, specifications- |
|  | Generator (MG) set. | running and Maintenance. |
|  | Maintenance of MG Sets. | Solid state controller and Invertors. |
|  | Solid state controller and |  |
|  | Invertors- Operation and Use |  |
| 10 | Practice on winding of small | **TRANSFORMER Winding** , Small |
|  | Transformers. | Transformer winding techniques |
|  |  |  |
| 11-12 | Testing of burnt DC machine for | **DC machine Winding--** Armature |
|  | rewinding – collection of data – | winding terms, pole pitch, coil pitch, back |
|  | developed diagram and | pitch, front pitch , Lap and Wave winding , |
|  | connection – winding | Progressive and retrogressive |
|  | procedure | Winding, developed diagram. |
|  | Making frame(forma), coil | Growler construction, working & |
|  | insulation, Slot insulation, | application. |
|  | Insertion of coils in slots, coil |  |
|  | connection, |  |
|  | Practice on armature winding, |  |
|  | Growler testing, Baking, |  |
|  | Impregnation and |  |
|  | Varnishing & assembling. |  |
| 13-15 | Testing of burnt motor for | **AC machine Winding—** Motor winding |
|  | rewinding – collection of data – | terminology – classification of conducting |
|  | developed diagram and | and insulating materials used in winding – |
|  | connection – winding | Types and methods of winding in single |
|  | procedure | and three phase motors. |
|  | Making frame(forma), coil |  |
|  | insulation, Slot insulation, |  |
|  | Insertion of coils in slots, coil |  |
|  | connection, Practice on single & | Stator winding terms, coil side, end coil |
|  | double layer, concentric | and grouping of coils. Connection to |
|  | Winding, | adjacent poles, connected stator winding, |
|  | Winding of table & ceiling fans, | alternate pole connection, developed |
|  | single phase and three phase | diagram. |
|  | motors – testing of wound |  |
|  | motor |  |
|  | Baking, impregnating and |  |
|  | varnishing & assembling. |  |

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| 16-17 | Installation of - |  |  | **Illumination**, Laws of Illuminations, |
|  | Mercury & Sodium vapours |  | terminology used , Illumination factors, |
|  | (H.P. & L.P.) |  |  |  | intensity of light –importance of light, |
|  | Halogen Lamps |  |  |  | human eye factor, , units. |
|  | Single FL tube and twin FL |  | Types of illumination |
|  | tube. |  |  |  |  | Type of lamps |
|  | Practice on decoration lighting |  | -Neon sign Halogen, Mercury vapour, |
|  | Principle | of | layout | of |  | sodium vapour, Fluorescent tube, CFL, |
|  | lighting installation. |  |  | LED, Solar lamp & photo cell applications, |
|  | Practice on photo cells. |  |  | Decoration lighting, Drum Switches, |
|  |  |  |  |  |  | efficiency in lumens per watt, Calculations |
|  |  |  |  |  |  | of lumens. |
|  |  |  |  |  |  | Estimating placement of lights, fans and |
|  |  |  |  |  |  | ratings. |
| 18-19 | Practice on wiring of electric |  | **Industrial wiring**. Code of practice and |
|  | motor, control panel, etc. |  | relevant span. Wiring of electric motors, |
|  | Trace/Test of different circuit |  | control panel, etc. |
|  | Breakers. |  |  |  |  | Types, specifications, advantages of |
|  | Protective and control relays, |  | different types of circuit brackets |
|  | contactors, etc. |  |  |  | construction and maintenance. |
|  | Operation | and | use | of |  | Working principle and construction of |
|  | XLPE cables. |  |  |  | domestic and agricultural appliances-their |
|  |  |  |  |  |  | maintenance. |
| 20-21 | Practice of wiring Maintenance |  | Complete House-wiring layout. |
|  | of institute, hostel, hotel, |  | Splitting load wire in accordance with NEC |
|  | residential building. |  |  | I.E.E. Rules. |
|  | Layout and repairing of |  | Multi-storeyed system. |
|  | workshop electrical |  |  | Fault finding and trouble shooting. |
|  | installation. |  |  |  |  |
|  | Fault finding practice |  |  |  |
| 22-23 |  |  |  | Industrial visit / project work |
|  |  |  |  |  |
| 24-25 |  |  |  | NCVT EXAMINATION |
|  |  |  |  |  |  |
| 26 |  |  |  |  | Semester Gap |
|  |  |  |  |  |  |  |

**Syllabus for the Trade of “*Electrician”***

**Duration : Six Months**

**Fourth Semester**

**Semester Code: ELE: SEM IV**

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| **Week** | **Trade Practical** | **Trade Theory** |
| **No.** |  |  |
|  |  |  |
| 1-3 | **Machine control cabinet /Control** | **Machine control cabinet** |
|  | **Panel Layout, Assembly & Wiring**: | **/Control Panel Layout,** |
|  | Practice Layout drawing of control | **Assembly & Wiring**: |
|  |  |
|  | cabinet , panel, power & control circuits | Layout of Control cabinet & |
|  | Preparing control cabinet / panel | control panel |
|  |  |
|  | wiring for | Study & Understand Layout |
|  | 1. Local & Remote control of | drawing of control cabinet , |
|  | panel, power & control circuits. |
|  | Induction motor |
|  |  |
|  | 2. Forward & Reverse operation of | **Control Elements:** Isolator, |
|  | Induction motor | pushbutton switches, Indicating |
|  | 3. Automatic Star Delta Starter | lamps, MCB, Fuse, Contactor, |
|  | 4. Automatic star delta starter with | Relays, Overload Relay, Timers, |
|  | change of direction of rotation | Rectifier, Limit switches, control |
|  | 5. Sequential control of three | transformers. |
|  | motors. | Wiring Accessories: Race ways/ |
|  |  |
|  | **Preparation of Control cabinet &** | cable channel, DIN Rail, Terminal |
|  | **panel**: Necessary marking, cutting, | Connectors, Thimbles, Lugs, |
|  | filing, drilling, tapping etc. | Ferrules, cable binding strap & |
|  | **Mounting of control elements &** | buttons, nylon cable ties, sleeves, |
|  | Gromats & clips |
|  | **wiring Accessories**: Isolator, |
|  |  |
|  | pushbutton switches, Indicating lamps, |  |
|  | meters, MCB, Fuse, Contactor, Relays, |  |
|  | Overload Relay, Timers, Rectifier, Limit |  |
|  | switches, control transformers, |  |
|  | Raceways/cable channel, Terminal |  |
|  | connectors etc. |  |
|  | **Wiring of control cabinet/panel:** As |  |
|  | per wiring diagram. |  |
|  | Bunching of wires & cables, |  |
|  | channelling, tying etc. |  |
|  | Checking / buzzing the wiring. |  |
|  | Power connections & motor connection |  |
|  | & testing. |  |
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| 4-6 | Repair & Test of Calling Bell, Buzzer, | **Domestic Appliances:** Working |
|  | Alarms, Electric Iron, Heater, Light. | principles and circuits of |
|  | Maintenance and repair of domestic | common domestic equipment |
|  | equipments – Electric Kettle, Heater | and appliances. – Calling Bell, |
|  | / Immersion Heater, Hot Plate, Oven, | Buzzer, Alarms, Electric Iron, |
|  | Geyser, Cooking range, Mixer, Washing | Heater, Light Electric Kettle, |
|  | machine, , Motor Pump set, etc. | Heater / Immersion Heater, Hot |
|  |  | Plate, Oven, Geyser, Cooking |
|  |  | range, Mixer, Washing machine, , |
|  |  | Motor Pump set, etc. |
|  |  | Concept of Neutral and Earth. |
|  |  |  |
| 7 | Practice on Thermal power plant | **POWER GENERATION :** |
|  | simulator (free version) or Plant visit. | Generation sources of energy, |
|  | To prepare layout plan, single line | Comparison of energy resources. |
|  | Types of fuels. Advantages of |
|  | diagram of the Thermal power system |
|  | liquid fuel & solid fuel. |
|  | of generation. |
|  | Various ways of electrical power |
|  |  |
|  |  | generation. • Thermal • Hydro |
|  |  | electric • Nuclear • Non- |
|  |  | Conventional |
|  |  | Thermal |
|  |  | Coal based, diesel based & Gas |
|  |  | based Turbine. Constituents in |
|  |  | steam power station. |
|  |  |  |
| 8 | Practice on Hydro power plant | **Hydro Electric:** |
|  | simulator (free version) or Plant visit. | Schematic arrangement of Hydro- |
|  | To prepare layout plan, single line | Electric Power Station. |
|  | Constituents of Hydro Electric |
|  | diagram of the Hydro electric power |
|  | Plant. Types of Hydro Electric |
|  | system of generation. |
|  | Power station. Advantages & |
|  |  |
|  |  | disadvantages. |
|  |  |  |
| 9 | Practice on Nuclear power plant | **Nuclear:** |
|  | simulator (free version) or Plant visit. | Schematic arrangement of |
|  | To prepare layout plan, single line | Nuclear Power Station. |
|  | Composition of an atomic |
|  | diagram of the Nuclear power system of |
|  | Nucleus. Advantages & |
|  | generation. | disadvantages. Comparison of |
|  |  |
|  |  | above Power Plant. |
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| 10-11 | Practice on Non-conventional power | **Non-Conventional** |
|  | plant simulator (free version) or Plant | An introduction to Power |
|  | visit. | generation through non- |
|  | To prepare layout plan, single line | conventional power generation |
|  | diagram of the non-conventional power | such as Solar, Bio-Gas, Wind |
|  | system of generation. | energy and Micro-hydel, Tidal |
|  |  | waves, etc. Basic principal, |
|  |  | Advantages & disadvantages of |
|  |  | each. |
|  |  |  |
| 12 | Identification and specification of | **TRANSMISSION OF** |
|  | different type of insulator used in HT | **ELECTRICAL POWER** |
|  | line. | Electrical Supply System : |
|  |  |
|  | Binding of Pin type insulator, shackle | Comparison of AC and DC |
|  | type and suspension type insulators. |
|  | transmission. Advantages of High |
|  |  |
|  | Fixing of jumper by crimping tool. | 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. | **Under Ground Cable :** |
|  | Straight joint of different types of | Construction of cables. Material |
|  | underground cables. | for cables, its insulation. |
|  | Test /check the insulation resistance of | Classification of cables, cables for |
|  | 3-phase service, Laying of |
|  | cables by using megger. |
|  | underground cable. Types of |
|  |  |
|  | Locating the faults (open circuit, short | cable faults and their location. |
|  |  |
|  | circuit & leakage) in cables. |  |
|  |  |  |

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