

Electrical Technology

1st semester

Name of the subject	Subject Code
Basic Electricity	66711

SUBJECT: BASIC ELECTRICITY

TPC
334

OBJECTIVES

- To familiarize the basic electrical quantities & laws and to apply them in solving problems of electrical circuits.
- To acquaint with electro-chemistry, electro-magnetism, electro-magnetic induction and electrostatic.
- To introduce electrical wiring.

SHORT DESCRIPTION

Electric current, voltage, resistance ; ohm's law; Conductors, semiconductors and insulators; Basic electrical circuits; Power and energy; Basic electro-chemistry; Electro-magnetism; Electro-magnetic induction; Electrostatics; Wires and cables; Hand tools used in wiring; House wiring; Controlling devices; Protective devices; Earthing.

DETAIL DESCRIPTION

Theory:

ELECTRIC CURRENT, VOLTAGE & RESISTANCE

Understand electricity and its nature.

- 1.1 State the meaning of electricity.
- 1.2 Describe the structure of atom.
- 1.3 Define current, voltage and resistance.
- 1.4 State the units of current, voltage and resistance.

CONDUCTOR, SEMICONDUCTOR & INSULATOR

2 Understand conductor, semiconductor and insulator.

- 2.1 Define conductor, semiconductor and insulator.
- 2.2 Explain the conductor, semiconductor, and insulator according to electron theory .
- 2.3 List different types of conductors, semiconductors and insulators.

- 2.4 Describe the factors effecting the resistance of a conductor.
- 2.5 State laws of resistance.
- 2.6 Prove the relation $R = A \rho L$
- 2.7 Explain the meaning of resistivity and name the unit of resistivity.
- 2.8 Solve problems relating to laws of resistance.

OHM'S LAW

3 Understand Ohm's Law

- 3.1 State Ohm's law.
- 3.2 Explain the limitations of Ohm's law
- 3.3 Deduce the relation between current, voltage and resistance.
- 3.4 Solve problems relating to Ohm's law.

BASIC ELECTRIC CIRCUITS

4 Understand electric circuit.

- 4.1 Define electric circuit.
- 4.2 State the elements of electrical circuit
- 4.3 Classify electric circuits.
- 4.4 Define series circuit, parallel circuit and mixed circuit.
- 4.5 Describe the characteristic of series circuit and parallel circuit.
- 4.6 Calculate the equivalent resistance of series circuit, parallel circuit and mixed circuit.
- 4.7 Solve problems relating to series, parallel and mixed circuit.

POWER AND ENERGY

5 Apply the concept of electrical power and energy.

- 5.1 Define electrical power and energy.
- 5.2 State the unit of electrical power and energy.
- 5.3 Show the relation between electrical power and energy.
- 5.4 List the name of instruments for measuring electrical power and energy.
- 5.5 Draw the connection diagram of wattmeter and energy meter in an electrical circuit.
- 5.6 Solve problems relating to electrical power and energy .

6 Understand the principles of Joule's law.

- 6.1 Describe the heating effect of electricity.
- 6.2 Explain Joule's law regarding the development of heat in electrical circuit.
- 6.3 Explain Mechanical equivalent of heat (J)
- 6.4 Solve problems relating to Joule's law.

BASIC ELECTRO-CHEMISTRY

6 Understand the concept of cells.

- 7.1 Describe the meaning of potential difference.
- 7.2 Define the meaning of cell.
- 7.3 Classify cell.
- 7.4 Define Primary Cell
- 7.5 List different types of primary Cell
- 7.6 Describe the construction and principle of action of a simple Voltaic cell.
- 7.7 List the defects of a simple Voltaic cell.

- 7.8 Describe the causes of defects of a simple Voltaic cell.
- 7.9 Describe the methods of removing the defects of a simple Voltaic cell.
- 7.10 Distinguish between Primary & Secondary Cell

8 Understand the concept of capacitors and inductors.

- 8.1 Define capacitor and capacitance.
- 8.2 Name the unit of capacitance.
- 8.3 Name the different types of capacitor.
- 8.4 State the uses of capacitor.
- 8.5 Define inductor and inductance.
- 8.6 Name the unit of inductance
- 8.7 Name the different types of inductor.
- 8.8 State the uses of inductor.
- 8.9 Determine the equivalent capacitance of a number of capacitors connected in series and parallel.
- 8.10 Explain energy storage in a capacitor.
- 8.11 Solve the problems relating to capacitors.

ELECTRO - MAGNETISM

9 Understand Electro - magnetism.

- 9.1 Describe magnetic field, magnetic lines of force and its properties.
- 9.2 Describe field intensity and magnetic flux density.
- 9.3 Distinguish between absolute permeability and relative permeability.
- 9.4 Describe the concept of magnetic effect of electrical current.
- 9.5 States Maxwell's cork screw rule.
- 9.6 Explain the force experienced in a current carrying conductor in a magnetic field.
- 9.7 State Fleming's left hand rule.
- 9.8 Explain the work done by a moving conductor in a magnetic field.
- 9.9 Explain the force between two parallel current carrying conductor.

ELECTRO MAGNETIC INDUCTION

10. Understand electro- magnetic induction.

- 10.1 Define Faraday's laws of electro-magnetic induction.
- 10.2 Describe the magnitude of dynamically induced emf and statically induced emf
- 10.3 Solve problems relating to emf generation.
- 10.4 Define Lenz's law and Fleming's right hand rule for determining the direction of induced emf and current.
- 10.5 Define self induced emf and self inductance.
- 10.6 Explain inductance of a iron cored inductor.
- 10.7 Define mutual inductance and co-efficient of coupling.

WIRES AND CABLES

11. Understand the uses of wires and cables.

- 11.1 Define electrical wires and cables.
- 11.2 Distinguish between wires and cables.
- 11.3 Describe the construction and uses of PVC, VIR, TRS or CTS and flexible wires
- 11.4 Describe the procedure of measuring the size of wires and cables by wire gauge.
- 11.5 Describe the current carrying capacity of a wire.

JOINTS AND SPLICES

12. Understand the usefulness of joints and splices.

12.1 Define the meaning of joints and splices.

12.2 State the five steps of making a joint.

12.3 Describe the procedure to make a pig tail joint, western union joint, Britannia joint, duplex joint, tap joint, simple splice.

12.4 Give example of uses of above mentioned joints.

HOUSE WIRING

13. Understand the different methods of house wiring.

13.1 State the meaning of wiring.

13.2 List the types of wiring.

13.3 State the procedure for Channel wiring, surface conduit wiring and concealed wiring.

13.4 State the types of wiring used in :

a) Residential building.

b) Workshop

c) Cinema hall/Auditorium

d) Temporary shed

13.5 List the name of fittings used in different types of electrical wiring.

CONTROLLING DEVICES

14. Understand the construction and uses of controlling devices.

14.1 Define controlling device.

14.2 Name the different types of controlling devices.

14.3 Describe the constructional features and uses of tumbler switch, iron clad switch, push button switch and gang switch.

PROTECTIVE DEVICES

15. Understand the construction and uses of protective devices.

15.1 Define protective devices.

15.2 Name the different types of protective devices.

15.3 Name the different types of fuses used in house wiring.

15.4 Describe the construction and uses of renewable fuse.

15.5 Name the different types of circuit breaker used in house wiring.

15.6 Describe safety procedure against electrical hazards.

15.7 List the performance of safety practices for electrical equipment, machines and accessories.

EARTHING

16. Understand the necessity of earthing.

16.1 Define earthing and mention the elements of earthing..

16.2 Explain necessity of earthing

16.3 Name different types of earthing.

16.4 List the value of earthing resistance in different condition.

WIRING DIAGRAM

17. Apply the principle of controlling electrical circuit by switch.

- 17.1 Sketch the wiring diagram of one lamp controlled by one SPST switch and describe its uses.
- 17.2 Sketch the wiring diagram of one lamp controlled by two SPDT switch and describe its uses.
- 17.3 Draw the wiring diagram of a calling bell.
- 17.4 Draw the wiring diagram of a calling bell with more than one lamp controlled from more than one point.
- 17.5 Draw the wiring diagram of a fluorescent tube light circuit.
- 17.6 Describe the working principle of fluorescent tube light.

Practical:

1. Practice with electrical measuring instruments.

- 1.1 Identify Voltmeters, Ammeters, Ohm Meter, Wattmeter, Energy meter and AVO meter.
- 1.2 Select & read the scale of given meters.
- 1.3 Connect correctly voltmeter, ammeter, wattmeter and energy meter to a given circuit..

2. Verify Ohm's Law.

- 2.1 Sketch the circuit diagram for the verification of Ohm's Law.
- 2.2 List tools, equipment and material required for the experiment.
- 2.3 Prepare the circuit according to the circuit diagram using proper equipment.
- 2.4 Check all connections before the circuit is energized.
- 2.5 Verify the law by collecting relevant data.

3. Verify the characteristics of series and parallel circuits.

- 3.1 Draw the working circuit diagram.
- 3.2 List tools, equipment and materials required for the experiment.
- 3.3 Prepare the circuit according to the circuit diagram using proper equipment.
- 3.4 Check all connections before the circuit is energized.
- 3.5 Record data and verify that in a series circuit total voltage and resistance is equal to the summation of individual voltage and resistance respectively but total current is equal to the individual current.
- 3.6 Record data and verify that for a parallel circuit supply voltage is equal to the branch voltage, supply current is equal to summation of branch currents and total conductance is equal to the summation of branch conductance.

4. Show skill in measuring the power of an electric circuit.

- 4.1 Sketch the necessary circuit diagram of an electrical circuit w electrical load, ammeter, voltmeter and wattmeter.
- 4.2 Prepare the circuit according to the circuit diagram using ammeter, voltmeter and wattmeter.
- 4.3 Record the power, measured by the wattmeter and verify t reading with that of calculated from ammeter and voltmeter.
- 4.4 Compare the measured data with that of calculated and rat power.

5. Show skill in measuring the energy consumed in an electrical circuit.

- 5.1 Sketch the necessary diagram of an electric circuit wattmeter, energy meter and electrical load.
- 5.2 Prepare the circuit according to the circuit diagram user wattmeter and energy meter.
- 5.3 Record the energy measured by the energy meter and verify with that of calculated from wattmeter for a fixed time..

6. Make artificial magnets.

- 6.1 Make an artificial magnet by rubbing method (Single touch)
- 6.2 Make an artificial magnet by divided touch method.
- 6.3 Make an artificial magnet by passing electrical current.
- 6.4 Detect the polarity of the produced artificial magnet with the help of a compass needle.

7. Practice with hand tools, wires and cables.

- 7.1 List the hand tools used in electrical wiring.
- 7.2 Identify the hand tools used in electrical wiring.
- 7.3 Draw neat sketches of hand tools used in electrical wiring.
- 7.4 Identify different types of wires and cables.
- 7.5 Measure the diameter of the identified wire and cables using standard wire gauge.

8. Show skill in making a duplex joint and a T-joint.

- 8.1 Sketch a duplex joint and a T-joint
- 8.2 Perform skinning and scraping of two pieces of PVC duplex cal and two pieces of simplex PVC cables.
- 8.3 Make the joints according to sketches.
- 8.4 Write a report.

9. Show skill in preparing wiring circuit of two lamps controlled from the points separately.

- 9.1 Sketch a working circuit of two lamps controlled from two point separately.
- 9.2 Make the wiring circuit using required materials and equipment a wiring board.
- 9.3 Test the connection of circuit by providing proper supply.

10. Show skill in preparing wiring circuit of one lamp controlled from the points.

- 10.1 Sketch a working diagram of one lamp controlled by two SPD tumbler switches.
- 10.2 Complete the wiring circuit using required materials and equipment on wiring board.
- 10.3 Test the connection of circuit by providing proper supply.

11. Show skill in preparing wiring circuit of one bell with two indicating lamp controlled from two points.

- 11.1 Sketch a working diagram of one bell with two indicating lamps controlled by two push button switch.
- 11.2 Make the wiring circuit using required materials and equipment in wiring board.
- 11.3 Test the connection of circuit by providing proper supply.

12 Show skill in preparing wiring circuit of a fluorescent tube light.

- 12.1 Sketch a working diagram of a fluorescent tube light circuit.

12.3 Make the connection of a fluorescent tube light circuit using required materials and equipment.

12.4 Test the connection of the circuit by providing supply.