3.1 ELECTRICAL AND ELECTRONICS ENGINEERING MATERIALS

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RATIONALE

A diploma holder in Electrical Engineering will be involved in maintenance, repair and production of electrical equipment and systems. In addition, he may be required to procure, inspect and test electrical and electronic engineering materials. Knowledge of various types of materials will be needed in order to execute the above mentioned functions. He may also have to decide for an alternative when a particular material is either not readily available in the market or its cost becomes prohibitive.

DETAILED CONTENTS

1. Classification: (3 Hrs)

   Classification of material into conducting, semi conducting and insulating materials through a brief reference to their atomic structures and energy bands

2. Conducting Materials (12 Hrs)

   2.1 Introduction
   2.2 Resistance and factors affecting it such as alloying and temperature etc
   2.3 Superconductor
   2.4 Classification of conducting material as low resistivity and high resistivity materials
   Low resistance materials

   2.4.1 Copper:
   Its general properties as conductor, resistivity, temperature coefficient, density, mechanical properties of hard-drawn and annealed copper, corrosion, contact resistance. Application in the field of electrical engineering.

   2.4.2 Aluminium:
   General properties at conductor, resistivity, temperature coefficient, density, mechanical properties of hard and annealed aluminium, solderability, contact resistance. Applications in the field of electrical engineering.

   2.4.3 Steel:
   General properties at conductor, resistivity, corrosion, temperature coefficient, density, mechanical properties, solderability, Applications in the field of electrical engineering.

   2.4.4 Introduction to handle conductors and its applications.

2.4.5 Low resistivity copper alloys: Brass, Bronze (cadmium and Beryllium), their practical applications with reasons for the same

2.5 Applications of special metals e.g. Silver, Gold, Platinum etc.

2.6 High resistivity materials and their applications e.g., manganin, constantin, Nichrome, mercury, platinum, carbon and tungsten

2.7 Superconductors and their applications

3. Semi-conducting Materials (8 Hrs)

3.1 Introduction

3.2 Semi-conductors and their properties

3.3 Different semi-conducting materials (silicon and germanium) used in manufacture of various semiconductor devices (i.e p-type and n-type semiconductors)

3.4 Materials used for electronic components like resistors, capacitors, diodes, transistors and inductors etc.

4. Insulating materials; General Properties: (12 Hrs)

4.1 Electrical Properties:
Volume resistivity, surface resistance, dielectric loss, dielectric strength (breakdown voltage) dielectric constant

4.2 Physical Properties:
Hygroscopicity, tensile and compressive strength, abrasive resistance, brittleness

4.3 Thermal Properties:
Heat resistance, classification according to permissible temperature rise. Effect of overloading on the life of an electrical appliance, increase in rating with the use of insulating materials having higher thermal stability, Thermal conductivity, Electro-thermal breakdown in solid dielectrics

4.4 Chemical Properties:
Solubility, chemical resistance, weather ability

4.5 Mechnical properties, mechanical structure, tensile structure

5. Insulating Materials and their applications: (12 Hrs)

5.1 Plastics

5.1.1 Definition and classification

5.1.2 Thermosetting materials:
Phenol-formaldehyde resins (i.e. Bakelite) amino resins (urea formaldehyde and Malamine-formaldehyde), epoxy resins - their important properties and applications

5.1.3 Thermo-plastic materials:
Polyvinyl chloride (PVC), polyethelene, silicons, their important properties and applications

5.2 Natural insulating materials, properties and their applications

- Mica and Mica products
- Asbestos and asbestos products
- Ceramic materials (porcelain and steatite)
- Glass and glass products
- Cotton
- Silk
- Jute
- Paper (dry and impregnated)
- Rubber, Bitumen
- Mineral and insulating oil for transformers switchgear capacitors, high voltage insulated cables, insulating varnishes for coating and impregnation
- Enamels for winding wires
- Glass fibre sleeves

5.3 Gaseous materials; Air, Hydrogen, Nitrogen, SF_6 their properties and applications

6. Magnetic Materials: (9 Hrs)

6.1 Introduction - ferromagnetic materials, permeability, B-H curve, magnetic saturation, hysteresis loop (including) coercive force and residual magnetism, concept of eddy current and hysteresis loss, curie temperature, magnetostriction effect.

6.2 Soft Magnetic Materials:

6.2.1 Alloyed steels with silicon, high silicon, alloy steel for transformers, low silicon alloy steel for electric rotating machines

6.2.2 Cold rolled grain oriented steels for transformer, Non-oriented steels for rotating machine

6.2.3 Nickel-iron alloys

6.2.4 Soft Ferrites

6.3 Hard magnetic materials
Tungsten steel, chrome steel, hard ferrites and cobalt steel, their applications

7. Special Materials (4 hrs)
Thermocouple, bimetals, lead soldering and fuse material, mention their applications

8. Introduction of various engineering materials necessary for fabrication of electrical machines such as motors, generators, transformers etc (4 hrs)

RECOMMENDED BOOKS

1. Electrical and Electronic Engineering Materials by SK Bhattacharya, Khanna Publishers, New Delhi
2. Electronic Components and Materials by Grover and Jamwal, Dhanpat Rai and Co., New Delhi
3. Electrical Engineering Materials by Sahdev, Unique International Publications
4. Electronic Components and Materials by SM Dhir, Tata Mc Graw Hill, New Delhi
5. Electronic Engineering Materials by ML Gupta, Dhanpat Rai & Sons, New Delhi
6. Electrical Engineering Materials by PL Kapoor, Khanna Publishers, New Delhi
7. Electrical & Electronics Engineering Materials BR Sharma and Others, Satya Parkashan, New Delhi

3.2 FUNDAMENTALS OF ELECTRICAL ENGINEERING

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RATIONALE

For a diploma holder in electrical engineering, it becomes imperative to know the fundamentals of the subject in order to grasp the knowledge of the field. This subject will provide knowledge of fundamental concepts of electricity, magnetism and various principles related to it.

DETAILED CONTENTS

1. Applications and Advantages of Electrical Energy (03 hrs)

    1.1 Different forms of energy
    1.2 Advantages of electrical energy
    1.3 Difference between AC and DC
    1.4 Uses of electrical energy

2. Basic Electrical Quantities (03 hrs)

    2.1 Basic concept of charge, current, voltage, resistance, power, energy and their units
    2.2 Conversion of units of work, power and energy from one form to another

3. Batteries (10 Hrs)

    3.1 Basic idea about primary and secondary cells
    3.2 working principle, construction and applications of Lead acid battery and Nickel Cadmium cells, Silver Oxide Cells
    3.3 Charging methods used for lead acid accumulator
    3.4 Care and maintenance of lead acid battery
    3.5 Grouping of cells in series and parallel (simple numerical problems).

4. DC Circuits (6 Hrs)

    4.1 Ohm's law, resistances in series and parallel
    4.2 Kinchhoff laws and their applications in solving electrical network problems
    4.3 Network theorems such as theorem and Newton theorem
    4.4 Star-delta transformation

5. Magnetism and Electromagnetism: (6 Hrs)

    5.1 Introduction to electromagnetism, Magnetic field around a straight current carrying conductor and a solenoid and methods to find its direction, force between two parallel current carrying conductors.
    5.2 Force on a conductor placed in the magnetic field

5.3 Series magnetic circuits, simple problems
5.4 Concept of hyteresis, hysteresis loop and hysteresis loss.

6. Electromagnetic Induction: (8 Hrs)

6.1 Faraday's Laws of electromagnetic induction
6.2 Lenz's law
6.3 Fleming's Right and Left Hand Rule
5.3 Principle of self and mutual induction
5.4 Principle of self and mutually induced e.m.f. and simple problems
5.5 Inductances in series and parallel
5.6 Energy stand in a magnetic field
5.7 Concept of eddy currents, eddy current loss

7. AC Fundamentals (18 Hrs)

7.1. Concept of alternating current and voltage, equation of instantaneous values
7.2. Representation of alternating sinusoidal quantities by vectors
7.3. Phasor algebra (addition, subtraction, multiplication and division of complex quantities)

7.4. AC through pure resistance, inductance and capacitance
7.5. Concept of susceptance, conductance and admitance
7.6. Alternating voltage applied to RL,RC and RLC series and parallel circuits (impedance triangle, phasor diagram and their solutions)
7.7. Power in pure resistance, inductance, capacitance, RL, RC, RLC circuits
7.8. Active and reactive components of current and their significance
7.9. Power factor and its practical significance
7.10. Resonance in series and parallel circuits
7.11. J-notation and its application in solving problems in ac circuits

8. Polyphase systems

8.1 Advantages of 3 phase over single phase system
8.2 Star and delta connections (relationship between phase and line voltages, phase and line currents
8.3 Power in 3 phase circuits
8.4 Measurement of power and power factor of a 3 phase load by two wattmeter method

LIST OF PRACTICALS

1. To verify Ohm's law
2. To verify that $R_t = R_1+R_2+\ldots$ where R_1, R_2 etc. are resistances connected in series
3. To verify $R_t = \dfrac{R_1 R_2 R_3}{R_1+R_2+R_3}$ Where R_1, R_2 etc. are resistances connected in parallel

4. Verification of Kirchhoff's laws applied to DC circuits

   a) to construct a circuit arrangement consisting of resistances in series, parallel combination
   b) identification of msde points in the circuit
   c) to see that algebric sum of currents at made point is zero
   d) to see that algebric sum of e.m.f.s. and voltage drops in a closed loop is zero

5. Filament lamp
   a) measure the resistance of a cold lamp filament with the help of multimeter
   b) measuer the current drawn by the lamp at different voltages from zero to 220 volts and the resistance of lamp at different voltages, plot a graph between resistance and voltage

6. To find ratio of inductance values of a coil having air /iron core respectively and to see the effect of introduction of a magnetic core on coil inductance

7. To construct an R-L series circuit and to measure:

   (a) impedance (z) of the circuit
   (b) Inductive reactance (X_L) of the circuit by measuring voltage drop across the inductance dividing it by the current through the circuit
   c) to verify impedance $Z = \sqrt{(R^2+X^2_L)}$
   d) to determine phase angle between voltage and current and its power factor
   e) construct its impedance triangle

9. To construct an RLC series circuit and to measure

   a) its impedance
   b) inductive (X_L) and capacitive reactance(X_c)
   c) verify $z= \sqrt{R^2+(X_L- X_c)^2}$
   d) measure phase angle between voltage and current
   e) construct impedance triangle

9. Measurement of power and power factor of a single phase RC, RL and RLC circuit. To calculate KVA and KVAR

10. Measurement of power and power factor of a 3 phase circuit by using 2 wattmeter and 3 wattmeter method. To calculate KVA and KVAR

12. Testing a battery for its changed condition and to charge it

Note: The result should be verified analytically also.

RECOMMENDED BOOKS

1. Electrical Science by VK Mehta, S Chand & Co., New Delhi
2. Electrical Science by Sahdev, Unique International Publication, Jalandhar
3. Electrical Engineering by DR Arora, Ishan Publications, Ambala
4. Electrical Science by JB Gupta, SK Kataria & Sons, New Delhi
5. Electrical Technology by BL Theraja, S Chand & Co., New Delhi
6. Electrical Science by Trilok Singh, SK Kataria, New Delhi
7. Electrical Science by S. Chandhni, R Chakrabarti and PK Chattopadhyay. Narosa Publishing House Pvt. Ltd., New Delhi
8. Basic Electrical Engineering by Mool Singh, Galgotia Publication Pvt. Ltd., New Delhi
9. Basic Electrical Engineering by PS Dhogal, Tata McGraw Hill, New Delhi
10. Principles of Electrical Engineering y BR Gupta, S Chand & Co., New Delhi
11. Handbook of Electrical Engineering by SL Bhatia, Khanna Publishers, New Delhi
12. Electrical Power System by S Channi Singh, McGraw Publishing Co.

3.3 BASIC ELECTRONICS

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RATIONALE

At present electronics gadgets are being extensively used in manufacturing process in industries, power system operations, communication systems, computers etc. Even for an electrical diploma holder, it is absolutely necessary to take a basic understanding of electronics components, their function and applications. This understanding should facilitate in operation and maintenance equipments which are electronically controlled.

In this course, topics like electronics components, semi-conductor physics, rectifiers, and amplifiers have been included. The remaining topics are included in electronic devices and circuits.

DETAILED CONTENTS

1. Introduction (5 hrs)

    1.1 Brief history of development of electronics
    1.2 Active and passive components
    1.3 Concept of current and voltage sources, constant voltage and current sources, their graphical representation. Conversion of voltage source into current source and vice-versa
    1.4 Difference between actual voltage source and constant voltage source

2. Semi-conductor Theory (10 hrs)

    2.1 Atomic structure, crystaline structure
    2.2 Energy band theory of crystals, energy band structure of insulator, semiconductor and conductor, generation and recombination. Energy band structure of Silicon and Germanium
    2.3 Silicon versus Germanium for mobility and conductivity
    2.4 Concept of intrinsic and extrinsic semiconductors
    2.5 Effect of temperature on intrinsic and extrinsic semiconductors

3. Semiconductor Diodes (10 hrs)

    3.1 PN Junction, mechanism of current flow in PN junction, drift and diffusion currents, depletion layer, potential barrier, effect of forward and reverse biasing and a PN junction. Concept of junction capacitance in forward and reverse biased conditions. Breakdown mechanism
    3.2 Ideal diode, Semiconductor diode characteristics, static and dynamic resistance
    3.3 Use of diode as half wave and full wave rectifiers (centre tapped and bridge type), relation between DC output and AC input voltage, rectifier efficiency

3.4 Concept of ripples, filter circuits – shunt capacitor, series inductor, and pie (π) filters and their applications
3.5 Diode ratings/specifications
3.6 Various types of diodes such as zener diode, varactor diode, schottky diode, light emitting diode, tunnel diode, photo diode; their working characteristics and applications
3.7 Zener diode and its characteristics
3.8 Use of zener diode for voltage stablization

4. Bi-polar Transistors (7 hrs)

4.1 Concept of junction transistor, PNP and NPN transistors, their symbols and mechanism of current flow
4.2 Transistor configurations: common base (CB), Common emitter (CE) and common collection (CC), current relation and their input/output characteristics; comparison of the three configurations

5. Transistor Biasing and Stabilization (10 hrs)

5.1 Transistor biasing, its need, operating point and need of stabilization of operating point.
5.2 Difference between circuits, limitations, simple problems to calculate operating point in different biasing circuits. Use of thevenin theorem to determine operating point
5.3 Effect of temperature on the operating point of a transistor
5.4 Concept of h-parameters of a transistor
5.5 Use of data book to know the parameters of a given transistor

6. Single-Stage Transistor Amplifiers (10 hrs)

6.1 Single stage transistor amplifier circuit in CE configuration, function of each component
6.2 Working of single stage transistor amplifier, physical and graphical explanation, phase reversal
6.3 Concept of DC and AC load line
6.4 Voltage gain of single stage transistor amplifier using characteristics of the device
6.5 Concept of input and output impedance
6.6 AC equivalent circuit of single stage transistor amplifiers
6.7 Calculation of voltage gain using AC equivalent circuit
6.8 Frequency response of a single stage transistor amplifier

7. Multi-Stage Transistor Amplifiers (7 hrs)

7.1 Need of multi-stage transistor amplifiers – different types of couplings, their purpose and applications.
7.2 Knowledge of various terms such as voltage gain, current gain, power gain, frequency response, decibel gain and band width

7.3 RC coupled two-stage amplifiers, circuit details, working, frequency response, applications
7.4 Loading effect in multistage amplifiers
7.5 Elementary idea about direct coupled amplifier, its limitations and applications
7.6 Transformer coupled amplifiers, its frequency response. Effect of co-efficient of coupling on frequency response. Applications of transformer coupled amplifiers

8. Field Effect Transistor (FET) (05 hrs)

8.1 Construction, operation, characteristics and applications of a N channel JFET and P channel JFET
8.2 JFET as an amplifier
8.3 Construction, operation, characteristics and applications of a MOSFET in depletion enhancement mode
8.4 Comparison between BJT, JFET and MOSFET

LIST OF PRACTICALS

1. a) Identification and testing of electronic components such as resistor, inductor, capacitor, diode, transister
   b) Measurement of resistances using multimeter and their comparison with colour code values

2. V-I characteristics of a Semiconductor diode and to calculate its static and dynamic resistance

3. a) V-I characteristics of a zenor diode and finding its reverse breakdown voltage
   b) Fabrication of a zenor diode voltage stabilizer circuit using PCB

4. Observation of input and output wave shapes of a half-wave rectifier and verification of relationship between dc output and ac input voltage

5. Observation of input and output wave shapes of a full wave rectifier and verification and relationship between dc and ac input voltage

6. Observation of input wave shape of a full wave rectifier with (i) shunt capacitor) (ii) series induction (iii) Π filter circuits

7. Plotting input and output characteristics of a transistor in CB configuration

8. Plotting input and output characteristics of a transistor in CE configuration

9. Measurement of operating point in case of (i) fixed biased circuit (ii) potential divider biasing circuit and to observe the effect of temperature variation on the operating point.

10. To measure the voltage gain of a single stage amplifier using CE configuration at different loads

11. To plot frequency response curve of a single stage transistor amplifier using semilog sheet and to measure its band width

12. To measure the voltage gain of a two-stage RC coupled amplifier (a) as individual stages (b) after coupling as multi-stage amplifier (c) to study effect of coupling capacitor on frequency response

13. To plot frequency response curve of a two stage RC coupled amplifier using semi-log sheet and measure the band width

14. To plot V-I characteristics of a FET

RECOMMENDED BOOKS

1. Basic Electronics and Linear Circuits by NN Bhargava, Tata McGraw Hill, New Delhi

2. Analog Electronics by BP Arora, Ishan Publications, Ambala

3. Electronic Principles by SK Sahdev, Dhanpat Rai & Co., New Delhi

4. Electronic Devices and Circuits by R Boylestead

5. Electronic Devices and Circuits by Ravi Raj Dubey

6. Analog Electronics by JC Karhara, King India Publication, New Delhi

7. Electrical Devices and Circuits by Rama Reddy, Narosa Pulishing House Pvt. Ltd., New Delhi

8. Principles of Electronics by SK Bhattacharya and Renu Vig, SK Kataria and Sons, Delhi

3.4 ELECTRICAL ENGINEERING DESIGN AND DRAWING - I

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RATIONALE

A polytechnic pass-out in electrical engineering is supposed to have ability to :

i) Read, understand and interpret engineering drawings

ii) Communicate and correlate through sketches and drawings

iii) Prepare working drawings of alternative panels, transmission and distribution

The contents of this subject has been designed to develop requisite knowledge and skills of electrical drawings in the students of diploma in electrical engineering.

DETAILED CONTENTS

1. Simple light and Alarm Circuits (10 hrs)

2.1 One lamp controlled by two switches (staircase circuit)
2.2 Two lamps controlled by three switches (double staircase circuit)
2.3 Circuit using master switch
2.4 Fluorescent tube controlled from one switch
2.5 One bell controlled by one push button
2.6 Two ordinary bells (for day and night) used at a distant residence
2.7 Nos. of bells controlled by separate switches
2.8 Bell response circuit using one bell and one relay
2.9 Bell response circuit of an office (for three rooms)
2.10 Traffic light control system for two road crossing

3. Design and draw wiring circuit of a two room set for light and fan circuit (14 hrs)

3.1 To draw Installation plan and wiring diagram of two room house
3.2 Conductor size calculation
3.3 List of material required with cost by doing market survey
3.4 Description of various tests to test the wiring installation before commissioning

4. Orthographic Projection of Simple Electrical parts (8 hrs)

4.1 Kit kat fuse base
4.2 Kit kat fuse carrier
4.3 Bus bar post
4.4 Pin type and shackle type insulator
4.5 Engineering translator
4.6 Stay insulators

4.7 M.C.B.
4.8 E.L.C.B.
4.9 Bobbin of a small transformer/choke

RECOMMENDED BOOKS

1. Electrical Engineering Design and Drawings by Surjit Singh, Khanna Publishers, New Delhi
2. Electrical Engineering Design and Drawings by SK Bhattacharya, SK Kataria and Sons, New Delhi
3. Electrical Engineering Design and Drawings by Ubhi & Marwaha, IPH, New Delhi
4. Electrical Design and Drawing by SK Sahdev, Unique International Publications, Jalandhar

3.5 COMPUTER PROGRAMMING AND APPLICATIONS (For Electrical Engineering)

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RATIONALE

Computers play a very vital role in present day life, more so, in the professional life of diploma engineers. With the extensive use of Information Technology in large number of areas, the diploma engineers should be well conversed with these environments. In order to enable the students to use the computers effectively in problem solving, this course offers the modern programming languages like C along with exposition to various engineering applications of computers.

DETAILED CONTENTS

1. Information Storage and Retrieval

    1.1 Need for information storage and retrieval

    1.2 Creating data base file

    1.3 Querying database file on single and multiple keys

    1.4 Ordering the data on a selected key

    1.5 Programming a very simple application

2. Programming in C

    2.1 Basic structure of C programs

    2.2 Executing a C program

    2.3 Constants, variables, and data types

    2.4 Operators and expressions

    2.5 Managing Input-Output operations like reading a character, writing a character, formatted input, formatted output through print, scan, getch, putch statements etc.

    2.6 Decision making and branching using IF ..... else, switch, go to statements

    2.7 Decision making and looping using do-while, and for statements

    2.8 Arrays - one dimensional and two dimensional

    2.9 File

3. Computers Application Overview

   3.1 Commercial and business data processing application

   3.2 Engineering computation

   3.3 CAD, CAM, CAE, CAI

4. Typical Applications:

   Students will be required to make a small programme for analysis of circuits design in Electrical Engineering components or any other area.

   Use of various software available in the field of electrical engineering

LIST OF PRACTICALS

1. Creating database.
2. Querying the database.
3. Report generation.
4. Programming in dbase
5. Use of spread sheets/Matlan/Mathematica/Eureka (or any other package) for engineering computers.
6. Use of design packages (appropriate design packages may be selected depending upon the availability) on Estimating and Costing, Analysis of rates and other areas
7. Use of and electrical engineering related CAI packages.
8. Programming for DAS and control.
9. Exercises on data acquisition.
10. Exercises on control - on/off switch, and proportional control.
11. Programming exercise on executing C program
12. Programming exercise on editing C program
13. Programming exercise on defining variables and assigning values to variables.
14. Programming exercise on arithmetic and relational operators.
15. Programming exercise on arithmetic expressions and their evaluation.
16. Programming exercise on reading a character.
17. Programming exercise on writing a character.
18. Programming exercise on formatting input using print.
19. Programming exercise on formatting output using scan.
20. Programming exercise on simple if statement.
21. Programming exercise on IF .... else statement.
22. Programming exercise on switch statement.
23. Programming exercise on go to statement.
24. Programming exercise on do-while statement.
25. Programming exercise on for statement.
26. Programming exercise on one-dimensional arrays.

27. Programming exercise on two-dimensional arrays.
28. Exercises on
    - Internet use/application
    - Typical application on Electrical Engineering

RECOMMENDED BOOKS

1. Programming in C by Sachaum Series, McGraw Hills
2. The essentials of Computer Organizing and Architecture by Linda Null and Julia Labur, Narosa Publishing House Pvt. Ltd., New Delhi
3. Programming in C by Kerning Lan and Riechie Prentice Hall of India, New Delhi
4. Programming in C by Balaguru Swamy, Tata McGraw Hill, New Delhi
5. Let us C – Yashwant Kanetkar, BPB Publications, New Delhi
6. Vijay Mukhi Series for C and C++
7. Elements of C by MH Lewin, Khanna Publishers, New Delhi
8. Programming in C by R Subburaj, Vikas Publishing House Pvt. Ltd., Jangpura, New Delhi
9. Programming in C by Kris A Jansa, Galgotia Publications Pvt. Ltd., Daryaganj, New Delhi
10. Programming in C by BP Mahapatra, Khanna Publishers, New Delhi

3.6 ELECTRICAL WORKSHOP PRACTICE-I

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RATIONALE

An electrical diploma holder will be required to inspect, test and modify the work done by skilled workers working under him. In addition, many a times, it will become necessary for him to demonstrate the correct method and procedure of doing a job. In order to carry out this function effectively in addition to conceptual understanding of the method or procedure he must possess appropriate manual skills. The subject aims at developing special skills required for repairing, fault finding, wiring in electrical appliances and installations.

DETAILED CONTENTS

1. Study of electrical safety measures and shock treatment

2. Wire jointing
   - 2.1 Straight married joint
   - 2.2 Technology-joint
   - 2.3 Western union joint
   - 2.4 Britania joint
   - 2.5 Twist sleeve joint
   - 2.6 Bolted type joint

3. Filling of thimbles and crimping of thimbles (using hydraulic and hand crimp)

4. Types of wiring and to make different light control circuits in the following types of wiring

   - 4.1 Casing caping (PVC) wiring
   - 4.2 Conduit wiring (surface/concealed)

5. Wiring of main distribution board with four outgoing circuits for light and fan loads including main switch and fuses (only internal connection)

6. Construction of an extension board with two 5A sockets, one 15A socket controlled by their respective switches, a fuse and indicator

7. Wiring of a switch board containing at least two switches, one fan regulator and one 5A socket controlled by their respective switches using (i) tumbler switches (ii) flush type switches

11. Wiring of a series test lamp board and to use it for finding out simple faults

12. Testing of domestic wiring installation using meggar

13. Fault finding and repair of a tube light circuit

14. Wiring and testing of alarm and indicating circuits using relay, push buttons and bells (simple single phase circuits)

15. Assembly of a 4-way distribution board using MCB, main switch and ELCB

16. Repair and maintenance of domestic electric appliances, i.e. electric iron, geyser, fan, heat converter, washing machine, desert room cooler, room heater, electric kettle, electric oven, electric furnace etc.