SEMESTER THIRD

DEE301 BASIC ELECTRICAL ENGINEERING L3:T0:P0

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 acquaintance with various terms knowledge of fundamental concepts of electricity, magnetism and various principles related to it.

DETAILED CONTENTS

Unit-1

Application and Advantages of Electrical Energy & DC circuits:

Different forms of energy, Advantages of electrical energy, Use of electrical energy, Basic Electrical Quantities; Basic concept of charge, current, voltage, resistance, power, energy and their units. Conversion of units of work, power and energy from one form to another.

DC Circuits: Ohm's law, resistances in series and parallel, Kirchhoff's laws and their applications in solving electrical network problems, Network theorems such as Thevenin's theorem, superposition theorem, Maximum power transfer theorem and Norton's theorem.

Unit-2

Batteries: Basic idea about primary and secondary cells, Working principle, construction and applications of Lead acid, Nickel Cadmium and Silver Oxide Cells.

Charging methods used for lead acid accumulator, Care and maintenance of a lead acid battery, grouping of cells in series and parallel (simple numerical problems).

Testing of lead Acid battery for fully charged conditions and their specifications.

Unit-3

Magnetism and Electromagnetism, Electromagnetic Induction: Introduction to electromagnetism, Magnetic field due to a straight current carrying conductor and a solenoid and rules for finding its direction, force between two parallel current carrying conductors. Force on a conductor placed in the magnetic field, Series magnetic circuits, simple problems, Concept of hysteresis loop and hysteresis loss.

Electromagnetic Induction; Faraday's Laws of electromagnetic induction, Lenz's law

Fleming's Right and Left Hand Rule, Principle of self and mutually induced e.m.f. and simple problems, Inductances in series and parallel, Energy stored in a magnetic field, Concept of eddy currents and eddy current loss

Unit-4

AC fundamentals & AC circuits: Concept of a.c generation(single phase and three phase),Difference between a.c and d.c, Concept of alternating current and voltage, equations for instantaneous values, average values, r.m.s value, form factor, power factor etc. Concept of phasor and phase difference, Representation of alternating sinusoidal quantities by vectors,Phasor algebra (addition, subtraction, multiplication and division of complex quantities),AC through pure resistance, inductance and capacitance, Alternating voltage applied to RL,RC and RLC series and parallel circuits (impedance triangle, phasor diagram and their solutions),Concept of succeptance, conductance and admittance, Power in pure resistance, inductance, , Active and reactive components of current and their significance, Power factor and its practical significance

Unit-5

Poly-phase Systems : Advantages of 3 phase over single phase system, Star and delta connections (Derive relationship between phase and line voltages, phase and line currents in star delta connections, Power in 3 phase circuits and measurement by two wattmeter method, Measurement of power and power factor of a 3-phase load by two wattmeter method using balanced/unbalanced load.

DEE301P BASIC ELECTRICAL ENGINEERING LAB L0:T0:P2

LIST OF PRACTICALS

1. (a) Determination of voltage-current relationship in a dc circuit under specific physical conditions and to draw conclusions (to verify ohm's law).

(b) Filament lamp; Measure the resistance of a cold lamp filament with the help of calculations.

Measure the current drawn by the lamp at different voltages from zero to 220 volt and the resistance of lamp at different voltages, plot a graph between current and voltage.

2. (a) To verify that, $R_t = R_1+R_2+\ldots\ldots+Rn$ where $R_1, R_2, \ldots\ldots R_n$ etc. are resistances connected in series.

(b) To verify that, $1/Rt = 1/R_1 + 1/R_2 + \ldots\ldots\ldots + 1/R_n$ Where R_1, R_2 etc. are resistances connected in parallel.

3. Verification of Kirchhoff's current and voltage law applied to DC circuits.

(a) To construct a circuit arrangement consisting of resistances in series, parallel combination.

(b) Identification of node points in the circuit.

(c) To see that algebraic sum of currents at node point is zero.

(d) To see that algebraic sum of emfs and voltage drops in a closed loop is zero.

4. To observe the a.c and d.c wave shapes on CRO.

5. 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 inside a coil.

6. To construct an RL and RC ^{circuit} and to measure

a) Impedance of the circuit

b) Phase angle between voltage and current

c) Construct impedance triangle

7. Measurement of power and power factor of a single phase RLC circuit. To calculate KVA and KVAR.

8. Measurement of power and power factor of a 3-phase circuit by using 2- wattmeter method using induction motor as a load and to calculate KVA and KVAR.

9. Testing a battery for its charged condition and to charge it/replace it.

Note: The results should be verified analytically also.

INSTRUCTIONAL STRATEGY

Basic electrical engineering being a fundamental subject need to be handled very carefully and in a manner such that students develop clear understanding of principles and concepts and develop skill in their application in solving related problems. Teacher may lay emphasis on laboratory experiments and give lot of tutorial work to students in order to giver them an opportunity in mastering the basics in solving related problems

RECOMMENDED BOOKS

1. Fundamentals of Electrical Engineering by Sahdev, Uneek Publication, Jalandhar
2. Basic Electrical Engineering by PS Dhogal, Tata McGraw Hill Education Pvt. Ltd., New Delhi
3. Electrical Science by VK Mehta, S Chand and Co., New Delhi
4. Electrical Engineering by DR Akrora, Ishan Publications, Ambala
5. Electrical Technology by JB Gupta, SK Kataria and Sons, New Delhi
6. Electrical Technology by BL Theraja, S Chand & Co., 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. Principles of Electrical Engineering by BR Gupta, S Chand & Co., New Delhi

DEE302 ANALOG ELECTRONICS L3:T0:P0

RATIONALE

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

In this course, topics like semi-conductor theory, semi-conductor Diodes, Bipolar transistors, rectifiers, field effect transistors have been included.

DETAILED CONTENTS

Unit-1

Introduction of Electronics & Semiconductor Theory: Brief history of development of electronics, Active and passive components, Concept of current and voltage sources, constant voltage and current sources, their graphical representation. Conversion of voltage source into current source and vice-versa, Difference between actual voltage source and constant voltage source, Atomic structure, crystalline structure, Energy band theory of crystals, energy band structure of insulator, semiconductor and conductor, generation and recombination of electron hole pairs. Energy band structure of Silicon and Germanium, Silicon versus Germanium for mobility and conductivity, Concept of Doping, intrinsic and extrinsic semiconductors, Effect of temperature on intrinsic and extrinsic semiconductors

Unit-2

Semiconductor Diodes: PN Junction , mechanism of current flow in PN junction, drift and diffusion currents, depletion layer, potential barrier, effect of forward and reverse biasing in a PN junction. Concept of junction capacitance in forward and reverse biased conditions. Breakdown mechanism, Ideal diode, Semiconductor diode, characteristics, static and dynamic resistance, 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, Diode ratings/specifications

Various types of diodes such as zener diode, varactor diode, schottky diode, light emitting diode, tunnel diode, photo diode; their working characteristics and applications , Use of zener diode for voltage stabilization.

Unit-3

Bipolar Transistors, Transistor Biasing & Stabilization: Concept of junction transistor, PNP and NPN transistors, their symbols and mechanism of current flow, Transistor configurations: common base (CB), common emitter (CE) and common collector (CC), current relation and their input/output characteristics; comparison of the three configurations.

Transistor biasing, its need, operating point, effect of temperature on the operating point of a transistor and need of stabilization of operating point.

Unit-4

Feedback in Amplifiers: Feedback and its importance, positive and negative feedback and their need, Voltage gain of an amplifier with negative feedback **,** Effect of negative feedback on voltage gain, stability, distortion, band width, output and input impedance of an amplifier (No mathematical derivation) **,**Typical feedback circuits

Unit-5

Field Effect Transistor (FET): Construction, operation, characteristics and applications of a N channel JFET and P channel JFET, JFET as an amplifier

Types, construction, operation, characteristics and applications of a MOSFET

Comparison between BJT, JFET and MOSFET Elementary idea about direct coupled amplifier, its limitations and applications, Transformer coupled amplifiers, its frequency response. Effect of co-efficient of coupling on frequency response. Applications of transformer coupled amplifiers

DEE302P ANALOG ELECTRONICS LAB L0:T0:P2

LIST OF PRACTICALS

1. a) Identification and testing of electronic components such as resistor, inductor, capacitor, diode, transistor and different types of switches used in Electronic circuits
   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 zener diode and finding its reverse breakdown voltage
   b) Fabrication of a zener 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 and output wave shapes of a full wave rectifier with (i) shunt capacitor) (ii) series inductor (iii) 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 and band width by plotting frequency response curve of a single stage amplifier using CE configuration at different loads
11. To study the effect of coupling capacitor on lower cut off frequency and upper cut off frequency by plotting frequency response curve of a two stage RC coupled amplifier
12. To plot V-I characteristics of a FET

INSTRUCTIONAL STRATEGY

This subject gives the knowledge of fundamental concepts of basic electronics. The teacher should give emphasis on understanding of concepts and various term used in the subject. The students be made familiar with diodes, transistors, resistors, capacitors, inductors etc. and electrical measuring instruments etc. Practical exercises will reinforce various concepts. Application of Semiconductor Diodes, Transistors, Field Effect Transistors etc must be told to students.

RECOMMENDED BOOKS

1. Basic Electronics and Linear Circuit by NN Bhargava, Kulshreshta and SC Gupta, Tata McGraw Hill Education Pvt Ltd, New Delhi.
2. Electronic Principles by SK Sahdev, Dhanpat Rai & Co., New Delhi
3. Principles of Electrical and Electronics Engineering by VK Mehta; S Chand and Co., New Delhi
4. Electronic Components and Materials by SM Dhir, Tata McGraw Hill Publishing Com;pany Pvt Ltd, New Delhi.
5. Principles of Electronics by SK Bhattacharya and Renu Vig, SK Kataria and Sons, Delhi
6. Electronics Devices and Circuits by Millman and Halkias; McGraw Hill.
7. Principles of Electronics by Albert Paul Malvino; Tata McGraw Hill Education Pvt Ltd, New Delhi.
8. Basic Electronics – Problems and Solutions by Albert Malvino and David J. Bates; Tata McGraw Hill Education Pvt Ltd, New Delhi.

9. Basic Electronics by J.S. Katre, Sandeep Bajaj, Tech. Max. Publications, Pune.
10. Analog Electronics by DR Arora, Ishan Publications, Ambala City.
11. Analog Electronics by JC Karhara, King India Publication, New Delhi
12. Electrical Devices and Circuits by Rama Reddy, Narosa Pulishing House Pvt. Ltd., New Delhi
13. Electronic Devices and Circuits by Dharma Raj Cheruku and Battula Tirumala Krishna: Pearson Education (Singapore) Pvt Ltd., Indian Branch, 482 F.I.E Patparganj, Delhi- 92
14. Basic Electronics by JB Gupta, SK Kataria and Sons, New Delhi
15. Grob's Basic Electronics- A text Lab Manual (Special Indian Edition) by Schultz, Tata McGraw Hill Education Pvt Ltd, New Delhi.

DEE303 ELECTRICAL ENGINEERING MATERIALS L3:T0:P0

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 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

Unit-1

Classification of Materials & Conducting Materials: Classification of materials into conducting, semi conducting and insulating materials through a brief reference to their atomic structure and energy bands, Resistance and factors affecting it such as alloying and temperature etc, Classification of conducting material as low resistivity and high resistivity materials,

Low resistance material.

a. Copper:

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.

b. Aluminium:

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

c. Steel:

General properties as conductor: Resistivity, corrosion, temperature coefficient, density, mechanical properties, solderability, Applications in the field of electrical engineering.

Unit-2

Introduction of bundle conductors & **Review of Semi –Conducting Materials:** Introduction to bundle conductors and its applications. Low resistivity copper alloys:

Brass, Bronze (cadmium and Beryllium), and their practical applications with reasons for the same, Applications of special metals e.g. Silver, Gold, and Platinum etc. High resistivity materials and their applications e.g., manganin, constantin, Nichrome, mercury, platinum, carbon and tungsten, Tantalum, Superconductors and their applications, Review of Semi-conducting Materials

Unit-3

General properties of Insulating Materials :

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

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

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

Chemical Properties: Solubility**,** chemical resistance, weatherability

Mechanical properties, mechanical structure, tensile structure

Unit-4

Insulating Materials & their Applications: Plastics-Definition and classification Thermosetting material: Phenol-formaldehyde resins (i.e. Bakelite) amino resins (urea Formaldehyde and Melamine-formaldehyde),epoxy resins - their important Properties and applications Procedure of preparation of plastic (PVC), Thermo plastic material,

Natural insulating materials and their applications: Mica and Mica products, Asbestos and asbestos products, Ceramic material (porcelain and steatite),Glass and glass products, Cotton, Silk, 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, Gaseous materials; Air, Hydrogen, Nitrogen, SF6 their properties and applications

Unit-5

Magnetic Materials & special Materials: 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, method of reduction of eddy current loss and hysteresis loss.

Soft Magnetic Materials: Alloyed steels with silicon: High silicon, alloy steel for transformers, low silicon alloy steel for electric rotating machines, Cold rolled grain

Oriented steels for transformer, Non-oriented steels for rotating machine, Nickel-iron alloys, Soft Ferrites

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

Special Materials: Thermocouple, bimetal, leads soldering and fuses material, mention their applications, Introduction of various engineering materials necessary for fabrication of electrical machines such as motors, generators, transformers etc

INSTRUCTIONAL STRATEGY

The teacher should bring different materials, electronic components and devices in the class while taking lectures and explain and make students familiar with them. Also he may give emphasis on practical applications of these devices and components in the field. In addition, the students should be given exercises on identification of materials used in various electronic gadgets etc .and be encouraged to do practical work independently and confidently.

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, Uneek International Publications
4. Electronic Components and Materials by SM Dhir, Tata Mc Graw Hill, New Delhi
5. Electrical Engineering Materials by PL Kapoor, Khanna Publishers, New Delhi

6. Electrical and Electronics Engineering Materials BR Sharma and Others, Satya Parkashan, New Delhi

7. Electrical and Electronics Engineering Materials DR Arora, Ishan Publications, kAmbala City

8. Electrical Engineering Materials by Rakesh Dogra, SK Kataria and Sons, NEW Delhi

DEE304 ELECTRICAL MEASUREMENTS L3:T0:P0

RATIONALE

Diploma holders in Electrical Engineering have to work on various jobs in the field as well as in testing laboratories and on control panels, where be performs the duties of installation, operation, maintenance and testing by measuring instruments. Persons working on control panels in power plants, substations and in industries will come across the use of various types of instruments and have to take measurements.

Instruments used to read and observe the general electrical quantities like current, voltage, power, energy, frequency, resistance etc and their wave shapes, have been incorporated in this subject. So the technician will know the construction and use of various types of electrical instruments.

DETAILED CONTENTS

Unit-1

Introduction to Electrical Measuring Instruments: Concept of measurement and measuring instruments ,Types of electrical measuring instruments – indicating, integrating and recording type instruments ,Essentials of indicating instruments – deflecting, controlling and damping torque

Unit-2

Ammeters and Voltmeters (Moving coil and moving iron type): Concept of ammeters and voltmeters and difference between them, Extension of range of voltmeters and ammeter, Construction and working principles of moving Iron and moving coil instruments, Merits and demerits, sources of error and application of these instruments**,**

Unit-3

Wattcmeters (Dynamometer Type) and Energy meter (Induction type)

Construction, working principle, merits and demerits of dynamometer type wattmeter, sourc;es of error .Construction, working principle, merits and demerits of single-phase and three-phase energy meters ,Errors and their compensation , Simple numerical problems, Construction and working principle of maximum demand indicators

Unit-4

Miscellaneous Measuring Instruments: Construction, working principle and application of Meggar, Earth tester, Multimeter, Frequency meter (dynamometer type) single phase power factor meter (Electrodynamometer type). Working principle of synchroscope and phase sequence indicator, tong tester (Clamp-on meter).

Instrument Transformers: Construction, working and applications

a) CT

b) PT

Unit-5

Electronic Instruments, LCR meters and Power Measurements in 3-phase circuits: Cathode Ray Oscilloscope: Block diagram, working principle of CRO and its various controls. Applications of CRO. Digital multi-meter (only block diagram) and Applications**,** Study of LCR meter and its applications**, 2** wattmeter method in balanced and unbalanced circuits and simple problems, three wattmeter method

DEE304P ELECTRICAL MEASUREMENTS LAB L0:T0:P2

LIST OF PRACTICALS

1 Use of analog and digital multimeter for measurement of voltage, current (a.c/d.c) and resistance

2. To calibrate 1-phase energy meter by direct loading method.

3 .To measure the value of earth resistance using earth tester.

4. To measure power, power factor in a single-phase circuit, using wattmeter and power factor meter and to verify results with calculations.

5. Measurement of power and power factor of a three-phase balanced load by two wattmeter method.

6. Measurement of voltage and frequency of a sinusoidal signal using CRO and draw wave shape of signal.

7. Measurement of power in a 3 phase circuit using CT, PT and 3-phase wattmeter.

8. Use of LCR meter for measuring inductance, capacitance and resistance.

9. To record all electrical quantities from the meters installed in the institution premises.

10. To measure Energy at different Loads using Single phase Digital Energy meter.

INSTRUCTIONAL STRATEGY

After making the students familiar with measuring instruments, they should be made conceptually clear about the constructional features and make them confident in making connection of various measuring instruments. Teacher should demonstrate the application of each measuring instrument in laboratory and encourage students to use them independently.

RECOMMENDED BOOKS

1. Electrical Measurements and Measuring Instruments by Golding and Widdis; Wheeler Publishing House, New Delhi

2. Electrical Measurements and Measuring Instruments by SK Sahdev, Unique International Publications, Jalandhar

3. A Course in Electrical Measurement and Measuring Instruments by AK Sawhney and PL Bhatia; Dhanpat Rai and Sons, New Delhi

4. Electric Instruments by D. Cooper

5. Experiments in Basic Electrical Engineering by SK Bhattacharya and KM Rastogi, New Age International (P) Ltd., Publishers, New Delhi

6. Electronics Instrumentation by Umesh Sinha, Satya Publication, New Delhi

7. Basic Electrical Measurements by Melville B. Staut.

8. Electrical Measurement and Measuring Instruments by JB Gupta, SK Kataria and Sons, New Delhi

9. Electrical Measurement and Measuring Instruments by ML Anand, SK Kataria and Sons, New Delhi

DEE305P ELECTRICAL ENGINEERING DESIGN AND DRAWING L2:T0:P4

RATIONALE

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

i) Read, understand and interpret engineering drawings
ii) Communicate and co-relate through sketches and drawings
iii) Prepare working drawings of panels, transmission and distribution

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

DETAILED CONTENTS

Unit-1

Symbols and Signs Conventions: Various Electrical Symbols used in Domestic and Industrial Installation and Power System as per BIS.

Unit-2

Panels/Distribution Boards: Design and Drawing of panels/Distribution board using MCBs, ELCB, main switches and change over switches for domestic installation, Industrial and commercial installation.

Unit-3

Orthographic projections of Simple Electrical Parts:

- Kit Kat
- Bus bar post/ Kit Kat
- Pin type and shackle type insulator (Pin Type 11kV/66kV)
- Bobbins of a small transformer / choke
- Stay insulators/Suspension type insulators
- Free hand sketching of M.C.B. and E.L.C.B Placed on Distribution Board.

Unit-4

Orthographic Projection of Machine Parts:

- Rotor of a squirrel cage induction motor
- Motor body (induction motor) as per IS Specifications (using outside dimensions)
- Slip rings of 3-phase induction Motor.
- Stator of 3 phase Induction motor (Sectional View)

Unit-5

Contactor Control Circuits: Schematic and wiring diagram and introduction of CADD:

- DOL Starter of 3-phase induction Motor.
- Forwarding/reversing of 3-phase induction motor
- Limit switch control of a 3-phase induction motor
- Sequence operation of two motors using T.D.R.
- Two speed motor control.
- Automatic star-delta starter for 3-phase induction motor.

Introduction to CADD

INSTRUCTIONAL STRATEGY

Teacher should identify/prepare more exercises on the pattern shown above. The teacher should make the students confident in making drawing and layouts of electrical wiring installations and doing estimation and costing. This capability will lead the students to become a successful entrepreneur. Take the students to field/laboratory and show the material and equipment.

RECOMMENDED BOOKS

1. Electrical Engineering Design and Drawings by Surjeet Singh, Dhanpat Rai and Co, 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, Uneek Publications, Jalandhar

5. Electrical Engineering Drawing by Surjit Singh, SK Kataria and Sons, New Delhi

DEE306P ELECTRICAL WORKSHOP PRACTICE – I L0:T0:P4

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 as mentioned in the Electricity Rules and shock treatment including first aid

2. Wire jointing
   - Straight married joint
   - Technology-joint
   - Western union joint
   - Britania joint
   - Twist sleeve joint
   - Bolted type joint

3. Types of wiring and to make different light control circuits in the following types of wiring. Casing and capping (PVC) wiring.

4. (a) Conduit wiring (surface/concealed), Filling and crimping of thimbles (using hydraulic and hand crimping tool)

4. (b) Study of ISI standard for MCBs and Conduct one test on MCB on above basis

5. Wiring of main distribution board with four outgoing circuits for light and fan loads including main switch and fuses (only internal connection) Types of wiring and to make different light control circuits in the following types of wiring:

5.1 Casing and Capping (PVC) wiring

5.2 Conduit wiring (surface/concealed)

6. Construction/assembly of Distribution Board and Extension Board

   (a) Construction of an extension board with two 5A sockets and one I5A Socket controlled by their respective switches, a fuse and indicator with series test lamp provision.

   (b) Assembly of distribution board panel using MCB, main switch, change over switch and ELCB and RCCB.

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

8. Simple light and Alarm Circuits(any four)

(a) One lamp controlled by two switches (staircase circuit)
(b) Two lamps controlled by three switches (double staircase circuit)
(c) Two ordinary bells (for day and night) used at a distant residence
(d) Bell response circuit using one bell and one relay

(e) Bell response circuit of an office (for three rooms)
(f) Traffic light control system for two roads crossing.

9. Testing of domestic wiring installation using meggar

10. Fault finding and repair of a tube light circuit

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