

## 2.3 BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING

L T P

5 - 4

### RATIONALE

The objective of the course is to impart basic knowledge and skills regarding basic electrical engineering, which diploma holders will come across in their professional life. This course will provide the students to understand the basic concepts and principles of d.c. and a.c. fundamentals, electromagnetic induction, batteries, transformers, motors distribution system, domestic installation, electrical safety etc. The students will also learn basic electronics including diodes and transistors and their applications.

### LEARNING OUTCOME

**After Undergoing the subject, the students will be able to**

- Understand the meaning of basic electrical quantities such as voltage, current, power etc.
- Use working principle of transformer.
- Use basic Network Theorem and Kirchoff's laws.
- Understand the concept of Junction Diode, transistor and field effect transistor.

### DETAILED CONTENTS

1. Application and Advantages of Electricity (03 periods)

Difference between ac and dc, various applications of electricity, advantages of electrical energy over other types of energy

2. Basic Electrical Quantities (06 periods)

Definition of voltage, current, power and energy with their units, name of instruments used for measuring above quantities, connection of these instruments in an electric circuit

3. AC Fundamentals (08 periods)

Electromagnetic induction-Faraday's Laws, Lenz's Law; Fleming's rules, Principles of a.c. Circuits; Alternating emf, Definition of cycle, frequency, amplitude and time period. Instantaneous, average, r.m.s and maximum value of sinusoidal wave; form factor and Peak Factor. Concept of phase and phase difference. Concept of resistance, inductance and capacitance in simple a.c. circuit. Power factor and improvement of power factor by use of capacitors. Concept of three phase system; star and delta connections; voltage and current relationship (no derivation)

4. Transformers (06 periods)

Working, principle and construction of single phase transformer, transformer ratio, emf equation, losses and efficiency, cooling of transformers, isolation transformer, CVT, auto transformer (brief idea), applications.

5. D.C. Circuits (10 periods)

- 5.1 Ohm's law, resistivity, effect of temperature on resistance, heating effect of electric current, conversion of mechanical units into electrical units.
- 5.2 Kirchhoff's laws, application of Kirchhoff's laws to solve, simple d.c. circuits
- 5.3 Thevenin's theorem, maximum power transfer theorem, Norton's theorem and superposition theorem, simple numerical problems.

6. Basic Electronics (22 periods)

- 6.1 Basic idea of semiconductors – P and N type; diodes, zener diodes and their applications,
- 6.2 Introduction to BJT : NPN and PnP transistors, other symbols and mechanism of current flow, explanation of fundamental current relations. Comparison of CB, CE and CC configuration transistor as amplifier in CE configuration.
- 6.3 Field Effect Transistor (FET) : Construction, Operation and Characteristics of Junction FET, Comparison of SFET, MOSFET & CMOS.

### **LIST OF PRACTICALS**

- 1. Identification of Resistor, Capacitor, Inductor, Transformer, LBD etc
- 2. Familiarization with multimeters/CPO etc.
- 3. Measurement of wave shapes of half wave rectifier and full wave rectifier.
- 4. Plot the P&T characteristics and determination of its parameter from this characteristics.
- 5. Connection and reading of an electric energy meter
- 6. Use of ammeter, voltmeter, wattmeter, and multi-meter
- 7. Study of different types of fuses, MCBs and ELCBs
- 8. Study of zener as a constant voltage source and to draw its V-I characteristics
- 9. To draw V-I characteristics of PN junction diode
- 10. Verify Thevenin and Norton theorem

### **INSTRUCTIONAL STRATEGY**

The teacher should give emphasis on understanding of concept and various terms used in the subject. Practical exercises will reinforce various concepts.

### **MEANS OF ASSESSMENT**

- Class Test
- Home Assignment
- Attendance
- Sessional Test

## RECOMMENDED BOOKS

1. Basic Electrical Engineering by PS Dhongal; Tata McGraw Hill Publishers, New Delhi
2. A Text Book of Electrical Technology, Vol. I and II by BL Thareja; S Chand and Co., New Delhi
3. Basic Electricity by BR Sharma; Satya Prakashan, New Delhi
4. Basic Electrical Engineering by JB Gupta, S Kataria and Sons, Delhi
5. Experiments in Basic Electrical Engineering by SK Bhattacharya and KM Rastogi, New Age International Publishers Ltd., New Delhi
6. Basic Electronics by VK Mehta; S Chand and Co., New Delhi
7. Electrical Machines by SK Bhattacharya; Tata McGraw Hill, New Delhi
8. Basic electronics and Linear circuits by NN Bhargava and Kulshreshta, Tata McGraw Hill New Delhi.
9. Electronic principles by SK Sachdev, Dhanpat Rai and Sons, New Delhi.
10. Electronic Devices and circuits by Rama Raddy Narora Publishing House Pvt. Ltd. New Delhi.
11. Principles of electrical and electronics Engineering by VK Mehta; S Chand and Co. New Delhi
12. Digital Electronics by Malvino

## *SUGGESTED DISTRIBUTION OF MARKS*

| Topic No.    | Time Allotted (Hrs) | Marks Allotted (%) |
|--------------|---------------------|--------------------|
| 1            | 03                  | 5                  |
| 2            | 06                  | 10                 |
| 3            | 09                  | 15                 |
| 4            | 06                  | 10                 |
| 5            | 10                  | 18                 |
| 6            | 22                  | 42                 |
| <b>Total</b> | <b>56</b>           | <b>100</b>         |