0944 -DIPLOMA IN INFORMATION TECHNOLOGY & ENGINEERING
SEMESTER -I
094425 BASIC ELECTRICAL ENGINEERING

RATIONALE

This course will enable the students to understand the basic concepts and principles of d.c and a.c fundamental, a.c circuits, batteries, electromagnetic induction etc. including constant voltage and current sources. A diploma holder may be involved in various jobs ranging from preventive maintenance of electrical installation to fault location etc. In addition, he may be working in testing laboratories where he uses measuring instruments. To carry out these and similar jobs effectively, knowledge of basic concepts, principles and their applications is very essential.

DETAILED CONTENTS'

1. DC Circuits
1.1   Concept of electricity, various applications of electricity, advantages of electricity over other types of energy.
1.2   basic terms – voltage, current, potential difference, power, energy and their units.
1.3   Ohm's law and its practical applications, concepts of resistance, conductance, resistivity and their units,
1.4   Effect of temperature on resistance, temperature coefficient of resistance
1.5   Series and parallel combination of resistors, wattage consideration, simple problems
1.6   Kirchhoff's current law and Kirchhoff's voltage law and their applications to simple circuits. Conversion of circuits from Star to Delta and Delta to Star.

2. DC Circuit Theorems

Thevenin's theorem, Norton's theorem, super position theorem, maximum power transfer theorem, application of network theorem in solving d.c circuit problems.

3. Constant Voltage and Constant Current Sources

a)   Concept of constant voltage source, symbol and graphical representation characteristics of ideal and practical sources.
b)   Concept of constant current sources, symbol, characteristics and graphical representation of ideal and practical current sources.

4. Electro Magnetic Induction

a)   Concepts of magnetic field produced by flow of current, Magnetic circuit, concept of magneto-motive force (MMF), flux, reluctance, permeability, analogy between electric and magnetic circuit.

b)   Faraday's law and rules of electro-magnetic induction, principles of self and

mutual induction, self and mutually induced e.m.f, simple numerical problems.
- c) Concept of current growth, decay and time constant in an inductive (RL) circuit.
- d) Energy stored in an inductor, series and parallel combination of inductors.

5. Batteries (4 hrs)
- 5.1 Basic idea about primary and secondary cells
- 5.2 Construction, working and applications of Lead-Acid battery and Nickel-Cadmium cells, Silver-Oxide cells
- 5.3 Charging methods used for lead-acid battery(accumulator)
- 5.4 Care and maintenance of lead-acid battery
- 5.5 Series and parallel connections of batteries.
- 5.6 General idea of solar cells, solar panels and their applications

6. AC Fundamentals

- 6.1 Concept of alternating voltage and current
- 6.2 Difference between a.c and d.c
- 6.3 Concept of cycle, frequency, time period, amplitude, instantaneous value, average value, r.m.s. value, maximum value, form factor and peak factor.
- 6.4 Representation of sinusoidal quantities by phasor diagrams.
- 6.5 Equation of sinusoidal wave form (with derivation)
- 6.6 Effect of alternating voltage applied to a pure resistance, pure inductance and pure capacitance.

7. AC Circuits
- 7.1 Inductive reactance and Capacitive reactance
- 7.2 Alternating voltage applied to resistance and inductance in series.
- 7.3 Alternating voltage applied to resistance and capacitance in series.
- 7.4 Impedance triangle and phase angle
- 7.5 Solutions and phasor diagrams for simple RLC circuits (series and parallel).
- 7.6 Introduction to series and parallel resonance and its conditions
- 7.7 Power in pure resistance, inductance and capacitance, power in combined RLC circuits. Power factor, active and reactive power and their significance, importance of power factor.
- 7.8 j-notation and its application in solving a series and parallel AC circuits
- 7.9 Definition of conductance, susceptance and admittance

8.. Various Types of Power Plants

Brief explanation of principle of power generation in thermal, hydro and nuclear power stations and their comparative study.
Elementary block diagram of above mentioned power stations

LIST OF PRACTICALS

1. Familiarization of measuring instruments viz voltmeter, ammeter, CRO, Wattmeter and multi-meter and other accessories

2. Determination of voltage-current relationship in a dc circuit under specific physical conditions and to draw conclusions.

3. To measure (very low) resistance of an ammeter and (very high) resistance of a voltmeter

4. To verify in d.c circuits:
   - a.. Thevenin's theorem,
   - b. Norton's theorem,
   - c. Super position theorem,
   - d. Maximum power transfer theorem,

5. To observe change in resistance of a bulb in hot and cold conditions, using voltmeter and ammeter.

6. Verification of Kirchhoff's Current Law and Kirchhoff's Voltage Laws in a dc circuit

7. To find the ratio of inductance of a coil having air-core and iron-core respectively and to observe the effect of introduction of a magnetic core on coil inductance

8. To find the voltage current relationship in a single phase R-L and R-C Series circuits, draw their impedance triangles and determine the power factor in each case .

9. To test a lead - acid storage battery and to charge it.

10. Measurement of power and power factor in a single phase R.L.C. circuit and to calculate active and reactive power.

11. Visit to a nearby Power Station(s).

RECOMMENDED BOOKS

1. Electrical Technology, Fifth Edition by Edward Hughes, Longman Publishers
2. Electrical Technology by BL Theraja, S Chand and Co, New Delhi
3. Basic Electrical and Electronics Engineering by SK Sahdev; Dhanpat Rai and Sons, New Delhi
4. Experiments in Basic Electrical Engineering by SK Bhattacharya, KM Rastogi; New Age International (P) Ltd.; Publishers New Delhi
5. Basic Electricity by BR Sharma; Satya Prakashan; New Delhi
6. Principles of Electrical Engineering by BR Gupta, S Chand and Co, New Delhi
7. Basic Electrical Engineering by PS Dhogal, Tata Mc Graw Hill, New Delhi
8. Basic Electrical Engineering by JB Gupta; SK Kataria and Sons, New Delhi
9. Experiments in Basic Electrical Engineering by GP Chhalhotra, Khanna Publishers, New Delhi