

## **Basic Electrical Engineering**

Course Objectives:

To provide the fundamental concept of DC, AC & 3-phase electrical circuits.

1. General Electric System(6 hours)

- a. Constituent parts of an electrical system (source, load, communication & control)
- b. Current flow in a circuit
- c. Electromotive force and potential difference
- d. Electrical units
- e. Ohm's law
- f. Resistors, resistivity
- g. Temperature rise & temperature coefficient of resistance
- h. Voltage & current sources

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2. DC circuits(4 hours)

- a. Series circuits
- b. Parallel networks
- c. Krichhhof's laws
- d. Power and energy

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3. Network Theorems(12 hours)

- a. Application of Krichhof's laws in network solution
  - i. Nodal Analysis
  - ii. Mesh analysis
- b. Star-delta & delta-star transformation
- c. Superposition theorem
- d. Thevnin's theorem
- e. Nortan's theorem
- f. Maximum power transfer theorem
- g. Reciprocity theorem

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4. Inductance & Capacitance in ElectricCcircuits(4 hours)

- a. General concept of capacitance
  - i. Charge & voltage
  - ii. Capacitors in series and parallel
- b. General concept of inductance
  - i. Inductive & non-inductive circuits
  - ii. Inductance in series & parallel

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5. Alternating Quantities(2 hours)

- a. AC systems
- b. Wave form, terms & definitions
- c. Average and RMS values of current & voltage
- d. Phasor representation

6. Single-phase AC Circuits(6 hours)

- a.AC in resistive circuits
- b.Current & voltage in an inductive circuits
- c.Current and voltage in an capacitive circuits
- d.Concept of complex impedance and admittance
- e.AC series and parallel circuit
- f.RL, RC and RLC circuit analysis & phasor representation

7. Power in AC Circuits(4 hours)

- a.Power in resistive circuits
- b.Power in inductive and capacitive circuits
- c.Power in circuit with resistance and reactance
- d.Active and reactive power
- e.Power factor, its practical importance
- f.Improvement of power factor
- g.Measurement of power in a single-phase AC circuits

8. Three-Phase Circuit Analysis(6 hours)

- a.Basic concept & advantage of Three-phase circuit
- b.Phasor representation of star & delta connection
- c.Phase and line quantities
- d.Voltage & current computation in 3-phase balance & unbalance circuits
- e.Real and reactive power computation
- f.Measurements of power & power factor in 3-phase system

Practical:

- 1.Measurement of Voltage, current& power in DC circuit : Verification of Ohm's Law  
Temperature effects in Resistance
- 2.Krichoff's Voltage & current Law : Evaluate power from V & I, Note loading effects of meter
- 3.Measurement amplitude, frequency and time with oscilloscope : Calculate & verify average and RMS value, Examine phase relation in RL & RC circuit
- 4.Measurements of alternating quantities : R, RL,RC circuits with AC excitation, AC power, power factor, VARs, phasor diagrams
- 5.Three-phase AC circuits : Measure currents and voltages in three-phase balanced AC circuits, Prove Y- $\Delta$  transformation, Exercise on phasor diagrams for three-phase circuits
- 6.Measurement of Voltage, current& power in a three-phase circuit : Two-wattmeter method of power measurement in R, RL and RC three phase circuits, Watts ratio curve

References:

- 1.J.R Cogdell, " Foundations of Electrical Engineering", printice Hall, Englewood Chiffs, New Jersy, 1990.
- 2.I.M Smith," Haughes Electrical Technology", Addison-Wesley, ISR Rprint,2000