

**CIRCUITS THEORY**

**Prerequisites:** Basic Electrical Engineering

**Course Objectives:**

1. To introduce the basic concepts of circuit analysis, which is the foundation for all subjects of the electrical engineering.
2. To introduce basic analysis of circuits which includes three phase circuits, magnetic circuits, theorems, transient analysis, network parameters, filters and network topology.
3. To introduce basic analysis of various types of filters.

**UNIT 1 : (~10 Lecture Hours )**

Faraday's laws of electromagnetic Induction-Self and Mutual Inductances-Types of induced EMFs-Series and Parallel Magnetic Circuits-Dot Convention-Coupled circuits-coefficient of coupling -Comparison of electric and magnetic circuits-problems.

Network Theorems: Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem, Reciprocity Theorem and Millman's Theorem with DC and AC Excitation.

**UNIT 2 : (~8 Lecture Hours )**

Network Topology:

Definitions- Graph, Tree, Basic Cut-set and Basic Tie-set matrices for planar networks - Loop and Nodal methods of analysis of Networks with dependent & independent voltage and current sources - Duality & Dual networks.

Three Phase Circuits: Phase sequence - Star and delta connection - Relation between line and phase voltages and currents in balanced systems - Analysis of balanced and Unbalanced 3 phase circuits - Measurement of active and reactive power.

**UNIT 3: (~9 Lecture Hours )**

Transient response of R-L, R-C, R-L-C circuits (Series and Parallel combinations) for D.C. and sinusoidal excitations - Initial conditions - Classical method and Laplace transforms methods of solutions. Transient response of the above circuits for different inputs such as step, ramp, pulse and impulse by using Laplace transforms method.

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