I Year - II Semester	L	T	P	C
17EE201	3	1	0	3

ELECTRICAL CIRCUIT ANALYSIS-I

Objectives:

1. To study the concepts of passive elements, types of sources and various network reduction techniques.
2. To understand the behaviour of RLC networks for sinusoidal excitations.
3. To study the performance of R-L, R-C and R-L-C circuits with variation of one of the parameters and to understand the concept of resonance.
4. To study the concept of magnetic coupled circuit.
5. To understand the applications of network topology to electrical circuits.
6. To understand the applications of network theorems for analysis of electrical networks.

UNIT-I

Introduction to Electrical Circuits

Passive components and their V-I relations, Sources (dependent and independent) - Kirchoff's laws, Network reduction techniques (series, parallel, series - parallel, star-to-delta and delta-to-star transformation). Source transformation technique, nodal analysis and mesh analysis, Super node and super-mesh for DC excitations.

UNIT-II

Single Phase A.C Systems

Periodic waveforms (determination of rms, average value and form factor). Concept of phase angle and phase difference. Complex and polar forms of representations, J-notation, steady state analysis of R, L and C circuits-Concept of Reactance, Impedance, Susceptance and Admittance. Power Factor and its significance – Real, Reactive power and apparent Power, Circuit elements in S-domain.

UNIT-III

Resonance

Locus diagrams for various combination of R, L and C. Resonance, concept of band width and Quality factor.

UNIT-IV

Magnetic Circuit

Basic definition of MMF, flux and reluctance. Analogy between electrical and magnetic circuits. Faraday's laws of electromagnetic induction Concept of self and mutual inductance. Dot convention-coefficient of coupling and composite magnetic circuit. Analysis of series and parallel magnetic circuits.

UNIT-V

Network topology

Definitions of Graph and Tree. Network incidence matrices, Basic cutset and tieset matrices for planar networks. Loop and nodal methods of analysis of networks with dependent and independent voltage and current sources. Duality and Dual networks.

UNIT-VI

Network theorems (DC & AC Excitations)

Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem, Reciprocity theorem, Millman's theorem, Tellegen's theorem, Substitution theorem and compensation theorem.

Text Books:

1. Engineering Circuit Analysis by William Hayt and Jack E.Kemmerley, McGraw Hill Company, 6th edition.
2. Network Analysis: Van Valkenburg; Prentice-Hall of India Private Ltd.

Reference Books:

1. Fundamentals of Electrical Circuits by Charles K.Alexander and Mathew N.O.Sadiku, McGraw Hill Education (India)
2. Linear Circuit Analysis by De Carlo, Lin, Oxford publications
3. Electric Circuits– (Schaum's outlines) by MahmoodNahvi& Joseph Edminister, Adapted by K. Uma Rao, 5th Edition – McGraw Hill.
4. Electric Circuits by David A. Bell, Oxford publications
5. Introductory Circuit Analysis by Robert L Boylestad, Pearson Publications
6. Circuit Theory(Analysis and Synthesis) by A.Chakrabarthi,DhanpatRai&Co.
7. Network analysis - N.C Jagan and C. Lakhminarayana, BS publications.

Outcomes:

i. Students are able to solve
ii. Various electrical networks in presence of active and passive elements.
iii. Any R, L, C network with sinusoidal excitation.
iv. Any R, L, C network with variation of any one of the parameters i.e R, L, C. and f.
v. Any magnetic circuit with various dot conventions.
vi. Electrical networks with network topology concepts.
vii. Electrical networks by using principles of network theorems.