I Year- II Semester		L	T	P	C
		4	0	0	3
Electrical Circuit Analysis - I (R161208)					

Prerequisite Course: Students should have basic knowledge of Electrical circuits.

Course Description and Objectives: This course introduces the basic concepts of circuit analysis which is the foundation for all subjects of the Electrical Engineering discipline. The emphasis of this course is laid on the basic analysis of circuits which includes single phase circuits, magnetic circuits, network theorems, transient analysis and network topology

Course Outcomes:

Upon completion of the course, the student will be able to achieve the following outcomes.

COs	Course Outcomes	POs
1	**To study the concepts of passive elements, types of sources and various network reduction techniques**	3
2	**To understand the applications of network topology to electrical circuits**	4
3	**To study the concept of magnetic coupled circuit**	5
4	**To understand the behaviour of RLC networks for sinusoidal excitations**	5
5	**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
6	To **understand the applications of network theorems for analysis of electrical networks.**	3

Syllabus:

UNIT I:

Objective: To study the concepts of passive elements, types of sources and various network reduction techniques

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.

UNIT II:

Objective: **To understand the applications of network topology to electrical circuits**.

Network topology:

Definitions of Graph and Tree, Basiccutset 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 III:

Objective: To study the concept of magnetic coupled circuit.

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 IV:

Objective:. **To understand the behaviour of RLC networks for sinusoidal excitations**.

Single Phase A.C Systems:

Periodic waveforms (determination of rms, average value and form factor).Concept of phase angle and phase difference – Waveforms and phasor diagrams for lagging, leading networks. Complex and polar forms of representations, steady state analysis of R, L and C circuits.

Power Factor and its significance real, reactive power and apparent power, waveform of instantaneous power triangle and complex power

UNIT V:

Objective: 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.

Analysis of AC Networks:

Extension of node and mesh analysis to AC networks, Numerical problems on sinusoidal steady state analysis, Series and parallel resonance, Selectively band width and Quasi factor, Introduction to locus diagram.

UNIT VI:

Objective: To **understand the applications of network theorems for analysis of electrical networks.**

Network theorems (DC & AC Excitations):

Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem, Reciprocity theorem, Millman's 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 Mahmood Nahvi& Joseph Edminister, Adapted by KumaRao, 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, Dhanpat Rai & Co.