



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

I Year II Semester		L	T	P	C
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ELECTRICAL CIRCUIT ANALYSIS -I					

Preamble:

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 Objectives:

- To study the concepts of passive elements, types of sources and various network reduction techniques.
- To understand the applications of network topology to electrical circuits.
- To study the concept of magnetic coupled circuit.
- To understand the behavior of RLC networks for sinusoidal excitations.
- 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.
- To understand the applications of network theorems for analysis of electrical networks.

UNIT-I**Introduction to Electrical Circuits**

Basic Concepts of passive elements of R, L, C and their V-I relations, Sources (dependent and independent), Kirchhoff'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 to DC networks with dependent and independent voltage and current sources., node and mesh analysis.

UNIT-II**Magnetic Circuits**

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-III**Single Phase A.C Systems**

Periodic waveforms (determination of rms, average value and form factor), concept of phasor, phase angle and phase difference – waveforms and phasor diagrams for lagging, leading networks, complex and polar forms of representations. node and mesh analysis.

Steady state analysis of R, L and C circuits, power factor and its significance, real, reactive and apparent power, waveform of instantaneous power and complex power.

UNIT-IV**Resonance - Locus Diagrams**

series and parallel resonance, selectively band width and Quality factor, locus diagram- RL, RC, RLC with R, L and C variables.



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UNIT-V

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.

Course Outcomes:

After the completion of the course the student should be able to:

- Various electrical networks in presence of active and passive elements.
- Electrical networks with network topology concepts.
- Any magnetic circuit with various dot conventions.
- Any R, L, C network with sinusoidal excitation.
- Any R, L, network with variation of any one of the parameters i.e., R, L, C and f.
- Electrical networks by using principles of network theorems.

Text Books:

1. Engineering Circuit Analysis by William Hayt and Jack E. Kemmerley, 6th edition McGraw Hill Company, 2012.
2. Network Analysis: Van Valkenburg; Prentice-3rd edition, Hall of India Private Ltd, 2015.

Reference Books:

1. Fundamentals of Electrical Circuits by Charles K. Alexander and Mathew N.O.Sadiku, 5th edition, McGraw Hill Education (India), 2013.
2. Linear Circuit Analysis by De Carlo, Lin, 2nd edition, Oxford publications, 2001.
3. Electric Circuits – (Schaum's outlines) by Mahmood Nahvi & Joseph Edminister, Adapted by KumaRao, 5th Edition – McGraw Hill, 2017.
4. Electric Circuits by David A. Bell, 7th edition, Oxford publications, 2009.
5. Introductory Circuit Analysis by Robert L Boylestad, 13th edition, Pearson, 2015
6. Circuit Theory (Analysis and Synthesis) by A. Chakrabarthi, 7th edition, DhanpatRai&Co., 2018.