1/4 B.Tech SECOND SEMESTER

EE2T5 ELECTRICAL CIRCUIT ANALYSIS-I Credits: 4

Lecture: 4 periods/week **Internal assessment: 30 marks**
Tutorial: 1 period /week **Semester end examination: 70 marks**

Objective:

Electrical Circuit Analysis-I 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 DC circuits, magnetic circuits, theorems, transient analysis and AC fundamentals.

Learning outcomes:

1. On completion of this course students will understand the basic concepts of electrical circuits and also basic laws of electrical circuits and their application to electrical circuits.
2. Understand nodal and mesh analysis and also understands the circuit theorems for DC excitation.
3. Student can do the tiem response analysis of electrical circuits for DC excitation and also can derive different network parameters.
4. Student will learn the basic concepts of single phase AC circuits.

UNIT-I Basic Circuit Concepts and Basic Laws:

Circuit concepts –Resistor(R)-Inductor(L)-Capacitor(C)-Voltage and Current Sources - Source transformation-Voltage, Current relationship for passive bilateral elements -Ohm's law, Kirchhoff's laws – Network reduction techniques-Series, parallel, series parallel, star-to-delta & delta-to-star transformation.

UNIT-II Magnetic Circuits:

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-composite magnetic circuit-analysis of series and parallel magnetic circuits

UNIT-III Methods of Analysis:

Nodal analysis, mesh analysis, super node and super mesh, Nodal Versus Mesh Analysis for D.C excitations.

UNIT-IV Circuit Theorems-I:

Linearity Property, Superposition Principle, Superposition, Thevenin's and Norton's theorems.

UNIT-V Circuit Theorems-II:

Maximum Power Transfer Theorem, Millman's theorem, Tellegen's, Reciprocity and compensation theorems for D.C Excitation.

UNIT-VI Time Response of Circuits (DC Excitation):

Time (Transient) response of R-L, R-C, R-L-C series circuits for Zero input, Step input, pulse input -Initial conditions-solution method using differential equation and Laplace transforms.

UNIT-VII Single Phase A.C Circuits:
Sinusoidal alternating quantities – Phase and Phase difference – Complex and polar forms of representations, J-notation, R.M.S, Average values and form factor for different periodic wave forms - Steady state analysis of R,L and C (in series, parallel and series parallel combinations) with sinusoidal excitation-Concept of Reactance, Impedance Susceptance and Admittance-Power Factor and significance-Real and Reactive power, Complex Power.

UNIT-VIII Two Port Networks
Two port network parameters – Z, Y, ABCD and hybrid parameters and their relations, Interconnection of Two-Port networks.

Text Books:
- "Fundamentals of Electric Circuits"Charles K.Alexander, Mathew N.O.Sadiku,Tata McGraw-Hill.
- Circuits & Networks Analysis & Synthesis by A. Sudhakar and Shyammohan S Palli, Tata McGraw- Hill.
- 3000 Solved Problems in Electrical Circuit by Schaum's solved problem series Tata McGraw- Hill.
- Circuit Theory by A.Chakrabarti Danapat Rai & Co publisher.

Reference Books:
- Engineering Circuit Analysis by William Hayt and Jack E.Kemmerley,Mc Graw Hill Company,6 th edition
- Network Analysis by N.C.Jagan, C.Lakshmi Narayana BS publications 2nd edition
- Network Analysis: Van Valkenburg; Prentice-Hall of India Private Ltd.