EEPC2001 ELECTRICAL CIRCUIT ANALYSIS (3-0-0)

Module I **8Hours**

Graph Theory: Graph of network, Trees, Cotrees and Loops, Number of possible trees of a graph, Incidence Matrix, Cut-set matrix, Tie-set and loop currents, Inter-relationship among various matrices.Concept of duality and dual networks.
Network Theorems (for both AC and DC networks): Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Reciprocity theorem, Compensation theorem, Millman's Theorem, Substitution Theorem.

Module II **9Hours**

Time Domain Analysis of First and Second-order networks: Source-free RC circuit, Source-free RL circuit, Singularity Functions, Step Response of an RC Circuit, Step Response of an RL Circuit, Initial and final conditions in network elements, The Source-Free Series RLC Circuit, The Source-Free Parallel RLC Circuit, Step Response of a Series RLC Circuit,Step Response of a Parallel RLC Circuit.
Coupled Circuit Analysis: DOT convention, coefficient of coupling, series and parallel coupled circuits, electrical equivalent of magnetically coupled circuits

Module III **6 Hours**

Laplace Transform: Definition of Laplace Transform, properties of Laplace transform, Inverse Laplace transform: (i) simple poles (ii) repeated poles (iii) complex poles, Gate Function, Impulse Function, Laplace Transform of periodic functions, Convolution Integral.
Electrical Circuit Analysis Using Laplace Transform: Representation ofCircuit Elements in s-domain, Circuit analysis in s-domain: With and without initial conditions.

Module IV **8Hours**

Resonance: Resonance in series and parallel RLC circuit, variation of current and voltage with frequency, selectivity and bandwidth, Q-factor.
Two Port Network Theory: Introduction, Characterization of Linear Time-invariant two-port networks, impedance parameters, admittance parameters, transmission and hybrid parameters, inter-relationship between the parameters, interconnections of two-port networks, Two-port symmetry.
Filters: Introduction to first-order and second-order passive and active filters.

Module V **5Hours**

Network Functions: Network functions, poles and zeroes, necessary condition for Driving point function, necessary condition for transfer function, Time domain behaviour from pole zero plot.
Passive network synthesis: Positive real function, Driving point and transfer impedance function, Cauer-I, Cauer-II, Foster-I and Foster-II forms, Driving point and transfer impedance function
Course Outcomes : This course will enable students to:
CO1:apply network theorems for the analysis of electrical circuits
CO2:analyse the transient and steady-state response of electrical circuits.
CO3:apply Laplace Transform for the analysis of electrical circuits.
CO4:analyse the behaviour of two-port networks and synthesis of passive two-port networks.

Text Book(s):

1. Charles K. Alexander, Matthew N. O. Sadiku, "Fundamentals of Electric Circuits" | 7th

Edition, McGraw Hill Publication.
2. D. Roy Choudhury, “Networks and Systems”, New Age International Publications, 1998.

Reference Book(s):

1. W. H. Hayt and J. E. Kemmerly, “Engineering Circuit Analysis”, McGraw Hill Education,2013.
2. M. E. Van Valkenburg, “Network Analysis”, Prentice Hall, 2006.