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CIRCUIT ANALYSIS AND SYNTHESIS

Paper Code	**ECS-303**
Course Credits	4
Lectures/ Week	3
Tutorials/ Week	1

Course description

UNIT- I   BASIC CIRCUIT FUNDAMENTALS
Circuit elements: passive and active elements, independent circuit elements, Independent and dependent sources, Source transformation, Review of Ohm's law, Kirchoff's law, Node and mesh-current method compared.   The dot-convention in magnetically coupled circuits, Dual circuits, The phasor concept, DC analysis using PSPICE, Analysis of RLC circuits.

UNIT- II   NETWORK FUNCTION AND TWO PORT PARAMETERS
The concept of complex frequency, Review of Laplace transform(LT), step impulse, ramp, sinusoidal and exponential function and their LT's, initial conditions in circuits, time-domain analysis of circuits using LT, poles and zeros of a network function, restrictions on poles and zeros location, stability of active network, two-port parameters, inter-connection of two-port networks, PSPICE analysis of RLC circuits.

UNIT- III   CIRCUIT THEOREMS AND OTHER APPLICATIONS
Superposition theorem, Reciprocity theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Millman's theorem, Substitution theorem, Tellegen's theorem- and their application to linear, AC and DC, active and passive circuits, Use of PSPICE for DC analysis.

UNIT- IV   GRAPH THEORY AND STATE VARIABLE ANALYSIS

Terminology and definitions: graph and sub-graph, tree and co-tree, twig and link, cut-set matrices, circuit analysis using graph theory concept. State variable analysis of circuits:

state variables, formation of state equations for circuits and their solution.

UNIT-V   PASSIVE NETWORK SYNTHESIS
Analysis versus synthesis, positive real function, properties of passive network, synthesis of RC, RL and LC network (foster and Cauer forms) Use of PSPICE for analysis and synthesis of circuits.

Pre-requisite Course/Paper:	Basic Circuit Theory
Text Book:	Hayt Jr. and Kemmerly, "Engineering Circuit Analysis", Mc Graw Hill Book Co. 1987
Reference Books:	1. M L Van Valkenburg, "Network Analysis", Prentice Hall of India, New Delhi, 1985
	2. FF Kuo, "Network Analysis and Synthesis", John Wiley and Sons Inc. , 1985
	3. Sudhakar A. Shyammohan, "Circuits and Network Analysis and Synthesis", Tata McGraw Hill Publishing Company Ltd. New Delhi, IIIrd edition, 2007
Course Outcome:	**CO1.** Analyze various electrical components in networks & understand application of KCL and KVL in electrical networks.
	CO2. Understand the Thevenin and Norton Theorem,Nodal and Mesh analysis to express complex circuits in their simpler equivalent forms.
	CO3. Understand linearity and superposition concepts and use them to analyse RL, RC & RLC circuits in time and frequency domains.
	CO4. Understand the concepts of Graph Theory and use them in solving electrical circuits.
	CO5. Learn the method of synthesizing an electrical network from given Impedance/Admittance function.
Computer usage/ Software required:	PSPICE