BVM ENGINEERING COLLEGE [AN AUTONOMOUS INSTITUTION]

2EC01: NETWORK THEORY
CREDITS - 4 (LTP:3,1,0)

Course Objective:
The students will be familiar with the basic laws of Circuits and Network. The fundamental concepts of various theorems for electronics circuit network along with various transformations.

Teaching and Assessment Scheme:

Teaching Scheme (Hours per week)			Credits	Assessment Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	ESE	CE	ESE	CE	
3	1	0	4	60	40	20	30	150

Course Contents:

Unit No.	Topics	Teaching Hours
1.	**Introduction, Nodel and Mesh Analysis of Circuits :** Basic terminology and definitions related to networks, classification of networks, Kirchhoff's laws, Mesh Analysis of Circuits with Dependent and Independent Sources, Concept of Super mesh, Nodal Analysis of Circuits Containing Dependent and Independent Sources, Concept of Super node, Source Transformation technique, Mutual inductance, Dot convention for coupled circuits	8
2.	**Circuit Network Theorems :** Superposition Theorem, The venin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem, Reciprocity Theorem, Substitution Theorem, Millman's Theorem, Application of above theorems in presence of dependent sources.	8
3.	**Time Domain Analysis& Transient Response of Linear Circuits :** Mathematical background, First order differential equations, Solution of Non-homogeneous equation using integrating factor, Time-constants, Second order equation, Solution of non-homogeneous differential equation	7
4.	**Frequency Domain Analysis & Transient Response Of Linear Circuits :** Laplace transformation, Inverse Laplace transformation, Partial fraction expansion, Heaviside's Expansion theorem, The initial and final value theorem Sinusoidal transient analysis using Laplace transform methods, complete response of RL, RC, and RLC circuits to step, sinusoidal, exponential, ramp, impulses and the combinations of excitations.	8
5.	**Network Functions and Two port Network :** Poles and Zeros of the networks function, Restriction on Pole and Zero locations for driving point and transfer function. Two port Impedance parameters, Two port Admittance Parameters, Two port Hybrid parameters, and Two port Transmission parameters, Symmetry and Reciprocity of all parameters, Inter-relationship between all these parameters	8

Unit No.	Topics	Teaching Hours
6.	**Network Topology and Synthesis :** Concept of Network Graph and Definitions, The Cut-set Matrix, The Tie-set Matrix, Kirchhoff's Laws in Fundamental Cut-set and Tie-set Matrix Basic synthesis procedure, Methods of synthesis, Driving point synthesis of one-port networks, synthesis of RLC driving point functions	6
	Total	**45**

List of References:

1. Van Valkenburg, "*Network analysis*", PHI, 3rd Edition, 2007.
2. Franklin S. Kuo, "*Network Analysis & Synthesis*", Wiley India, 2nd Edition, 2010.
3. John O' Malley, "*Basic Circuit Analysis*", Schaum'series, TMH, 2/E, 2011
4. De Carlo/Lin.,"*Linear Circuits Analysis*", Oxford University Press.,2nd Edition,2003.
5. A. Chakrabarti, "*Circuit Theory: Network analysis and Synthesis*", Dhanpat Rai & Co Pvt.Ltd, 6th Edition, 2014.
6. U. A. Patel, "*Network Analysis*", Mahajan Publication, 3rd Edition, 2016

Course Outcomes (COs) :

By learning this course students will be able to …

1. Recollect the basic knowledge of various circuit laws and can perform its analysis.
2. Understand and Analyze behavior of passive circuits using the various circuit theorems.
3. Understand and Analyze behavior of passive circuits such as RC, RL and RLC.
4. Apply Laplace Transform for circuit analysis.
5. Calculate two port parameters such as y, z, h, ABCD and for that given two port network topologies
6. To design circuit graphs using network topology and also understand the synthesis techniques.