Sankalchand Patel University

Faculty of Engineering and Technology

Second Year Bachelor of Technology

3rd Semester Electrical Engineering

In Effect from Academic Year 2017-18

Subject Code: 1ET1020302	**Subject Title: Circuits and Networks**
Pre-requisite Subject:	Basics of Elements of Electrical Engineering, Knowledge of integration and differentiation.

Course Objective:

- To understand the application of fundamental laws and network theorems for circuit analysis.
- To study and analyse the transient response of first and second order circuits.
- To learn network parameters and its relation for two port networks.

Teaching Scheme (Hours per week)				**Evaluation Scheme (Marks)**				
				Theory		**Practical**		
Lecture	**Tutorial**	**Practical**	**Credit**	**University Assessment**	**Continuous Assessment**	**University Assessment**	**Continuous Assessment**	**Total**
04	--	02	05	70	30	30	20	150

Subject Contents			
Sr. No	**Topic**	**Total Hours**	**Weight (%)**
1.	**Introduction to Basic Circuits Elements:** Charge, Work, Potential, Potential difference, Current, Power, Energy, Resistance, Inductance, Capacitance, Active elements, Passive elements, Ideal and Practical Voltage and Current Sources, Dependent & Independent Sources, VI relationship of circuit elements, Classification of Electrical Networks, Basic definitions like. node, junction, circuit, network, loop, mesh, branch etc, Kirchhoff's Voltage Law, Voltage Division, Kirchhoff's Current Law,Current Division, Introduction to Coupled Circuits, Dot Convention.	05	8%
2.	**Nodal Analysis and Mesh Analysis of resistive Circuits:** Introduction, Nodal Analysis of circuits with independent and dependent sources, Mesh Analysis of circuits with independent and dependent sources, Source Transformation Theorem for circuits with independent sources and dependent sources.	07	14%
3.	**Network Theorems for D.C. and A.C. Circuits:** Introduction, Superposition Theorem, Thevenin's Theorem and Norton's Theorem for circuits with independent and dependent sources, Maximum Power Transfer Theorem, Reciprocity Theorem, Substitution Theorem, Millman's Theorem, Compensation Theorem, Duality Theorem, Duality between Electricity and Magnetism.	12	22%
4.	**Initial Conditions:** Introduction, Initial conditions in elements, procedure for evaluating initial conditions, Solution of circuit equations by using Initial Conditions.	04	8%
5.	**Time domain Response of First Order and Second Order Circuits:** Introduction, Differential Equations, General and Particular Solutions, Source free and forced response of R-L, R-C and R-L-C circuits with D.C. and Sinusoidal Excitation.	05	8%
6.	**Laplace Transform Analysis:** Introduction, Laplace Transform of Standard Functions, Initial value theorem and final value theorem, Laplace transform of basic elements including initial conditions, Solving Differential Equations, Network Analysis using Laplace Transform, Resistor-inductor-capacitor in Laplace Domain, S-Domain Network, Network Analysis in S-Domain.	05	8%

7.	**Two –Port Networks Parameters :**	10	18%
	Introduction, Two Port Impedance Parameters (z-parameters), Admittance Parameters (Y-parameters), Hybrid Parameters (H-parameters), Inverse Hybrid Parameters, Transmission Parameters (ABCD-parameters), Relationship between different parameters.		
8	**Introduction to Network Topology:**	08	14%
	Graph ,Tree, planner and non planner networks, Incidence Matrix, Kirchhoff's Laws in Incidence Matrix Formulation, Basic Cutset matrix, Kirchhoff's Laws in Basic Cutset Formulation, Tie-set matrix, Kirchhoff's Laws in Tie-set Formulation, Loop and Nodal analysis of Networks with dependent & independent voltage and current sources, Relationship between Basic Cutset, Tie-set and incidence matrices.		

List of References:

1. Network Analysis By M.E Van Valkenburg PHI Publication
2. Circuits Theory by U. B. Bakshi, A.V.Bakshi, Technical Publication Pune
3. Circuits Theory, Analysis and Synthesis by A.Chakrabarati, Dhanpat Rai & Co.
4. Network Analysis By G. K. Mithal, Khanna Publications
5. Electric Circuits and Networks By K. S. Suresh Kumar – Pearson Education
6. Circuits and Networks By U. A. Patel, Mahajan Publishing House
7. Graphs: Theory and Algorithms By K. Thulasiraman, M.N.Swamy, Wiley Publication.
8. Electric Circuit Analysis By S N Sivanandam, Vikas Publishing House

Course Outcome:

After studying this course students will be able to:

1. To Explain the fundamental of various parameters like voltage, current, power, energy, resistance, capacitance and inductance, dependent and independent sources.
2. To Apply Kirchhoff's laws and networks theorems in the design and analysis of circuits.
3. To apply dot convention technique for analysis of transformer based circuits
4. To Determine the transient response of first and second order circuits using initial condition and laplace transform techniques.
5. To understand basics of network topologies and the tieset and cutset schedules.

List of Suggested Experiments:

1. To measure and calculate currents and voltages for a given resistive circuit and verify KCL and KVL.
2. To verify Superposition theorem experimentally for a given resistive circuit consisting two independent sources.
3. To verify Thevenin's theorem experimentally for a given circuit.
4. To verify Nortons's theorem experimentally for a given circuit.
5. To verify Milman's theorem experimentally for a given circuit.
6. To verify Substitution's theorem experimentally for a given circuit.
7. To verify Maximum power transfer theorem experimentally for a given circuit.
8. To verify Reciprocity theorem experimentally for a given circuit.
9. To measure and calculate RC time constant for a given RC circuit.
10. To measure and calculate RC time constant for a given RL circuit.
11. To measure and calculate Z-parameters for a given two-port system.
12. To measure and calculate Y-parameters for a given two-port system.
13. To measure and calculate H-parameters for a given two-port system.
14. To measure and calculate ABCD-parameters for a given two-port system