

Course Title	Circuit Theory	
Course Code	EL3XX	
Course Credit	Lecture	: 03
	Practical	: 01
	Tutorial	: 00
	Total	: 05
Course Learning Objective		
<p>At the end of this course students will be able to:</p> <ul style="list-style-type: none"> • Acquire knowledge about various circuit solving methods • Differentiate transient response and steady state response of electrical circuit. • Distinguish time domain and frequency domain analysis. • Identify and troubleshoot electrical circuits. • Develop circuits for modification of input wave forms to desired ones. 		
Detailed Syllabus		
Sr. No.	Name of chapter & details	Hours Allotted
Section – I		
1	Review Topics Introduction, Basic terminology and definitions related to networks, Classification of networks, Kirchoff's laws.	03
2	Analysis of resistive Circuits Mesh Analysis of Circuits with Dependent and Independent Sources, Concept of Supermesh, Nodal Analysis of Circuits Containing Dependent and Independent Sources, Concept of Super node, Source Transformation technique, Duality.	05
3	Magnetic Circuits & resonance Mutual inductance, Dot convention for coupled circuits, Series Resonance, Parallel resonance, Quality factor in resonance, Relation between quality factor and bandwidth.	03

4	Network Theorems for DC & AC circuits Superposition Theorem, Thevenin'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.	06
5	Network Topology 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.	04
Total hours		21
Section – II		
6	Initial conditions Initial conditions in elements, Procedure for evaluating initial conditions, Solution of circuit equations by using Initial Conditions.	03
7	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, Examples.	06
8	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.	06
9	Network functions Poles and Zeros of the network function, Restriction on Pole and Zero locations for driving point and transfer function.	03
10	Two –Port Networks Two port Impedance parameters, Two port Admittance Parameters, Two port Hybrid	03



SYLLABUS

	parameters, Two port Transmission parameters, Symmetry and Reciprocity of all parameters, Inter-relationship between all these parameters	
	Total hours	21
Instructional Method and Pedagogy		
<ul style="list-style-type: none">• Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.• Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval.• Surprise tests/Quizzes/Seminar/Tutorials will be conducted.• The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.• Minimum ten experiments shall be there in the laboratory related to course contents.		
Reference Books		
<ol style="list-style-type: none">1. Franklin Kuo, "<i>Network Analysis & Synthesis</i>," Wiley International.2. John O' Malley, "<i>Basic Circuit Analysis</i>," Schaum's series.3. DeCarlo, "<i>Linear Circuits Analysis</i>," 2nd edition: Oxford University Press (Indian edition)4. A. Chakrabarti, "<i>Network analysis and Synthesis</i>," Dhanpat Rai & Co. Pvt. Ltd.5. Van Valkenburg, "<i>Network analysis and Synthesis</i>," Prentice Hall of India.6. U. A. Patel, "<i>Network Analysis</i>," Mahajan Publication House.		
Additional Resources		
<p>http://nptel.ac.in/courses/108102042/ http://nptel.ac.in/courses/108106075/</p>		



School of Engineering
(Electrical Department)

List of Experiments

Subject Code :

Subject Name : Circuit Theory

Sr.No	Aim of experiment
1	Demonstrate Superposition theorem.
2	Demonstrate Thevenin's theorem.
3	Demonstrate Reciprocity theorem.
4	Demonstrate Millman's' theorem.
5	Demonstrate Maximum Power Transfer theorem.
6	Analyze time response of R-C circuit to a step D.C. voltage input.
7	Analyze time response of R-L circuit to a step D.C. voltage input.
8	Estimate and demonstrate different types of time responses of R-L-C series circuit to a step D.C. voltage input.
9	Calculate parameters of Two Port Network.
10	Create and demonstrate resonance in R-L-C Parallel circuit.
11	Perform and calculate resonance, Bandwidth and Q factor of R-L-C series circuit.
12	Perform and analyze R-L transient response in PSIM.
13	Perform and analyze R-C transient response in PSIM.
14	Perform and analyze R-L-C transient response in PSIM.
15	Design low pass, High pass and band-pass filter using passive components.