COURSE CODE	COURSE NAME	L-T-P-C	YEAR OF INTRODUCTION
EC201	NETWORK THEORY	3-1-0-4	2016

Prerequisite: Nil

Course objectives:

- To make the students capable of analyzing any linear time invariant electrical network.
- To study time domain, phasor and Laplace transform methods of linear circuit analysis.
- To study the transient response of networks subject to test signals.
- To develop understanding of the concept of resonance, coupled circuits and two port networks.

Syllabus:

Circuit variables and Circuit elements, Kirchhoff's laws, Network topology, Mesh and node analysis of network, Laplace transform, Inverse Laplace transform, Solution of differential equations by using Laplace transforms, Transient analysis of RL, RC, and RLC networks, Network functions for the single port and two ports, Parameters of two-port network, Resonance, Coupled circuits

Expected outcome:

At the end of the course students will be able to analyze the linear time invariant electrical circuits.

Text Books

1. Ravish R., Network Analysis and Synthesis, 2/e, McGraw-Hill, 2015.
2. Valkenburg V., Network Analysis, 3/e, PHI, 2011.

References:

1. Sudhakar A,S. P. Shyammohan, Circuits and Networks- Analysis and Synthesis, 5/e, McGraw-Hill, 2015.
2. Choudhary R., Networks and Systems, 2/e, New Age International, 2013.
3. Franklin F. Kuo, Network Analysis and Synthesis, 2/e, Wiley India, 2012.
4. Pandey S. K., Fundamentals of Network Analysis and Synthesis, 1/e, S. Chand, 2012.
5. Edminister, Electric Circuits – Schaum's Outline Series, McGraw-Hill,2009.

Course Plan

Module	Course content (48 hrs)	Hours	Sem. Exam Marks
I	Introduction to circuit variables and circuit elements, Review of Kirchhoff's Laws, Independent and dependent Sources, Source transformations	3	15
	Network topology, Network graphs, Trees, Incidence matrix, Tie-set matrix and Cut-set matrix	2	
	Solution methods applied to dc and phasor circuits: Mesh and node analysis of network containing independent and dependent sources	3	
II	Network theorems applied to dc and phasor circuits: Thevenin's theorem, Norton's theorem, Superposition theorem, Reciprocity theorem, Millman's theorem, Maximum power transfer theorem	6	15

	Laplace transform, properties Laplace Transforms and inverse Laplace transform of common functions, Important theorems: Time shifting theorem, Frequency shifting theorem, Time differentiation theorem, Time integration theorem, s domain differentiation theorem, s domain integration theorem, Initial value theorem, Final value theorem	4	
FIRST INTERNAL EXAM			
III	Partial Fraction expansions for inverse Laplace transforms, Solution of differential equations using Laplace transforms	3	**15**
	Transformation of basic signals and circuits into s-domain	2	
	Transient analysis of RL, RC, and RLC networks with impulse, step, pulse, exponential and sinusoidal inputs	3	
	Analysis of networks with transformed impedance and dependent sources.	3	
IV	Network functions for the single port and two ports, properties of driving point and transfer functions, Poles and Zeros of network functions, Significance of Poles and Zeros	3	**15**
	Time domain response from pole zero plot, Impulse Response	1	
	Network functions in the sinusoidal steady state, Magnitude and Phase response	3	
SECOND INTERNAL EXAM			
V	Parameters of two port network: impedance, admittance, transmission and hybrid parameters, Interrelationship among parameter sets	5	**20**
	Series and parallel connections of two port networks	2	
	Reciprocal and Symmetrical two port network	2	
	Characteristic impedance, Image impedance and propagation constant (derivation not required)	2	
VI	Resonance: Series resonance, bandwidth, Q factor and Selectivity, Parallel resonance	3	**20**
	Coupled circuits: single tuned and double tuned circuits, dot convention, coefficient of coupling, Analysis of coupled circuits	4	
END SEMESTER EXAM			

Question Paper Pattern

The question paper consists of three parts. Part A covers modules I and II, Part B covers modules III and IV and Part C covers modules V and VI. Each part has three questions. Each question can have a maximum of four subparts. Among the three questions one will be a compulsory question covering both the modules and the remaining two questions will be as one question from each module, of which one is to be answered. Mark pattern is according to the syllabus with maximum 30% for theory and 70% for logical/numerical problems, derivation and proof.