

BEEE203L	Circuit Theory	L	T	P	C
		3	1	0	4
Pre-requisite	BEEE101L, BEEE101P	Syllabus version			
		1.0			
Course Objectives					
<ol style="list-style-type: none"> <li>1. Familiarize the network topology, theorems and the analysis of three-phase unbalanced systems.</li> <li>2. Understand the time domain system behaviour using pole zero plot, resonant circuits and to implement different types of passive filters.</li> <li>3. Evaluate the transient and steady state response of electrical circuits and two port network parameters.</li> </ol>					
Course Outcomes					
At the end of the course, student will be able to:					
<ol style="list-style-type: none"> <li>1. Understand the network topology and to apply the network theorems to estimate the steady state response for a given excitation.</li> <li>2. Analyse three-phase unbalanced systems in star and delta configurations.</li> <li>3. Infer and evaluate transient response, steady state response of RL, RC and RLC circuits and network functions.</li> <li>4. Acquire knowledge about the application of Laplace transform, Fourier series and Fourier transform in the electrical network.</li> <li>5. Evaluate two port network parameters to simplify the network computations.</li> </ol>					
Module:1	Network Topology	6 hours			
Concept of tree, branch, tree link, incidence matrix, tie-set matrix and loop currents, cut-set matrix and node pair potentials; Duality					
Module:2	Network Theorems	10 hours			
Network theorems for AC circuits: Superposition, reciprocity, thevenin's, norton's, maximum power transfer and millman's theorem					
Module:3	Three-phase Systems	8 hours			
Review of balanced system; Unbalanced systems: Delta-connected, three-wire star connected, four-wire star-connected loads; Analysis of unbalanced 3-wire star load: Kirchhoff's law, loop current method, star/delta conversion method using millman's theorem					
Module:4	Analysis of Transient Response of Circuits	10 hours			
Review of Laplace transformation; Laplace transform of network and time domain solution for RL, RC and RLC networks for AC and DC excitations; Transient behaviour of circuit elements under switching conditions and their representations, evaluation of initial and final conditions in RL, RC and RLC circuits with AC and DC excitations					
Module:5	Network Function and Frequency Response	10 hours			
Transfer Function; Poles and zeros diagram, time-domain response from pole-zero plot, poles and zeros of network functions and their significance; Stability; Series and parallel resonance: Q factor and bandwidth Filters: Definitions, classification and characteristics of different filters; Design of passive filters: Low pass filter, high pass filter, band pass filter and band stop filter					
Module:6	Fourier Analysis and Its Applications	7 hours			
Trigonometric fourier series for non-sinusoidal functions: Circuit analysis; Average power and RMS values using fourier coefficients; Exponential fourier series; Fourier transform for commonly used periodic and aperiodic functions; Circuit analysis in frequency domain					
Module:7	Two Port Networks	7 hours			
Open circuit impedance parameters, Short circuit admittance parameters, transmission parameters, hybrid parameters; Relationship between parameter sets; Interconnections of two port networks					
Module:8	Contemporary Issues	2 hours			

		<b>Total Lecture hours:</b>		<b>60 hours</b>	
<b>Text Book(s)</b>					
1.	Charles K Alexander, Matthew Sadiku, Fundamentals of Electric Circuits, 2021, 7 <sup>th</sup> edition, Mc Graw Hill Education				
2.	Ravish. R. Singh, Network Analysis & Synthesis, 2019, 2 <sup>nd</sup> Edition, Mc-Graw Education				
<b>Reference Books</b>					
1.	William Hayt, Jack Hemmerly, Jaime Phillips, Steven Durbin, Engineering Circuit Analysis, 2019, 9 <sup>th</sup> edition, Mc Graw Hill Education				
2.	M.E Van Valkenberg, Network Analysis, 2019, Revised 3 <sup>rd</sup> Edition, Pearson Publishers				
3.	Abhijit Chakrabarthy, Circuit Theory (Analysis and Synthesis), 2018, 7 <sup>th</sup> Revised Edition, Dhanpat Rai & Co.				
4.	V. K. Mehta, Rohit Mehta, Basic Electrical Engineering, 2017, S Chand Publishers				
5.	Mahmood Nahvi, Joseph Edminister, Electric Circuits, 2018, 7 <sup>th</sup> Edition, McGraw Hill Education				
Mode of Evaluation: CAT, Digital Assignments, Quiz and FAT					
Recommended by Board of Studies			30-10-2021		
Approved by Academic Council			No. 64	Date	16-12-2021