Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
(Autonomous Institute Affiliated to University of Mumbai)

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
EL32	Circuit Theory	3	1	--	3	1	--	4
		Examination Scheme						
		ISE		MSE	ESE			
		10		30	100 (60% Weightage)			

Pre-requisite Course Codes		ES21 (Basic Electrical Technology)
After successful completion of the course, student will be able to		
Course Outcomes	CO1	Analyse the given circuits using theorems and transformation techniques
	CO2	Analyse the given circuit using Graph Theory
	CO3	Analyse the given RL, RC and RLC circuits in time domain
	CO4	Analyse the given RL, RC and RLC circuits in frequency domain
	CO5	Predict the circuits using Foster and Cauer realization methods
	CO6	Explain the concept of two port network, relation between the parameters and their interconnection

Module No.	Unit No.	Topics	Ref.	Hrs.
1	1.1	**Analysis of DC circuits**: Analysis of circuits with and without controlled sources using generalized loop, node matrix, Superposition, Thevenin, Norton, Maximum Power transfer, Millman theorems	3	10
	1.2	**Analysis of coupled circuits:** Self and mutual inductances, coefficient of coupling, Dot convention, equivalent circuit, solution using loop analysis	1	
2	2.1	**Graph Theory:** Concept of loop, tree, co-tree, incidence matrix, cut set matrix and tie set matrix	4	6
	2.2	Tellegen's theorem, Planar and Non planar graphs, Duality principle	4	
3	3.1	**Time domain analysis of R-L and R-C circuits:** Forced and natural response, time constant, initial and final values **Solution using first order equation for standard input signals:** Transient and steady state time response, solution using universal formula	1,3	12
	3.2	**Time domain analysis of R-L-C circuits:** Forced and natural response, effect of damping	1,3	

		Solution using second order equation for standard input signals: Transient and steady state time response		
	3.3	**Frequency domain analysis of RLC circuits:** S-domain representation, applications of Laplace Transform in solving electrical networks	1,3	
4	**4.1**	**Network Function:** driving point and transfer function, Poles and Zeros, calculation of residues by analytical and graphical method, frequency response	2	6
	4.2	**Positive real functions:** Concept of positive real function, testing for Hurwitz polynomials, testing for necessary and sufficient conditions for positive real functions	2	
	4.3	**Synthesis of RC, RL, LC circuits:** Concepts of synthesis of RC, RL, LC driving point functions.	2	
5	**5.1**	**Parameters:** Open Circuit, Short Circuit, Transmission and Hybrid parameters, relationships among parameters, reciprocity and symmetry conditions	1	8
	5.2	**Series/parallel connection:** T and Pi representations, interconnection of Two-Port networks	1	
			Total	**42**

References:

[1] A. Chakrabarti, "Circuit Theory", Dhanpat Rai and Co.,New Delhi, Edition 2013

[2] Franklin F Kuo, "Network Analysis and Synthesis", Wiley, Second Edition

[3] M E Van Valkenburg, "Network Analysis", Prentice-Hall of India Pvt Ltd, Third Edition

[4] D. Roy Choudhury, "Networks and Systems", New Age International Pvt Ltd, Wiley, Second Edition.