CIRCUIT THEORY

Course Code	20ES1302	**Year**	II	**Semester(s)**	I
Course Category	Engineering Science	**Branch**	EEE	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	BEEE (20ES1201)
Continuous Internal Evaluation:	**30**	**Semester End Evaluation:**	**70**	**Total Marks:**	**100**

Course Outcomes	
Upon successful completion of the course, the student will be able to	
CO1	**Understand** the basic concepts of AC circuits, Resonance, Concepts of magnetically coupled circuits, two port networks, transient analysis and three phase circuits(L2)
CO2	**Apply** the basic electrical laws, engineering mathematics and sciences to obtain, the desired circuit variables, steady state, transient responses of electrical circuits and relationship between two port network parameters. (L3)
CO3	**Apply** the principles of electrical engineering to solve resonant circuits, magnetically coupled circuits, three phase networks and verify circuit theorems. (L3)
CO4	**Analyze** the different three phase circuit configurations and transient response of electrical circuits. (L4)
CO5	**Analyze** two port networks, super mesh and super node circuits to obtain desired parameters. (L4)
CO6	**Investigate** various electrical circuit problems and **submit a report**

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1														
CO2	3												3	1
CO3	3												3	1
CO4		2											3	1
CO5		2											3	1
CO6									3	3			2	

SYLLABUS		
Unit No.	**Contents**	**Mapped CO**
I	**Sinusoids & Phasors:** Sinusoids, Phase, Phase difference, Phasors, phasor relationships for circuit elements. Complex and polar form representations, J-notation, Effective values of current and voltage. Instantaneous power, average power, Apparent power, real power, reactive power, power triangle, complex power, power factor. Steady state analysis of RL, RC and RLC circuits.	**CO 1 CO 2 CO 6**
II	**Resonance:** Series resonance, Parallel resonance, bandwidth, quality factor. Super Mesh and Super Node, Reciprocity theorem, Millman's theorem, Compensation theorem and Tellegen's theorem.	**CO 1 CO 3 CO 5 CO 6**
III	Magnetically coupled circuits, Self Inductance, Mutual Inductance, Coupling coefficient, Dot convention. Two port networks - impedance parameters, admittance parameters, Hybrid parameters and Transmission parameters, relationships between parameters.	**CO 1 CO 2 CO 3 CO 5 CO 6**
IV	**Transient Analysis:** Time response of RL, RC, RLC series circuits for Zero input, Step input, sinusoidal excitation - Initial conditions-solution approachusing differential equation and Laplace transforms.	**CO 1 CO 2 CO 4 CO 6**
V	Three –phase circuits: Phase sequence, Relation between line and phase voltages and currents in balanced systems – Analysis of balanced three phase circuits – two wattmeter method for measurement of active & reactive power, measurement of three phase reactive power using one wattmeter method.	**CO 1 CO 3 CO 4 CO 6**

Learning Resources
Text Books
1. William H. Hayt Jr., Jack E. Kemmerly, 'Engineering Circuit Analysis', 9/e, McGraw Hill,2020. 2. Charles K.Alexander, Mathew N.O.Sadiku, "Fundamentals of Electric Circuits" (Sixth Edition), Tata McGraw-Hill,2019.
Reference Books
1. Van Valkenburg M.E, 'Network Analysis', 3/e, Prentice Hall India , 2014 2. Sudhakar and ShyamMohan ,Network Theory', ,2/e, TMH,2012. 3. Schaum's outlineseries—Basiccircuit analysis,McGraw-Hill Professional, 2012 4. A.Chakrabarti,Circuit Theory – Analysis and Synthesis', 7/e, DhanpatRai and Company, 2014.
Web Links 1. https://nptel.ac.in/courses/117/106/117106108/ 2. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-002-circuits-and-electronics-spring-2007/video-lectures/