ELECTRICAL CIRCUITS

II Semester: EEE / ECE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AEEB03	Foundation	3	1	-	4	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

OBJECTIVES:

The course should enable the students to:

I. Classify circuit parameters and apply Kirchhoff's laws for network reduction.
II. Apply mesh analysis and nodal analysis to solve electrical networks.
III. Illustrate single phase AC circuits and apply steady state analysis to time varying circuits.
IV. Analyze electrical circuits with the help of network theorems.

Module-I	INTRODUCTION TO ELECTRICAL CIRCUITS	Classes: 09

Circuit concept: Basic definitions, Ohm's law at constant temperature, classifications of elements, R, L, C parameters, independent and dependent sources, voltage and current relationships for passive elements (for different input signals like square, ramp, saw tooth, triangular and complex), temperature dependence of resistance, tolerance, source transformation, Kirchhoff's laws, equivalent resistance of series, parallel and series parallel networks.

Module -II	ANALYSIS OF ELECTRICAL CIRCUITS	Classes: 09

Circuit analysis: Star to delta and delta to star transformation, mesh analysis and nodal analysis by Kirchhoff's laws, inspection method, super mesh, super node analysis; Network topology: definitions, incidence matrix, basic tie set and basic cut set matrices for planar networks, duality and dual networks.

Module-III	SINGLE PHASE AC CIRCUITS AND RESONANCE	Classes: 10

Single phase AC circuits: Representation of alternating quantities, instantaneous, peak, RMS, average, form factor and peak factor for different periodic wave forms, phase and phase difference, 'j'notation, concept of reactance, impedance, susceptance and admittance, rectangular and polar form, concept of power, real, reactive and complex power, power factor.

Steady state analysis: Steady state analysis of RL, RC and RLC circuits (in series, parallel and series parallel combinations) with sinusoidal excitation; Resonance: Series and parallel resonance, concept of band width and Q factor.

Module-IV	MAGNETIC CIRCUITS	Classes: 09

Magnetic circuits: Faraday's laws of electromagnetic induction, concept of self and mutual inductance, dot convention, coefficient of coupling, composite magnetic circuit, analysis of series and parallel magnetic circuits

Module-V	NETWORK THEOREMS (DC AND AC)	Classes: 08

Network Theorems: Tellegen‟s, superposition, reciprocity, Thevenin‟s, Norton‟s, maximum power transfer, Milliman‟s and compensation theorems for DC and AC excitations, numerical problems.

Text Books:

1. A Sudhakar, Shyammohan S Palli, “Circuits and Networks”, Tata McGraw-Hill, 4th Edition, 2010.

Reference Books:

1. John Bird, “Electrical Circuit Theory and Technology”, Newnes, 2nd Edition, 2003.
2. C L Wadhwa, “Electrical Circuit Analysis including Passive Network Synthesis”, New Age International, 2nd Edition, 2009.
3. David A Bell, “Electric circuits”, Oxford University Press, 7th Edition, 2009.
4. E Hughes, “Electrical and Electronics Technology”, Pearson Education, 2010.
5. A Chakrabarthy, “Electric Circuits”, Dhanipat Rai & Sons, 6th Edition, 2010.
6. V D Toro, “Electrical Engineering Fundamentals”, Prentice Hall India, 1989.

Web References:

1. https://www.igniteengineers.com
2. https://www.ocw.nthu.edu.tw
3. https://www.uotechnology.edu.iq
4. https://www.iare.ac.in

E-Text Books:

1. https://www.bookboon.com/en/concepts-in-electric-circuits-ebook
2. https://www.www.jntubook.com
3. https://www.allaboutcircuits.com
4. https://www.archive.org