ELCTRICAL CIRCUITS

II Semester: EEE / ECE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AEEB03	Foundation	3	1	0	4	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

I. COURSE OVERVIEW:

This course deals with fundamentals of electrical circuit, basic parameters like resistor, inductor and capacitor, formation of circuit and network, nature of sources to feed the networks, different network reduction techniques to study behaviour of networks, two port network parameters, single phase AC circuits and their analysis and for easy simplifications. The emphasis of this course is laid on the basic analysis of circuits which includes, transient analysis of DC and AC circuits Faraday's laws of electromagnetic induction, network theorems for reducing complexity of networks.

II. 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

III. COURSE OUTCOMES(COs):

COs	Course Outcome
CO 1	Understand and analyze basic AC and DC electrical circuits.
CO 2	Apply mesh analysis and nodal analysis to solve electrical networks. Calculate the two port network parameters.
CO 3	Illustrate single phase AC circuits and apply steady state analysis to time varying circuits.
CO 4	Understand the transient response of series and parallel RL, RC and RLC circuits for DC excitations.
CO 5	Understand the characteristics of complex electrical networks using DC and AC Theorems.

IV. SYLLABUS:

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.		

V. Text Books:

1. A Sudhakar, Shyammohan S Palli, "Circuits and Networks", Tata McGraw-Hill, 4th Edition, 2010.
2. M E Van Valkenberg, "Network Analysis", PHI, 3rd Edition, 2014.

VI. 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.

VII. 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

VIII. 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