ELECTRICAL CIRCUITS

II Semester: EEE / ECE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AEEC02	Foundation	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

Prerequisites: There are no prerequisites to take this course.

I. COURSE OVERVIEW:

The course introduces the basic concepts of circuit analysis which is the foundation for all subjects of the electrical and electronics engineering. It includes the basic fundamental laws of electricity and magnetism with an emphasis on resistors, inductors and capacitors (RLC) circuits applied to alternating current (AC) or direct current (DC) of electrical networks. Further This course provides network theorems with different excitations, two-port network and network topology to solve for real-time applications.

II. COURSE OBJECTIVES:

The students will try to learn

I. The network reduction techniques such as source transformation, mesh analysis, nodal analysis and network theorems to solve different networks.
II. The basic concept of AC circuits for optimization of household and industrial circuitry.
III. The various configurations of electromagnetic induction used in magnetic circuits helps in the winding of electrical machines.
IV. The characteristics of two-port networks and network topologies suitable in power system.

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to:

CO 1	**Define** the various terminology used to study the characteristics of DC and AC electrical networks.	Remember
CO 2	**Discuss** the different laws and indirect quantities associated with electrical circuit for branch currents and nodal voltages.	Understand
CO 3	**Summarize** the procedure for several theorems to reduce complex network into simple equivalent network with DC and AC excitation.	Understand
CO 4	**Describe** the electromagnetic induction, magnetic flux, self and mutual inductance in the single coil and coupled coils magnetic circuits to know total magneto motive force and total ampere turns values.	Understand
CO 5	**Recognize** the two port parameters and network topology for graphical and digital representation of complex circuits to be measure easily, without solving for all the internal voltages and currents in the different networks.	Remember
CO 6	**Define** the importance of dual network for compare both mesh and nodal networks.	Remember

IV. SYLLABUS:

MODULE-I: INTRODUCTION TO ELECTRICAL CIRCUITS (09)

Circuit concept: Basic definitions, Ohm's law at constant temperature, classifications of elements, independent and dependent sources, voltage and current relationships for passive elements,

Single phase AC circuits: Representation of alternating quantities, properties of different periodic wave forms, phase and phase difference, concept of impedance and admittance, power in AC circuits.

MODULE-II: ANALYSIS OF ELECTRICAL CIRCUITS (09)

Circuit analysis: Source transformation, Kirchhoff's laws, total resistance, inductance and capacitance of circuits, Star - delta transformation technique, mesh analysis and nodal analysis, inspection method, super mesh, super node analysis.

MODULE-III: NETWORK THEOREMS (DC AND AC) (10)

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

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

MODULE-IV: MAGNETIC CIRCUITS (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: **TWO PORT NETWORK AND GRAPH THEORY (08)**

Two Port Network: Two port parameters, interrelations, Two port Interconnections.

Network topology: Definitions, incidence matrix, basic tie set and basic cut set matrices for planar networks, duality and dual networks.

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