FUNDUMENTALS OF ELECTRICAL ENGINEERING

I Semester: CSE | IT

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AEEB01	Foundation	3	1	-	4	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

COURSE OBJECTIVES:

The course should enable the students to:

I. Understand the basic electrical circuits and circuit laws to study behavior of electrical networks.
II. Use different network reduction techniques to study characteristics of electrical networks.
III. Analyze series and parallel AC circuits using complex notation.
IV. State and use DC circuit theorems to determine unknown currents and voltages.

COURSE OUTCOMES (COs):

CO 1 Understand the basic concepts of electricity, electrical circuits elements, application's of Kirchhoff laws to complex circuits.
CO 2 Explore to the working of mesh analysis and nodal analysis, inspection method, super mesh, super node analysis.
CO 3 Summarize various alternating quantities such as instantaneous, peak, RMS, average, form factor and peak factor for different periodic wave forms.
CO 4 Discuss the basic theory of real, reactive, apparent power and complex power, power factor.
CO 5 Explain the concepts of graph, tree, incidence matrix, basic cut set and basic tie set matrices for planar networks, duality and dual networks.

COURSE LEARNING OUTCOMES (CLOs):

1. Define the various nomenclature used to study the DC electrical circuits.
2. Understand the concept of electrical circuit and classify electrical circuits elements.
3. Analyze the circuits using Kirchhoff's current and Kirchhoff's voltage law.
4. Use of series-parallel concepts for simplifying circuits.
5. Describe source transformation technique to determine equivalent resistance and source current.
6. Apply network reduction techniques to calculate unknown quantities associated with electrical circuits.
7. Summarize the procedure of mesh analysis and nodal analysis, inspection method, super mesh, super node analysis.
8. Apply the concept of network theorems.
9. Summarize the procedure of thevenin's and norton's theorems to reduce complex network into simple equivalent network.
10. List out various alternating quantities such as Sinusoidal AC voltage, average and RMS values, form and peak factor, and understand concept of three phase alternating quantity.
11. Interpret the alternating quantities with its instantaneous, average and root mean square values.
12. Illustrate the concept of impedance, reactance, admittance, susceptance and conductance.
13. Understand the phase and phase difference and j notation.
14. Discuss representation of rectangular and polar forms.
15. Analyze the steady state behavior of R, L and C elements with sinusoidal excitation.
16. Analyze the steady state behavior of series and parallel RL and RC circuits with sinusoidal excitation.

17. Analyze the steady state behavior of series and parallel RLC circuits with sinusoidal excitation.
18. Illustrate the concept of real, reactive, apparent power and complex power.
19. Interpret the power factor in single phase AC circuits.
20. Discuss the various nomenclatures related with network topology.
21. Formulate incidence, tie-set and cut-set matrix which are used to solve the behavior of complex electrical circuits.
22. Understand the concepts of duality and importance of dual networks.

MODULE-I	INTRODUCTION TO ELECTRICAL CIRCUITS	Classes: 08

Circuit concept: Basic definitions, Ohm's law at constant temperature, classification of elements, R, L, C parameters, independent and dependent sources, Kirchhoff's laws, equivalent resistance of series, parallel and series parallel networks.

MODULE -II	ANALYSIS OF ELECTRICAL CIRCUITS	Classes: 15

Circuit analysis: Source transformation, Star to delta and delta to star transformation, mesh analysis and nodal analysis, inspection method, super mesh, super node analysis; DC Theorems: Thevenin's and Norton's.

MODULE-III	INTRODUCTION TO AC CIRCUITS	Classes: 14

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, representation of rectangular and polar forms. Concept of reactance, impedance, susceptance and admittance.

MODULE-IV	COMPLEX POWER ANALYSIS	Classes: 15

Complex power analysis: Concept of real, reactive, apparent power and complex power, power factor in single phase AC circuits consisting of R, L, C, RL, RC and RLC combinations.

MODULE-V	NETWORK TOPOLOGY	Classes: 08

Network Topology: Definitions, Graph, Tree, Incidence matrix, Basic cut set and Basic Tie set Matrices for Planar Networks, Duality and Dual Networks.

Text Books:

1. A Chakrabarthy, "Electric Circuits", DhanipatRai& Sons, 6th Edition, 2010.
2. A Sudhakar, Shyammohan S Palli, "Circuits and Networks", Tata McGraw-Hill, 4th Edition, 2010.
3. M E Van Valkenberg, "Network Analysis", PHI, 3rd Edition, 2014.

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.

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