COURSE CONTENT

ELECTRICAL CIRCUITS-I

I Semester: EEE

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
2510221	Foundation	2	0	0	2	40	60	100
Contact Classes:45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes:45		

Prerequisites: **Mathematics**

Course Overview:

This course provides a comprehensive foundation in electrical circuit analysis, covering network elements, circuit laws, single- and three-phase AC circuits, network theorems, and magnetically coupled circuits**.** Students learn systematic methods such as nodal and mesh analysis**,** phasor techniques, power calculations, resonance, and analysis of balanced and unbalanced systems**.** The course equips learners with analytical skills essential for understanding and solving practical electrical engineering problems.

Course Objectives:

1. To understand the basic network elements and analyze circuits using fundamental laws.
2. To develop analytical skills to study single-phase AC circuits.
3. To learn to analyze three-phase circuits under balanced and unbalanced loads.
4. To apply network theorems to simplify and solve complex AC and DC circuits.
5. To understand magnetic coupling and analyze circuits involving self and mutual inductance.

Course Outcomes: After Completion of the Course, Students should be able to

1. Analyze electrical circuits using network elements and network simplification methods.
2. Elucidate steady-state analysis of single-phase AC circuits and resonance characteristics.
3. Evaluate three-phase circuits and measure power under various loading conditions.
4. Apply network theorems for electric circuits simplification.
5. Examine the behavior of magnetically coupled coils by applying concepts of self and mutual inductance and appropriate dot conventions.

UNIT - I: **Network Elements & Laws:** Active elements- Independent and dependent sources, Passive elements- R, Land C, Energy stored in Inductance and Capacitance, Kirchhoff's laws, Source transformation, Star-Delta transformation, Node voltage method, and Mesh current method.

UNIT - II: **Single-Phase Circuits:** RMS and average values of periodic sinusoidal and non-sinusoidal waveforms, Phasor representation, j-Notation, Steady-state analysis of series, parallel circuits. Impedance, Admittance, Active and Reactive Powers, Complex Power. Resonance: Series and parallel circuits, Bandwidth and Q-factor.

UNIT - III: **Three-phase Circuits:** Analysis of balanced and unbalanced three-phase circuits, Star and delta connections, Measurement of three-phase power for balanced and unbalanced loads.

UNIT - IV: **Network theorems:** Superposition theorem, Thevenin's theorem, Norton's theorems, Maximum power transfer theorem, Tellegen's theorem, Compensation theorem, Millman's theorem and Reciprocity theorem.(AC & DC).

UNIT - V: **Magnetic Coupled circuits:** Concept of self and mutual inductance, Dot convention, Coefficient of coupling, Analysis of circuits with mutual inductance.

TEXT BOOKS:

1. Van Valkenburg M.E, "Network Analysis", Prentice Hall of India, 3rd Edition, 2000.
2. Ravish R Singh, "Network Analysis and Synthesis", McGraw Hill, 2nd Edition, 2019.

REFERENCE BOOKS:

1. B. Subramanyam, "Electric Circuit Analysis", Dream tech Press & Wiley, 2021.
2. James W.Nilsson, Susan A.Riedel, "Electric Circuits", Pearson, 11th Edition, 2020.
3. A Sudhakar, Shyammohan S Palli, "Circuits and Networks: Analysis and Synthesis", McGraw Hill, 5thEdition, 2017.
4. Jagan N.C, Lakshrninarayana C., "Network Analysis", B.S. Publications, 3rd Edition, 2014.
5. William Hayt H, Kimmerly Jack E. and Steven Durbin M, "Engineering Circuit Analysis", Mc Graw Hill,6th Edition, 2002.
6. Chakravarthy A., "Circuit Theory", Dhanpat Rai & Co., First Edition, 1999.

ELECTRONIC RESOURCES:

1. **https://nptel.ac.in/courses/108/104/108104139/**
2. **https://nptel.ac.in/courses/108/106/108106172/**

MATERIALS ON LINE:

1. Course template
2. Tutorial question bank
3. Tech talk and Concept Video topics
4. Open-ended experiments
5. Definitions and terminology
6. Assignments
7. Model question paper–I
8. Model question paper–II
9. Lecture notes
10. E-Learning Readiness Videos (ELRV)