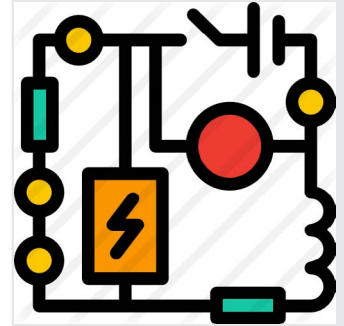


22EE103 ELECTRICAL CIRCUITS AND NETWORKS

Hours Per Week :

L	T	P	C
3	0	2	4



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PREREQUISITE KNOWLEDGE: Basics in Circuit Theory, Basic Mathematics.

COURSE DESCRIPTION AND OBJECTIVES:

This course deals with the analysis of DC and AC circuits using methods like mesh, node and network theorems. It also introduces the concepts of Electrical Resonance, two port networks and coupled circuits. The objective of this course is to introduce the properties of network elements and methods of analysis for various electrical circuits and magnetic coupled circuits.

MODULE-1

UNIT-1

20L+0T+0P=20 Hours

CIRCUIT ANALYSIS, NETWORK THEOREMS AND 3-PHASE AC SYSTEM:

Circuit Analysis: Analysis of DC and AC circuits by Mesh and Nodal Analysis, Super mesh and super node analysis.

Network Theorems: Superposition, Thevenin's, Norton's, Reciprocity, Tellegen's, Maximum Power transfer and Millman's theorems for both DC and AC circuits.

3-Phase AC System : Three phase unbalanced systems, Measurement of Power in three phase circuits.

UNIT-2

04 L+0T+16P=20 Hours

TWO PORT NETWORKS:

Open circuit (impedance), Short circuit (admittance), Transmission (ABCD) and Inverse Transmission, Hybrid and Inverse hybrid parameters, Inter relation between them, Inter connection of 2-port networks.

PRACTICES:

- Verification of source transformation technique.
- Verification of Thevenin's, Norton's Theorem, Superposition and Maximum Power Transfer Theorem.
- Determination of Z, Y, h and ABCD Parameters in a Two-Port network.
- Measurement of 3-phase Power by two Wattmeter Method for balanced and unbalanced load (Star/Delta).

MODULE-2

UNIT-1

20L+0T+0P=20 Hours

COUPLED CIRCUITS AND RESONANCE:

Coupled Circuits: Concept of self and mutual inductance, Concept of mutual coupling, Calculation of equivalent inductance in complex coupled circuit, Coupled impedance.

Resonance: Series and Parallel Resonance, Different combinations, Quality factor, Bandwidth, Selectivity of different circuits.

UNIT-2

04L+0T+16P=20 Hours

TRANSIENTS:

Response of simple RL, R-C and R-L-C series and parallel circuits subjected to DC, Impulse, Pulse and Sinusoidal excitations using Laplace transforms method.

SKILLS:

- ✓ Determine currents and voltages of all elements in any electrical network.
- ✓ Analyze a simple house wiring diagram.
- ✓ Calculate power, current and voltage in any three phase circuit.
- ✓ Select a suitable fuse for overcurrent protection.
- ✓ Analyze transient behaviour of various electrical networks.

PRACTICES:

- Determination of mutual inductance for 2 or 3 inductive coils connected in series and parallel.
- Determination of Average and R.M.S. Values of various waveforms using MATLAB.
- Determination of impedance in complex AC circuits using MATLAB.
- Determination of Time-Response in simple series RL and RC network using MATLAB.

COURSE OUTCOMES:

Upon successful completion of this course, students will have to ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Apply the knowledge of basic circuit law and simplify the network using reduction techniques.	Apply	1	1,2,6,9
2	Analyze the circuit using Kirchhoff's law and Network simplification theorems.	Analyze	1	1,2,9,12
3	Analyze the series resonant and parallel resonant circuit.	Analyze	2	1,2,3,9,12
4	Apply mathematical and analytical techniques to observe the transient behaviour of networks and verify using electrical simulation tools.	Evaluate	1,2	1,2,3,9,12
5	Synthesize two port networks.	Create	1	1,2,9,12

TEXT BOOKS:

1. A. Chakrabarti, "Circuit Theory Analysis & Synthesis, 7th revised edition, Dhanpat Rai & Co., 2018.
2. W.H. Hayt, J.E. Kimmerly and Steven. M. Durbin, "Engineering Circuit Analysis", 9th edition, Tata Mc Graw Hill, 2019.

REFERENCE BOOKS:

1. Joseph Edminister and Mahmood Nahvi, "Electric Circuits", 5th edition, (Schaum's outline series) Tata Mc Graw Hill, 2017.
2. M.E. Van Valkenburg, "Network Analysis", 3rd edition, Prentice Hall of India, 2015.