COURSE CONTENT

ELECTRICAL CIRCUITS LAB								
II Semester: EEE								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
2520276	Core	0	0	2	1	40	60	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes:30				Total Classes:30		
Prerequisites: Electrical Circuits - I.								

Course Overview: This laboratory course provides hands-on and digital simulation-based exposure to fundamental concepts in electrical circuits, network analysis, and power measurement. The experiments are designed to enhance understanding of resonance phenomena, time-domain and frequency-domain responses, two-port network parameters, power measurement in three-phase systems, and the verification of key electrical theorems. Students will also gain experience in using digital simulation tools for analysis and verification of circuit behavior.

Course Objectives: Students will learn

1. To understand the behavior of RLC circuits and resonance characteristics through simulation-based experiments.
2. To examine the transient and steady-state responses of first-order RL and RC circuits for different input signals.
3. To analyze network parameters and coupled circuits to understand interrelationships between electrical quantities.
4. To evaluate performance characteristics of electrical networks and filters in frequency and time domains using simulation tools.
5. To investigate power measurement techniques in balanced three-phase systems and validate network theorems using software simulations.

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

1. Analyze resonance phenomena in series and parallel RLC circuits using circuit simulation software.
2. Determine time-domain response parameters of first-order RL and RC circuits for non-sinusoidal inputs.
3. Evaluate two-port network parameters and magnetic coupling characteristics experimentally.
4. Interpret frequency-domain behavior of low-pass, high-pass, band-pass, and band-stop filters using simulation tools.
5. Measure active and reactive power in three-phase systems and verify network theorems through circuit simulation.

The following experiments are required to be conducted compulsorily:

1. Verification of Series and Parallel Resonance using digital simulation.
2. Determination of Time response of first order RL and RC circuit for periodic non – sinusoidal inputs- Time Constant and Steady-state error using digital simulation.
3. Determination of Two port network parameters – Z, Y, Transmission and Hybrid parameters.

5. Determination of Co-efficient of coupling, self and mutual inductance in magnetic Coupled Circuits.
6. Frequency domain analysis of Low-pass filter and High-pass filters using digital simulation.
7. Verification of Superposition and Maximum Power Transfer theorems using digital simulation.
8. Verification of Thevenin's and Norton's theorems using digital simulation.

In addition to the above eight experiments, at least any two of the experiments from the following list are required to be conducted

1. Measurement of Active Power for Delta connected balanced loads.
2. Measurement of Reactive Power for Star and Delta connected balanced loads.
3. Frequency domain analysis of Band-pass filters.
4. Frequency domain analysis of Band-stop filters.
5. Determination of Time response of first order RL, RC circuit for periodic non – sinusoidal inputs – Time Constant and Steady state error.
6. Verification of Compensation theorem.

Proposed open ended experiments:

1. Verification of active and reactive power measurements in EV Microgrid using digital simulation

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", Dreamtech 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, 5th Edition, 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", McGraw 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/**
3. **https://ocw.mit.edu/search/ocwsearch.htm?q=laboratory**

MATERIALS ONLINE:

1. Lab Manual
2. Open-ended experiments