Title: Linear Circuit Analysis

Code Number: EE1103

Credit Hours: 4 (3+1)

Prerequisites: Nil

Semester: 1st

Course Objectives

The course will enable students to:

1. Apply circuit reduction techniques such as series, parallel and source conversions and circuit solving techniques like Mesh and Node Analysis to analyze for steady state solutions for both sinusoidal AC and DC
2. Analyze for transients in RC and RL circuits for DC
3. Apply phasor techniques for the solution of steady state AC response including voltage, current, power and power factor.
4. Conduct experiments in laboratory in order to interpret experimental data and observe its conformance with analyzed results of circuits

Contents

Unit 1: Basic Electrical Concepts

1. Charge, Current, Voltage, Power
2. Voltage and Current sources

Unit 2: Voltage and Current Laws

1. Ohm's Law
2. Kirchhoff's Current Law
3. Kirchhoff's Voltage Law
4. Voltage Division in Series
5. Current Division in Parallel
6. Series and Parallel Sources

Unit 3: Nodal and Mesh Analysis

1. Nodal Analysis and Super Node
2. Mesh Analysis and Super Mesh
3. Comparison between Nodal and Mesh Analysis

Unit 4: Circuit Analysis Techniques

1. Linearity and Superposition
2. Source Transformation
3. Thevenin's and Norton's Theorems
4. Maximum Power Transfer
5. Delta-Wye Transformation

Unit 5: Energy Storing Elements

1. The Inductor
2. The Capacitor
3. Physical construction and Mathematical Model

Unit 6: First Order Circuits (RL and RC)

1. Transient Response
2. Steady State Response

Unit 7: Apply Phasor Techniques:

1. AC fundamentals
2. RMS or effective, average and maximum values of current & voltage for sinusoidal signal wave forms

Lab Work Outline

Learn the use of basic instruments in electrical engineering such as function generators, power supplies, oscilloscopes. Design and implement circuits using R, RL and RC and verify the node voltages and loop currents using instruments. Verify Circuit-theorems using lab instruments. Verify circuit transformations using lab instruments.

Teaching-Learning Strategies:

The pedagogical approach to this course relies on face-to-face teaching in a university classroom environment. The lectures are delivered using multimedia support and on white board. Students are engaged and encouraged to solve real world problems using computer-aided tools.

Assignments/Types and Number with calendar:

A minimum of four assignments to be submitted before the written exams for each term.

Assessment and Examinations:

Sr. No.	Elements	Weightage	Details
1.	Midterm Assessment	35%	It takes place at the mid-point of the semester.
2.	Sessional Assessment	25%	It is continuous assessment. It includes classroom participation, attendance, assignments and presentations, homework, attitude and behavior, hands-on-activities, short tests, quizzes etc.
3.	Final Assessment	40%	It takes place at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.

Recommended Books:

1. J D Irwin and R M Nelms, "Basic Engineering Circuit Analysis", Wiley, 9th Edition, 2008
2. R E Thomas, A J Rosa and G J Toussaint, "The Analysis and Design of Linear Circuits" John Wiley, 6th Edition, 2009
3. C Alexander and M Sadiku, "Fundamentals of Electric Circuits", McGraw- Hill, 4th Edition, 2008
4. S. Franco, "Electric Circuits Fundamentals", Oxford University Press, (Latest Edition)
5. W Hayt, J Kemmerly and S Durbin, "Engineering Circuit Analysis", McGraw- Hill, 7th Edition, 2007
6. Introductory Circuit Analysis" by Robert L. Boylestad