Electrical Network Analysis

Code	Credit Hours
EE 211	3-1

Course Description

This is the second course in two part sequence of Electrical Circuit Analysis stream. The course requires basic concepts and knowledge related to circuit analysis and theorems taught in the first course EE-111 titled Linear Circuit Analysis. The course introduces steady state solution of linear circuits (comprising resistors, capacitors, inductors and controlled sources) excited by sinusoidal sources using 'Phasor Method'. AC power analysis and poly-phase circuits are introduced. Next part of the course introduces the students to magnetically coupled circuits and linear and ideal transformers. Laplace Transform techniques are introduced followed by their application to linear circuit analysis. Basic circuit synthesis is discussed. Concept of frequency response is discussed and applied to parallel and series resonant circuits. Bode plots are studied and applied to some basic filter design. The last part of the course covers two-port networks and their analysis using two-port network parameters.

Text Book:

Engineering Circuit Analysis (Eighth Edition); by W. H. Hayt Jr (late), Jack Kemmerly (late) and Steven Durbin

Reference Book:

Fundamentals of Electric Circuits (Fifth Edition); by Charles K Alexander and Matthew N.O. Sadiku

Prerequisites

EE-111 Linear Circuit Analysis

ASSESSMENT SYSTEM FOR THEORY

Quizzes	15%
Assignments	5%
Mid Terms	30%
ESE	50%

ASSESSMENT SYSTEM FOR LAB

Assignments	N/A
Lab Work and Report	70%
Lab ESE/Viva	30%

Teaching Plan

Week No	Topics	Learning Outcomes
1-2	Sinusoidal Steady State Analysis	Course Introduction, Phasors, Impedance, Circuit analysis in phasor domain
3-4	AC Power	Real power Reactive Power Complex Power RMS – DC value Power factor correction
5-6	Poly Phase circuits	Single Phase Three Wire Systems Delta Connected sources and loads Wye connected sources and loads
7-8	Magnetically coupled circuits	Dot convention Energy in coupled circuits Linear Transformers Ideal transformer Equivalent Circuits
9	**MID Term Exam**	
10-14	Laplace Transform & S-Domain Analysis	Complex Frequency Intro to Laplace Transform LT of Simple Functions Basic Theorems of LT Circuit Analysis in S domain Analysis Poles, Zeros and Transfer Functions Convolution Synthesis of Transfer Functions using Op-Amps
14-15	Frequency Response	Resonance Scaling Bode Plots Basic & Active Filters Design Advanced Filters
16-17	Two port Networks	One Port Networks Admittance Parameters Some Equivalent Networks Impedance Parameters Hybrid Parameters Transmission Parameters Revision
18	**End Semester Exam**	

Practical:

Lab Experiments:	
Lab 01:	Function Generator and Digital Oscilloscope Operation
Lab 02:	Sinusoidal Response Analysis and Simulation
Lab 03:	Sinusoidal Response Analysis and Simulation of Phase Shifter
Lab 04:	Capacitive Phase Shift and Reactive Power (Part 1)
Lab 05:	Inductive Phase Shift and Reactive Power
Lab 06:	Power in AC Circuits
Lab 07:	Balanced Three-Phase Delta and Wye Circuits (**Part One**)
Lab 08:	Balanced Three-Phase Delta and Wye Circuits (**Part Two**)
Lab 09:	Use of Matlab for s-Domain Circuit Analysis
Lab 10:	Use of PSpice for Phasor Domain Circuit Analysis and Frequency Response Analysis
Lab 11:	Analysis of Series RLC Circuit in Terms of Amplitude and Phase Angle – Hardware
Lab 12:	Implementation of Tuned Circuit and Frequency Response
Lab 13:	Two-Port Network - Impedance, admittance and Hybrid Parameters Using PSpice