EECE 311
Linear Circuits II

4 Units: 4 hours lecture (Engineering topics)

Course Supervisor/Main Instructor: Meghdad Hajimorad/ Meghdad Hajimorad, David Silveira , and Ghang-Ho Lee

Required Textbook and Other Course Materials:

Textbook

Fundamentals of Electric Circuits, 6th Ed., Charles Alexander and Matthew Sadiku, McGraw Hill, ISBN 9780078028229.

Software

LTSpice
MATLAB: also requires "System Identification" and "Control Systems" toolboxes.
Octave: free alternative to MATLAB but functionality is substantially reduced.

Course Description:

This course introduces students to advanced concepts related to analysis and applications of linear circuits. Topics include analysis of circuits with dependent sources, Thévenin equivalents, Fourier series, multi-stage operational amplifier circuits, transfer functions, magnitude and phase response, filter applications and design, transient analysis with Laplace Transforms. 4 hours discussion.

Prerequisites: EECE 211, MATH 260 (may be taken concurrently)

Learning Objectives:

Students shall be able to:

- Solve DC circuits containing dependent sources to determine voltages, currents, and power using linear analysis methods such as nodal analysis, Kirchhoff's Laws, source transformations, and voltage/current division. (SO 1)
- Determine the Thévenin Equivalent voltage and resistance for a circuit containing both dependent and independent sources. (SO 1)
- Use phasor analysis to determine the response of passive and active RLC circuits to periodic non-sinusoidal signals expressed as Fourier Series. (SO 1)
- Determine the s-domain transfer function for circuits containing resistors, capacitors, inductors, and operational amplifiers. (SO 1)
- Sketch Bode magnitude and phase plots, perform analysis and simulation of frequency response using MATLAB and LTSpice. (SO 1)
- Identify, analyze, and design circuits that implement various types of filters. (SO 1, 2 and 6)

- Determine the transient and steady-state response of a circuit using Laplace transforms. (SO 1)

Course Topics:

Week #	Course Topics and Reading List/Activities	Chapter
1	Review of prerequisite topics: DC analysis, KCL/KVL, dependent sources, Thévenin Eq.,	1-4
2	Review of prerequisite topics: op-amps, sinusoids and phasors, impedance.	5, 9
3	Frequency domain analysis, transfer functions, Fourier Series.	14.1-14.3 17.1-17.4
4	Continue topics from Week 3.	14.1-14.3 17.1-17.4
5	Components of transfer functions. Bode magnitude/phase plots. MATLAB intro.	14.4-14.6
6	Bode plots continued. Exam Review. Exam #1	14.4-14.6
7	Frequency selective circuits and frequency response. Filter types and applications.	14.7-14.8
8	Continue topics from Week 7.	14.7-14.8
9	Project discussion: WAV files, audio signal analysis and filtering with LTSpice	
10	Project discussion: audio speakers and crossovers. Filter design from tables.	
11	Project discussion continues. Exam Review. Exam #2	
12	Review of partial fractions. Singularity functions. Laplace transform theory.	7.4 15.1-15.4
13	Laplace transforms and circuit analysis, initial conditions and equivalent circuits.	16.1-16.4
14	Continue topics from Week 13.	16.1-16.4
15	Final Exam Review	
16	Final Exam	

Grading Scheme:

Homework and Quizzes, lowest two scores dropped	10%
Filter Design Project	20%
Exam 1	20%
Exam 2	20%
Final Exam	30%