University of Texas at El Paso

EE2151: LAB FOR EE2351 ELECTRIC CIRCUITS II

FALL 2015

Instructor: Eric Galvan

Office Location: E325

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Email anytime.

Office Hours: 9:00am-10:00am, Monday-Wednesday.

Lab Days/Time: Monday 13:30 – 16:20 Tuesday 10:30 – 13:20

Room: E333

Prerequisites: EE 1105 or EE 1110 with a grade of "C" or better.

Laboratory Description: Use of oscilloscopes, function generators, and power supplies to test and study electrical networks and their behavior. Technical writing and computer aided design.

Laboratory Requirements:

- **Composition Notebook (Lab Log):**
  - Name on front cover
  - Table of contents on the first page
  - Number all pages on the right hand side of pages ONLY. Write numbers on the bottom right hand side of the page.
  - All labs must be in this order: Prelab -> Lab Assignment/Data Collection -> Conclusion/Lab Report (Report and answer questions if any)
- **Prelab**:
  - Have it ready to turn in at the beginning of lab hours.
  - All prelabs must be turned in individually.
  - All prelabs must be done on your lab logs.
- **Grading Labs:** I will grade the lab logs and prelab during lab hours.
- **Work:** Can be done in groups of two but everyone must have their own individual log and work done.

- **Lab Data:** Please attach all of your lab data onto your logs. Lab data may be print outs of your simulations or pictures of your data (i.e. Circuit Boards, Measurements, etc.).
- **Reports:**
    - Must be done on your logs.
    - Please write legibly or type out your conclusion.
    - Answer all questions (if any).
    - At least 1 paragraph discussing expected/calculated data vs. experimental data. Compare measurements and explain how you arrived at those results. Write any interesting details about any problems you might have encountered during your lab.

GRADING	
Prelab	20%
Lab	50%
Reports	30%

PROPOSED OUTLINE FOR EE2151: LAB FOR 2351 ELECTRIC CIRCUITS II

By: Eric Galvan

(Content subject to change)

1. **LAB EXERCISE 1: Introduction of Simulation Software Using Multisim.**
    - **1.1** Students will perform node voltage & mesh current analysis on a Wheatstone Bridge Circuit.
    - **1.2** Students will simulate the Wheatstone Bridge circuit on Multisim.
    - **1.3** Students will compare and explain their results.
2. **LAB EXERCISE 2: Introduction to Basic Circuits on Breadboard**
    - **2.1** Students will build the Wheatstone Bridge circuit from their prelab on the breadboard. New components have been added to match resistor values.
    - **2.2** Students will measure voltage, current, and power using the multimeters from lab.
    - **2.3** Students will compare results from those of the previous lab and explain.
3. **LAB EXERCISE 3: Introduction to Oscilloscopes and Function Generators**
    - **3.1** Students will receive training on the use of basic electronic test equipment such as oscilloscopes and function generators.
    - **3.2** Students will use the Function Generator to generate waveforms with specific shapes and voltages.
    - **3.3** Students will measure and verify the signal parameters using the Oscilloscope.
4. **LAB EXERCISE 4: Analysis of Fundamental Op-Amps.**
    - **4.1** Students will use Oscilloscope and Function Generator to analyze basic Op-Amp function.
    - **4.2** Students will determine the gain, cut-off frequency, and saturation of the selected Op-Amps.

5. **LAB EXERCISE 5: Sinusoidal Steady State Analysis**
    - **5.1** Students will analyze, simulate, and construct two separate RLC circuits with a sinusoidal source.
    - **5.2** Students will determine if response is underdamped, overdamped, or critically damped.
    - **5.3** Students will simulate the step response in Multisim.
6. **LAB EXERCISE 6: Steady State Power Analysis**
    - **6.1** Students will analyze, simulate, and build an RL circuit with average and complex power.
7. **LAB EXERCISE 7: Natural Response of RC and RL Circuits**
    - **7.1** Students will construct RC and RL circuits in Mulitsim to gain a full understanding of their nature.
    - **7.2** Students will learn about the time constant τ and the transient response of capacitors and inductors.
8. **LAB EXERCISE 8: Transient Response of Second Order RLC Circuits**
    - **8.1** Students will explore the 3 types of responses by building the circuits in NI ELVIS.
    - **8.2** Students will identify the parameters that identify the type of response.
    - **8.3** Total loss of energy in a circuit.
9. **LAB EXERCISE 9**: **Balancing 3-Phase Circuits**
    - **9.1** Students will simulate circuits that demonstrate the transfer of power from the source to the load.
    - **9.2** Students will measure delays between voltage source and current through the circuit.
    - **9.3** Students will simulate a 3-phase circuit in Multisim
10. **LAB EXERCISE 10: Frequency Response and Filters**
    - **10.1** Students will experimentally investigate the magnitude and phase frequency response of several circuits, and applications of these circuits.
11. **LAB EXERCISE 11: Filters and Transfer Functions**
    - **11.1** Students will design and implement a 3-way audio crossover.
12. **LAB EXERCISE 12**: **Make Up Lab**
    - **12.1** Students have the opportunity to make up an unfinished lab.

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