

York University  
Dept. of Electrical Engineering and  
Computer Science

A laboratory Manual for Electric Circuits  
Lab  
EECS2200

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**Fall 2015-2016**

## ACKNOWLEDGEMENT

Prof Mokhtar Aboelaze developed this manual for EECS2200. Mr. Konstantin Bolshakov, who took this course in 2013, invested a lot of time and energy to improve this manual. Mr. Syed Islam updated this manual in Fall 2015.

***PREFACE***

This laboratory manual is intended for use in EECS2200 Electric Circuits. Every care was taken in preparing this manual, however no one is perfect. If you find any typos or errors in this manual, please contact the course director.

To the student:

The objective of this lab is to get you familiar with the instruments used in electric and electronic circuits measurements. It will introduce you to the concept of “lab book” and to how to design, implement and test simple electric circuits.

The lab will be done in groups of 2. Each lab consists of 2 parts. The prelab part will be done before you arrive to the lab. It will be submitted at the beginning of every lab. Then you have to do the experiment and record results. At the beginning of the next lab you should submit the lab report for the previous lab.

Each lab covers a specific topic in the course that will be clear from the lab title. It is your responsibility to read the theoretical part from the text book and the course notes before you go to the lab.

After you connect the circuit on the breadboard, check with the TA before connecting power. Please read the safety rules and troubleshooting hints before you start your first lab. Please be alert and use common sense during the experiment.

You have to maintain a laboratory book or journal, the TA must sign each page before you leave the lab. The journal will be checked once or twice during the term in order to be sure that you successfully did that part. Tips for maintaining a good journal are explained in this manual, please read “Appendix A: Laboratory Notebook” carefully.

The TA is there to help you, if you have any question ask the TA. A simple question might save you a lot of time and trouble later. Remember, you are dealing with expensive equipment.

To the TA:

Please read the experiment before you come to the lab. In the lab you have to approve the schematic diagram and the circuit connection before the students power up the experiment. Your job is to prevent any accidental mishaps that might injure students or destroy any equipment.

To the course Director:

The course director’s responsibility is to be sure that the lab is properly equipped, the TA is qualified to run the lab, the marked reports are returned to the students in a timely manner, and supervising the TA.

## LAB 5: AC Measurements.

### OBJECTIVE:

- Learn how to use oscilloscopes to measure complex voltages.
- Learn how to use the oscilloscope to calculate the phase difference between 2 voltages.

### PRELAB

Solve the following circuit showing the current in, and the voltage across, every element.

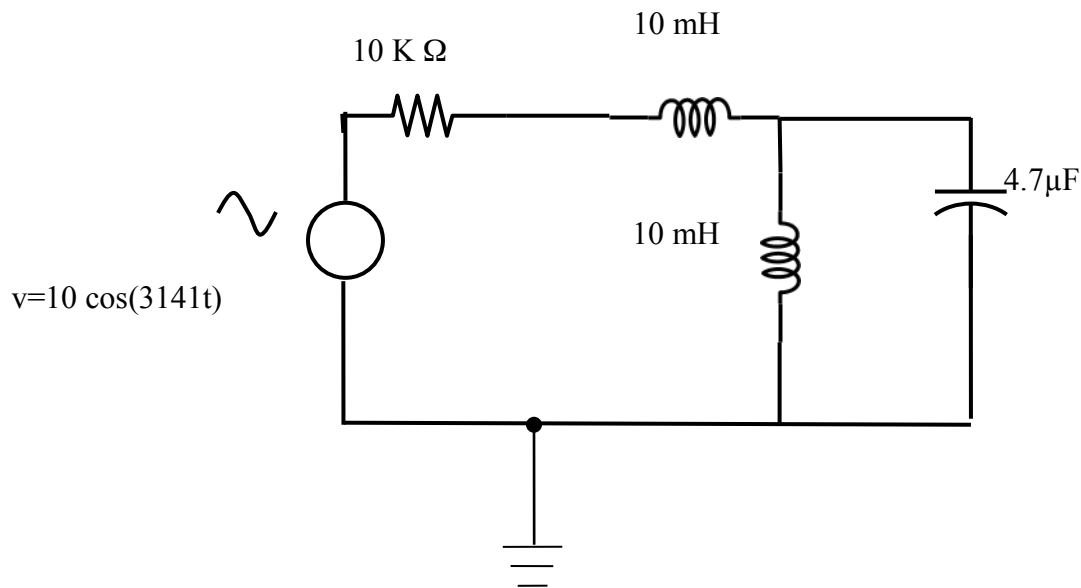


Figure L5.1: A simple RC circuit.

Simulate the above circuit using SPICE. Show the following graphs (use time domain analysis)

- Current vs. voltage across every circuit element
- Voltage across the capacitor, the inductor and the power supply

From the graph calculate the phase shift between these voltages and compare it with the phase shift you got it by solving the circuit above.

Construct the circuit in Fig. L5.2, set the power supply to 5-V P-P with a frequency of 250Hz.

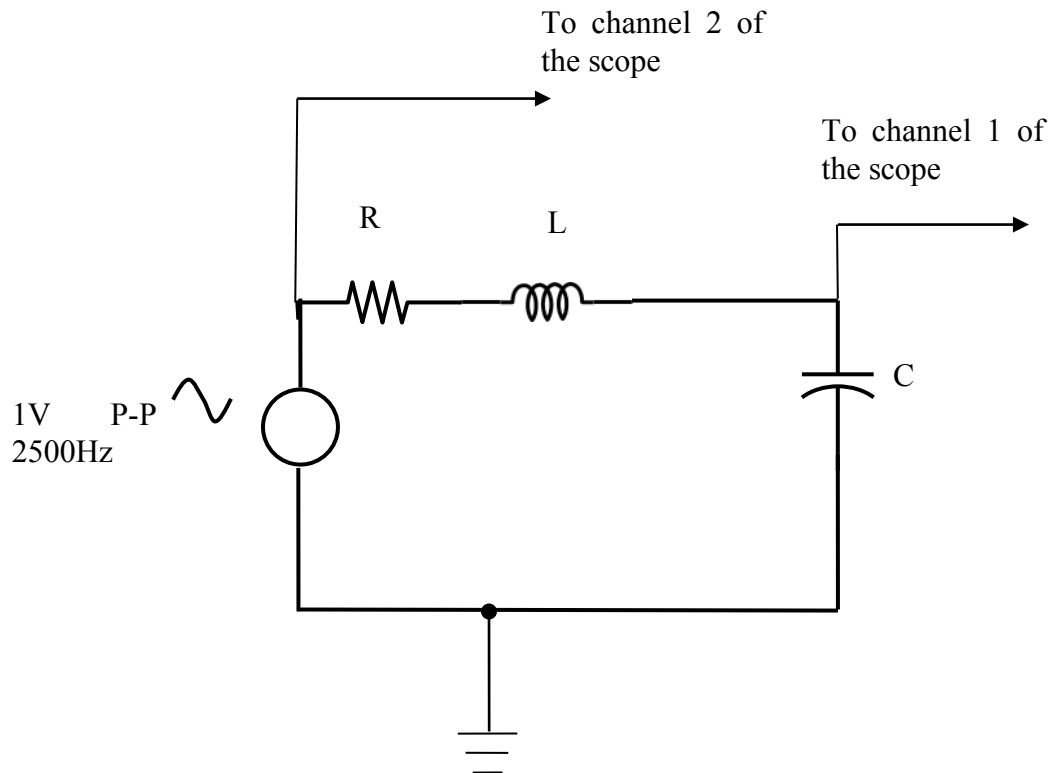


Figure L5.2 A simple RC circuit with the connection to the scope.

- Measure the actual values of the components and compare it with the nominal values. What is the error? Is it within the tolerance?
- Display the voltage across the input source and the capacitors on the scope. The way to do so is shown in the Figure. Sketch it in your lab notebook.
- Find a way to display the voltage across the inductor and the input source on the scope. What are the difficulties you faced? Can we just do that by connecting one end of the conductor to the scope? Why or why not.
- What are the phase shifts for the three voltages (take the source as a reference).
- Solve this circuit using the actual values for the components and compare the results with the values obtained in the lab.