

**Laboratory Goals**

- ❑ Design and construct an RLC circuit
- ❑ Measure the frequency response
- ❑ Compare the measured and calculated values to a PSPICE simulation of the circuit

**Pre-lab reading**

- ❑ RLC Circuits, EECE 203/213 circuit analysis textbook
- ❑ *Agilent Oscilloscope Users Guide*, by Agilent Technologies, Copyright 2000
- ❑ *Student Reference Manual for Electronic Instrumentation Laboratories* by Stanley Wolf and Richard Smith, Copyright 1990

**Equipment needed**

- ❑ Lab notebook, pen
- ❑ Agilent 54622 Digital Oscilloscope
- ❑ Agilent 33120A Function Generator
- ❑ 2 oscilloscope probes (attached to the oscilloscope)
- ❑ 1 BNC/EZ Hook test lead

**Parts needed**

- ❑ Circuit breadboard
- ❑ Lab parts kit
- ❑ Resistor (value to be determined),  $\frac{1}{4}$  Watt
- ❑ Capacitor, ceramic disc (value to be determined)
- ❑ Inductor, 1mH
- ❑ Jumper wires

**Lab safety concerns**

- ❑ Make sure all circuit connections are correct, and no shorted wires exist.
- ❑ Adjust the signal generator to the proper level before connecting it to the circuit

**1. Pre-Lab Filter Design**

- Complete RLC filter design by finding **R** and **C**. You are given:

$$f_0 = 16 \text{ kHz}$$

$$L = 1 \text{ mH}$$

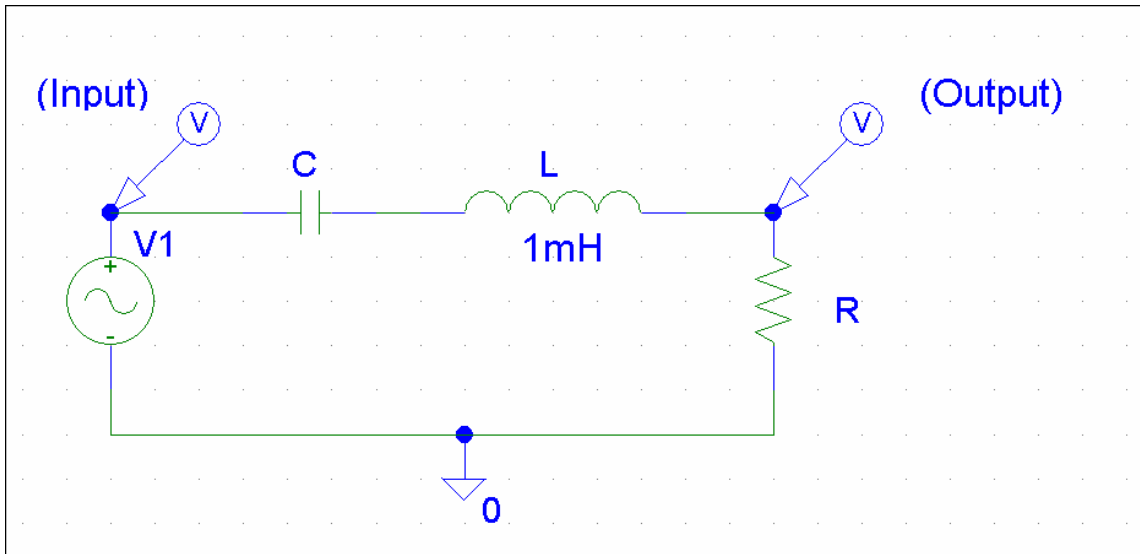
$$BW = 63 \text{ kHz}$$

- Create a PSPICE model of the circuit using the **L** provided, and your calculated **R** and **C** values. Use 1V<sub>pp</sub> for your AC input amplitude. Run an **AC Sweep** simulation with the following values:
  - **Pts/Decade:** 1000
  - **Start Freq:** 10
  - **End Freq:** 10MEG
  - **AC Sweep Type:** Decade
- Add a phase plot to the output plot (refer to Lab 4, page 6 if needed)
- Bring a diskette copy of the results to your lab section
- Create the following table in your lab notebook:

Frequency	V <sub>in</sub>	V <sub>out</sub>	Gain (V <sub>out</sub> /V <sub>in</sub> )	Phase shift (degrees)
1 KHz				
10 KHz				
100 KHz				
1 MHz				

## 2. Circuit Construction and Signal Measurement

- Build the following RLC circuit using the components provided by your teaching assistant:



- Adjust the generator to output a 1V<sub>pp</sub> sine wave at 1kHz
- Connect the BNC/EZ Hook test lead to the generator **OUTPUT**
- Clip the EZ Hook end of the test leads to the circuit input and ground respectively
- Clip the **CH1** oscilloscope probe and ground clip to the circuit input and ground respectively
- Clip the **CH2** oscilloscope probe and ground clip to the circuit output and ground respectively
- Measure and record the circuit input and output amplitude, and phase shift (note: for phase shift measurements, refer to the *Agilent Oscilloscope Users Guide* (page 5-40))
- Repeat the oscilloscope measurements for all the frequencies in Table 1
- When all measurements are complete, turn the equipment off
- Disconnect the test leads from the circuit

**Before leaving the lab, take a few minutes to clean up your workstation, and return all equipment to your cabinet.**

**3. Analysis**

Write a summary report for this lab. Be sure to also include the following topics:

Does the frequency response that you observed match the PSPICE model? Are there differences? If so, why?

What applications can you think of for this circuit?

Explain any difficulties you had with this lab. (Please include suggestions to improve the lab, if you have them).