ECE 209L - INTRODUCTION TO FILTERS - LAB 16
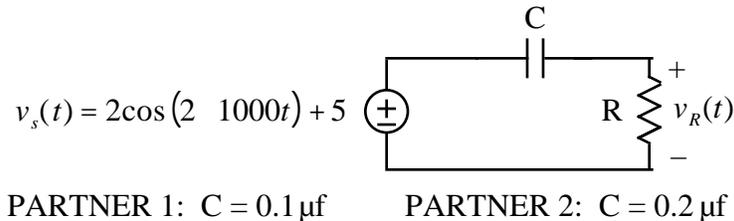# FIRST ORDER HIGHPASS RC FILTERS

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OBJECTIVE

The objective of this lab is to make use of superposition to find the steady state response of the following highpass filter.

$$v_s(t) = 2\cos\left(2\pi 1000t\right) + 5$$

PARTNER 1: $C = 0.1\,\mu f$ PARTNER 2: $C = 0.2\,\mu f$

LAB

1. **Prelab** - Obtain and measure your resistor and capacitor values. Then compare your nominal and measured values. Put your results in a Table

2. **Prelab** - What will happen to $v_R(t)$ in this circuit as R increases. Why

3. **Prelab** - Choose a value for f_{3dB} so that $v_R(t) \approx 0$. Then make use of your f_{3dB} to sketch a graph of the magnitude of the frequency response $G(j2\pi f) = V_R(j2\pi f)/V_S$

4. **Prelab** - Make use of your value of f_{3dB} and the fact that the transfer function of our first order highpass RC circuit is given by $G(j2\pi f) = \dfrac{jf}{jf + f_{3dB}}$ to find $G(j2\pi f)$

5. **Prelab** - Make use of your transfer function in Problem (4) to find and sketch $v_R(t)$

6. **Prelab** - Make use of the fact that in our circuit $f_{3dB} = \dfrac{1}{2\pi RC}$ to find R for your f_{3dB} in Problem (3)

7. Build your filter and then make use of a scope to sketch and obtain an equation for $v_R(t)$

8. Compare DC offsets and amplitudes of the sinusoids of your calculated and measured $v_R(t)'s$

9. **Prelab** - Choose a value for f_{3dB} so that $v_C(t) \approx 2\cos(2\pi 1000t)$. Then find and sketch a graph of the magnitude of the corresponding transfer function $G(j2\pi f)$

10. **Prelab** - Make use of your transfer function to calculate and sketch $v_R(t)$ for your filter

11. **Prelab** - Calculate the value of R for your filter

12. Build your filter and then sketch and write an equation for $v_R(t)$

13. Compare your calculated and measured $v_R(t)'s$