ECE 207L - FIRST ORDER RC CIRCUITS - LAB 9
INTRODUCTION TO CAPACITORS

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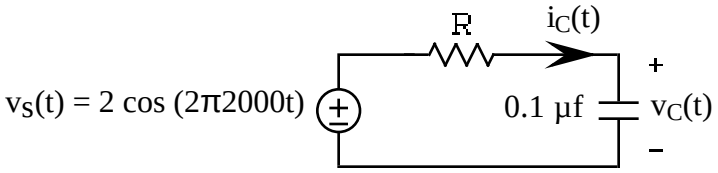
OBJECTIVE

The objective of this lab is to demonstrate that a capacitor's current $i_C(t)$ and voltage $v_C(t)$ are related as follows

$$i_c(t) = C\frac{dv_c(t)}{dt}$$

LAB

1. Given the following circuit



PARTNER 1: R = 1K PARTNER 2: R = 2K

   a. Measure your resistor and capacitor values. Compare with nominal values
   b. Measure the amplitudes and phases of $i_C(t)$ and $v_C(t)$. The phases should be with respect to $v_S(t)$. Show your calculations along with corresponding graphs.
   c. Make use of your results in part (b) to write expressions for $i_C(t)$ and $v_C(t)$ as cosines with positive coefficients. What is the phase difference between your $i_C(t)$ and $v_C(t)$
   d. Make use of your measured value for $v_C(t)$ to calculate $i_C(t)$ from the expression

$$i_c(t) = C\frac{dv_c(t)}{dt}$$

      Express your result as a cosine. What is the phase difference between your $i_C(t)$ and $v_C(t)$
   e. Compare your calculated and measured values in parts (b) and (d) for the amplitude of $i_C(t)$ and the phase difference between your $i_C(t)$ and $v_C(t)$

2. Given any two capacitors C_1 and C_2
   a. Measure their values
   b. Measure the equivalent capacitances when they're connected in series and when they're connected in parallel
   c. Calculate the equivalent capacitances when they're connected in series and when they're connected in parallel
   d. Compare your measured and calculated equivalent capacitances in parts (b) and (c)