

**EE221**  
**Experiment #6: First-Order Transient Response**

**Problem:** The circuit shown below in Figure 1 can be used to demonstrate both the transient step response (putting energy into the capacitor when the switch closes) as well as the natural response (taking energy out of the capacitor when the switch opens).

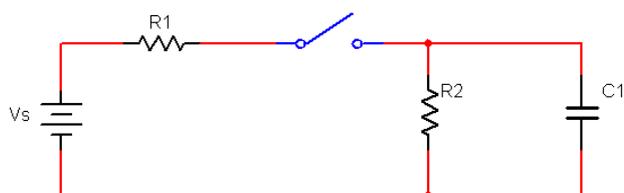


Figure 1 – RC circuit

Using available components for  $R_1$ ,  $R_2$ , and  $C_1$ , listed below in Table 1, design an experiment to evaluate the transient response of the circuit in Figure 1 having the following constraints. Use a voltage of 10 V for  $V_s$ .

1. Peak current from  $V_s < 200$  mA.
2. Total time to fully energize  $C_1$  is  $< 200$  ms.
3. Total time to fully de-energize  $C_1$  is  $> 200$  ms.

Table 1: Available component values

Resistors (k $\Omega$ )	Capacitor ( $\mu$ F)
1	47
2	100
3.3	
4.7	
10	

Build your circuit on the proto-board and experimentally determine that your design meets the constraints. Use the oscilloscope to measure the voltage across the capacitor and install a resistive shunt for measuring the current. Include the oscilloscope plots in your lab notebook.

Demonstrate your working design for the lab instructor.  
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