Electric Potential

TOPICS

E&M Topics

Capacitance

Combination of capacitors

EQUIPMENT LIST

Qty	Items	Part Numbers
1	Multimeter	35XP
2	Metallic Plates	
1	Book	
2	Capacitors 47 µF	
1	Capacitor 10 µF	

OBJECTIVES

Students will be able to...

- discover how the capcitance of conducting parallel plates is related to seperation between them.
- explore the equivilant capacitance of several capacitors wired in parallel and in series.

INTRODUCTION

This lab has two parts.

The purpose of Part 1 is to investigate how capacitance depends on separation of the two plates of the capacitor. For this you will have two fixed plates for which you will vary the distance, allowing you to observe the changing capacitance.

The the second part, the purpose is to measure the different capacitance for connections in parallel and series. Using a multimeter, you will be able to analyze the changing in capacitance for a circuit with two and three capacitors in series and parallel.

BACKGROUND

The capacitance C of a capacitor is defined as the ratio of the magnitude of the charge on either conductor to the magnitude of the potential difference between the conductors.

$$C = \frac{q}{\Delta V} \tag{1}$$

For two parallel plates of equal area and separated a certain distance, the capacitance is defined as $C{=}\epsilon\frac{A}{d}$; A being the area, d being the distance, and ϵ being the permittivity of the medium between the plates.

Combination of Capacitors

In series the inverse of the equivalent capacitance is the algebraic sum of the inverse of the individual capacitances, and it is always less than any individual capacitance of the combination.

$$\frac{1}{C_{\text{eq}}} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3} \cdots \tag{2}$$

In parallel the equivalent capacitance is the algebraic sum of the individual capacitances, and it is always greater than any of the individual capacitances.

$$C_{\text{eq}} = C_1 + C_2 + C_3 \ldots \tag{3}$$

