## Introduction

The third lab in Electrical Engineering Technology ( EE306 ) works on determining the characteristic of a capacitor. A capacitor is a passive element designed to store energy in its electric field. Besides resistors, capacitors are the most common electrical components. Capacitors are used extensively in electronics, communications, computers, and power systems. For example, they are used in the tuning circuits of radio receivers and as dynamic memory elements in computer systems. A capacitor is typically constructed as depicted in Fig1 **[1]** .

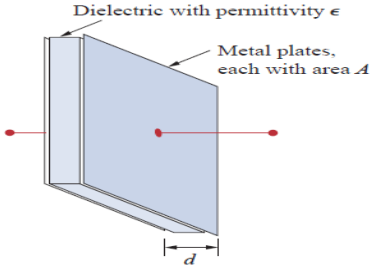


**Figure 1.** A typical capacitor **[1]**.

A capacitor consists of two conducting plates separated by an insulator (or dielectric). In many practical applications, the plates may be aluminum foil while the dielectric may be air, ceramic, paper, or mica. When a voltage source is connected to the capacitor, as in Figure2, the source deposits a positive charge q on one plate and a negative charge on the other. Figure3 shows the circuit symbols for fixed and variable capacitors. Note that according to the passive sign convention, if v > 0 and i > 0 or if v < 0 and i < 0 the capacitor is being charged, and if v.i < 0, the capacitor is discharging **[2]**.

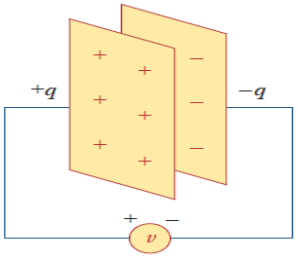


**Figure 2.** A capacitor with applied voltage v **[2]**.

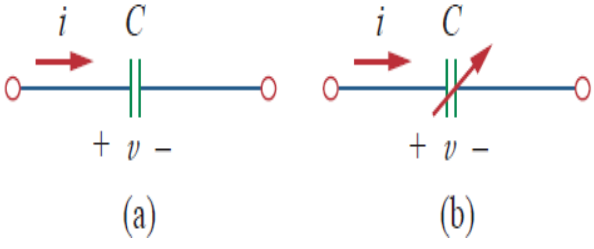


**Figure 3.** Circuit symbols for capacitors: (a) fixed capacitor, (b) variable capacitor **[2]**.

Tantalum, Ceramic, Electrolytic, and Mica capacitors were used in the expriment of lab3 (see table1). The report shows the procedures of charging and discharging the Tantalum and Ceramic capacitors. When a voltage was applied across a capacitor, the voltage spent some time (the time which a capacitor takes to charge and discharge) to reach the expected value. The readings of voltages and time were recorded in the tables based on charging and dicharging (see tables2, 3, 4 and 5). The report also shows the relation between the experimental voltage and the time for charging and discharging by using scatter plot. Formulas that we used in lab3 :

- Constant Time : $\tau = RC$
- The Theoretical Voltage For Charging : $V = V_\circ (1 - e^{-t/RC})$
- The Theoretical Voltage For Discharging : $V = V_\circ (e^{-t/RC})$
- The Theoretical Voltage For Charging when the time is constant : $V = V_\circ (1 - e^{-1})$
- The Theoretical Voltage For Discharging when the time is constant : $V = V_\circ (1 - e^{-1})$
- Percentage Error in calculations: %Error = $\frac{|\text{theoretical value} - \text{experimental value}|}{\text{theoretical value}} \text{ x } 100$