PHYSICS 231 – CHAPTER 24: CAPACITANCE AND DIELECTRICS

Capacitance:

$$C = \frac{Q}{V}$$

Parallel-plate capacitor:

$$C = \epsilon_0 \frac{A}{d}$$

Capacitors in series:

$$\frac{1}{C_{eq}} = \frac{1}{C_1} + \frac{1}{C_2}$$

Capacitors in parallel:

$$C_{eq} = C_1 + C_2$$

Energy:

$$U = \frac{Q^2}{2C} = \frac{1}{2}CV^2 = \frac{1}{2}QV$$

Energy density:

$$u = \frac{1}{2}\epsilon_0 E^2$$

Capacitor filled with dielectric of permittivity $\epsilon = K\epsilon_0$,

$$C = KC_0$$

Energy density in dielectric:

$$u = \frac{1}{2}\epsilon E^2$$

Gauss's law in dielectric:

$$\int K\vec{E} \cdot d\vec{A} = \frac{Q_{enc,free}}{\epsilon_0}$$