Basic Circuits

2.00A Lecture
Prof. A. Techet
Electronic Circuits

- **Resistance**: The property of a component to oppose the flow of electrical current through itself.

- **Capacitance**: The property of a component to oppose any change in voltage across its terminals, by storing and releasing energy in an internal electric field.

- **Inductance**: The property of a component to oppose any change in current through itself, by storing and releasing energy in a magnetic field surrounding itself.

**Resistance**

**Resistance in Series**: Current is the same everywhere
\[ V_I = I^* R_1 \ ; \ V_1 = I^* R_1 \ ; \ V_2 = I^* R_2 \]
\[ V_I = V_1 + V_2 = I^* (R_1 + R_2) \]

**Resistance in Parallel**: Voltage is the same everywhere
\[ I_1 = \frac{V}{R_1} \ ; \ I_1 = \frac{V}{R_1} \ ; \ I_2 = \frac{V}{R_2} \]
\[ I_T = I_1 + I_2 = \frac{V}{R_1} + \frac{V}{R_2} \]
\[ R_T = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2}} = \frac{R_1 R_2}{R_1 + R_2} \]

**Capacitance**

**Capacitance in Series**: Voltage is the same everywhere
\[ C_I = \frac{1}{\frac{1}{C_1} + \frac{1}{C_2}} = \frac{C_1 C_2}{C_1 + C_2} \]

**Capacitance in Parallel**: Current is the same everywhere
\[ C_I = C_1 + C_2 + \ldots \]
RESISTORS

Images removed due to copyright restrictions.
Please see http://www.art-sci.udel.edu/ghw/phys245/05S/lab/images/penny.jpg and http://www.art-sci.udel.edu/ghw/phys245/05S/lab/images/dime.jpg and any table of resistor color codes, such as http://en.wikipedia.org/wiki/Electronic_color_code

Resistor DecoderJava Applet:
http://www.physics.udel.edu/~watson/phys345/decoder/

LED Light Bank

Figure 13: Working LED Light Bank

Figure 2: Circuit Diagram for LED Light Bank

LED Light Bank

http://www.instructables.com/id/Circuit-Building-10V/

Light Absorption in the Ocean

Image removed due to copyright restrictions.
Please see http://www.art-sci.udel.edu/ghw/phys245/05S/lab/images/leads.gif

Figure 3: Tools for Building LED Light Bank

Figure by MIT OpenCourseWare.