

### Outline of Lecture #1: D.C. Circuits

This lecture covers the concepts and principles used to analyze *circuits* containing batteries (and other sources of steady *electromotive force*) and *resistors* in which steady *currents* and *voltages* are present.

#### Basic Concepts:

- Circuit
- Current (I): units = Amperes (A)
- Voltage or electric potential (V): units = Volts (V)
- Ground
- Resistance (R): units = Ohms ( $\Omega$ )
- Electromotive force ( $\mathcal{E}$ ): units = Volts (V)

#### Principles:

- Ohm's Law:  $V = IR$
- Power:  $P = IV$
- Kirchoff's Rules
  - Loop rule:  $\sum V = 0$
  - Junction rule:  $\sum I = 0$
- Thevenin's Theorem – output (or internal resistance)

#### Examples:

- Combining resistors in series:  $R_{eq} = R_1 + R_2 + R_3$
- Combining resistors in parallel:  $\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$
- Voltage divider:  $V_{out} = \frac{R_2}{R_1 + R_2} V_{in}$