LEDs are common elements in modern electronic circuits. They come in a range of colors, styles and sizes.

LEDs are an inexpensive option for learning about circuit theory and for use in a wide range of creative maker projects.
LED Basics

**LEDs** (light-emitting diodes) are semiconductor devices which can produce light in an electrical circuit. They are ‘polarized’ devices, meaning that there is a specific “positive” and “negative” lead on the LED – the longer lead (wire) of a two-wire LED must be connected to the positive side of the circuit. LEDs must have a minimum voltage to turn on and must be protected from excessive electrical current. A “current-limiting” resistor is often included in the circuit to prevent damage to the LED.

LEDs can come in packages of different shapes, sizes and colors. Round LEDs with two wires are commonly available in 3mm, 5mm and 10mm diameters and usually cost $0.05 - $0.25 each in moderate quantities. Multi-color, flashing and programmable LEDs are also available.

Circuit Basics

Many electrical and electronic devices exist to convert electrical energy into some other form of energy often light, heat, sound or motion. An electrical circuit can be considered a means to conduct and modify the flow of electrical charges from a source (such as a battery) to the load (such as a lamp, motor or heater). Circuit elements are said to be in “series” if the current flows out of one device into another device before returning to the battery. Circuit elements are in “parallel” if the current flow branches between multiple devices before returning to the battery.

Analysis of basic circuits may require simple applications of Ohm’s Law and Kirchhoff’s Circuit Laws. These are useful to determine the correct resistance needed to protect LEDs in a circuit.

Resources

Sparkfun: ‘Voltage, Current, Resistance, and Ohm’s Law’

Adafruit: ‘All About LEDs’
https://learn.adafruit.com/all-about-leds

Sparkfun: ‘Light-Emitting Diodes (LEDs)’
https://learn.sparkfun.com/tutorials/light-emitting-diodes-leds

Forrest M. Mims III has written a number of introductory books, including “Getting Started in Electronics”, which introduced a generation of makers to electronics. A more advanced and comprehensive resource is “The Art of Electronics” by Horowitz and Hill.