Electronics: Intro

Quantities:
- Voltage
- Current
- Power

Devices:
- Resistor
- Capacitor
- Inductor
- LED
- Transistor
- Op-Amp

Laws:
- Ohm’s Law
- Kirchhoff’s Laws
Voltage

9V \[+\] v
Voltage = pressure that pushes electrons through circuit
Water analogy: voltage = altitude of water
Current

3A $i$
Current = flow of electrons through circuit
Water analogy: current = flow of water
Power = voltage \times current

Water analogy: power = altitude drop \times flow

http://en.wikipedia.org/wiki/Hydroelectric

http://www.usbr.gov/power/data/sites/glencany/glencany.html

Resistor reduces current flow
Water analogy: flow less for winding river
Capacitor
Capacitor stores charge
Water analogy: tank stores water
Inductor

1\mu H

Inductor creates magnetic field opposing current change

Water analogy: mill wheel with inertia opposes flow change

LED

http://www.furuier.com/english/product/index0.htm

http://www.xmission.com/~m3lody/junk/xmas2002/lit_waterfall1.jpg
LED lights up and acts like voltage drop
Water analogy: lit waterfall
Transistor
Transistor current flow controlled by second small current flow
Water analogy: spillway for dam controlled by hydraulic line
Op-amp magnifies voltage across inputs
Water analogy: Lever translates small pressure into high pressure
Ohm’s Law
Ohm’s Law

Current in resistor = voltage / resistance

Water analogy: flow = altitude drop / length of river
Kirchhoff’s Voltage Law

9V

+ v1

v2

+
Kirchhoff’s Voltage Law

Sum of voltage drops around loop = 0
Water analogy: total altitude change for loop = 0
Kirchhoff’s Current Law
Kirchhoff’s Current Law

Sum of current flowing out of node = 0

Water analogy: what flows in must flow out