IEEE - CSULB Branch
February 26, 2021
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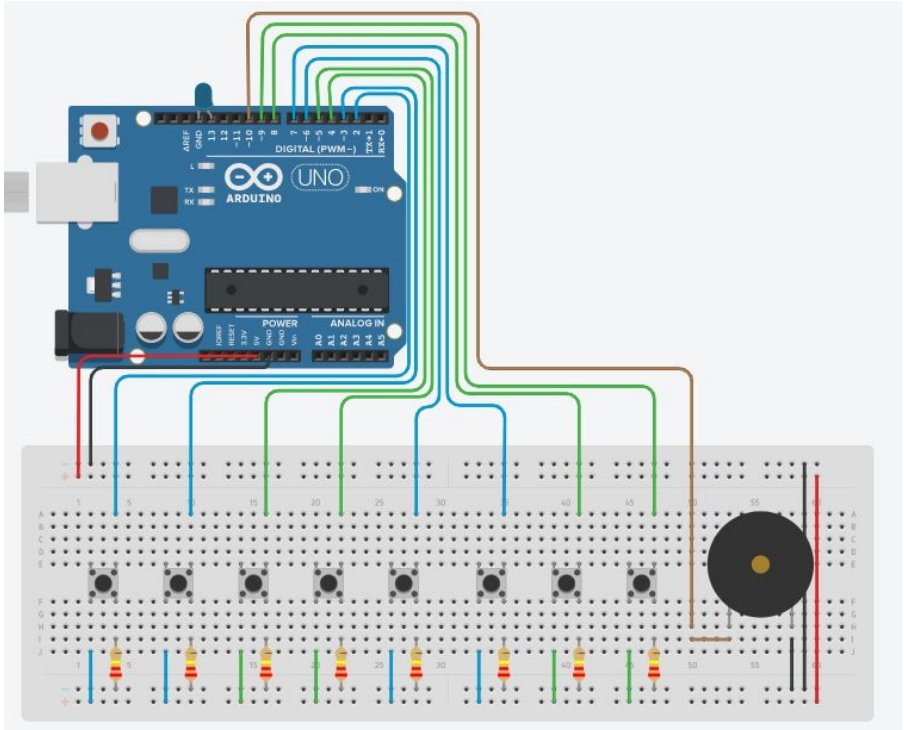
Agenda

- Project
- Resistors
- capacitors
- Inductors
- Breadboard

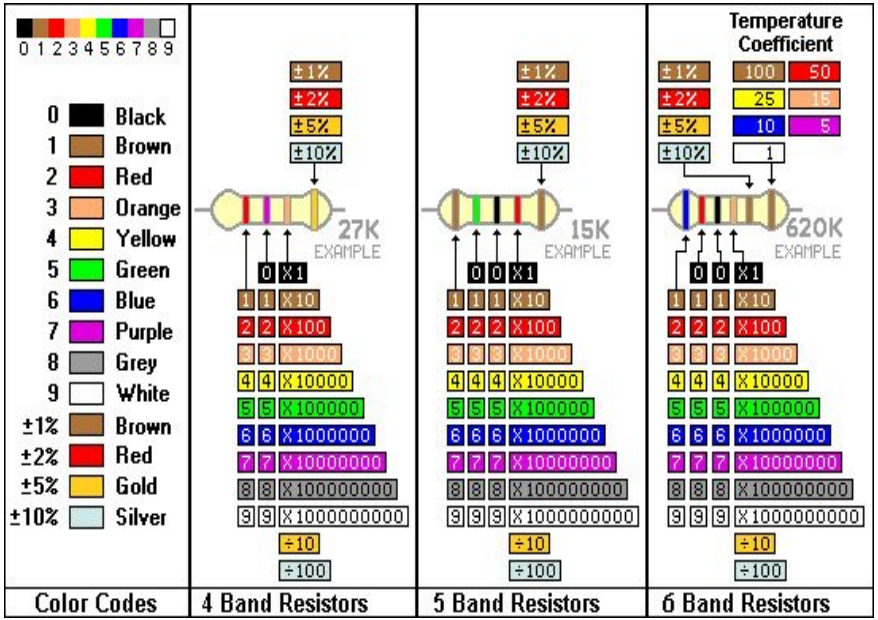
Project- Arduino Piano

- Sound Reactive Arduino Floor Piano
- Modules used
  - Arduino Uno/nano
- Components
  - Resistors
  - Jumper wires
  - Piezo



Resistor

- What is a resistor
  - A passive electrical component
    - create resistance in the flow of electric current
      - Reduces electric current
      - Divides voltages

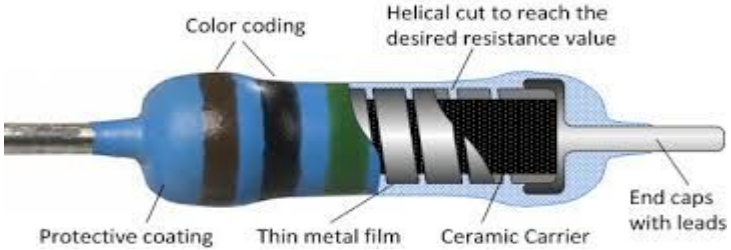


Resistors - continued

- Ohm's Law
  - To calculate the resistance in a circuit
  - V = IR
    - R = Resistance (ohms)
    - V = Voltage (volts)
    - I = current (amps)

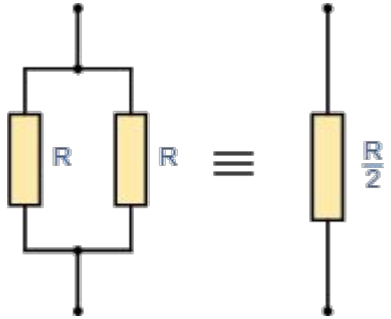
Resistors- continued

- Types of resistors
  - Wire wound round resistors
  - Metal Film Resistors
  - Thick and thin film resistors
  - Surface mount resistors

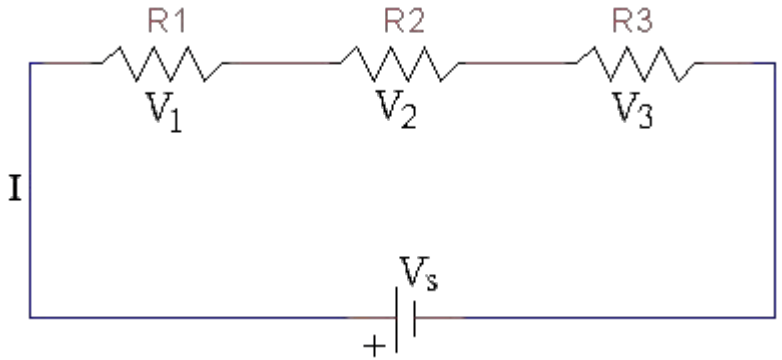


Resistor- Continued

- Resistors in Series
  - $R_{series} = R_1 + R_2 + R_3$
- Parallel Resistors
  - $R_{parallel} = 1/((1/R_1) + (1/R_2) + (1/R_3))$



Parallel Resistor



Series Resistor

Capacitors

- What are capacitors?
  - Stores and releases electrical energy
  - Same as a battery
    - Can charge and discharge faster
    - Capacitance is measured in farads
      - Mostly used µF

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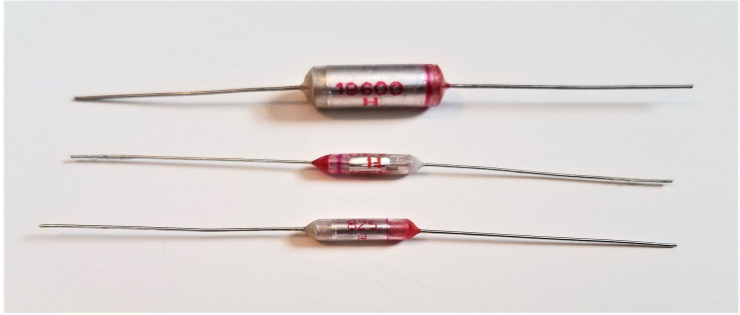
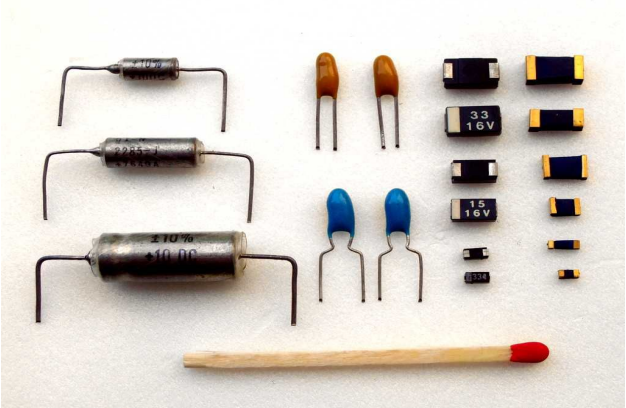
Capacitors- continued

- How to find the capacitance
  - **I = C dv/dt**
    - **I** = instantaneous current through the capacitor
    - **C** = capacitance in Farads
    - **dv/dt** = instantaneous rate of voltage change

Capacitors- continued

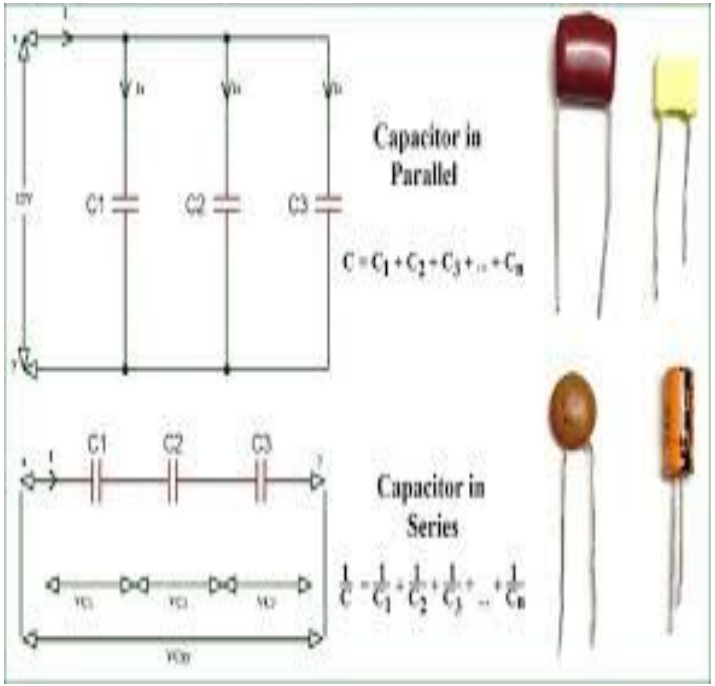
- What is it made out of
  - Dielectric
    - Polyester
    - Polystyrene
    - Tantalum





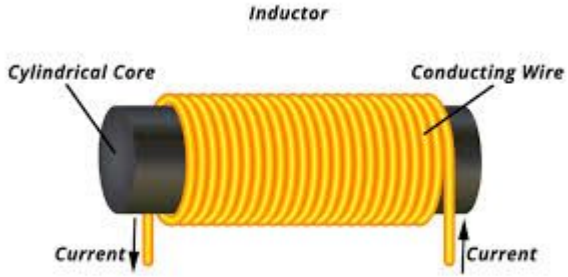
Capacitor - continued

- Parallel Capacitors
  - Ceq=C1+C2+C3.....+Cn
- Series Capacitors
  - 1/Ceq=(1/C1)+(1/C2)+(1/C3).....+(1/Cn)



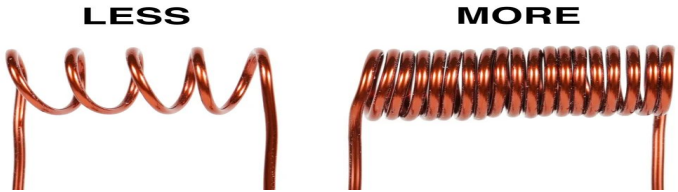
Inductors

- What are Inductors
  - Coil of conducting wires
    - Stores energy in electromagnetic field
- Inductance
  - Measured in Henrys
  - The greater number of turns of wire the greeted inductance



$$L = \frac{n^2 \times \mu_0 \times a}{l}$$

where: L = inductance in henrys
n = number of turns
μ_0 = permeability of free space ($4\pi \times 10^{-7}$ henrys/metre)
a = cross-sectional area of winding in square metres
l = length of winding in metres



Inductor- continued

- Inductor Ohm's law
  - **V = L (di/dt)**
    - **V** = Voltage
    - **L** = Inductance in Henrys
    - **di/dt** = instantaneous rate of current change (amps per sec)

Inductances

$$L_{series} = L_1 + L_2 + \ldots L_n$$

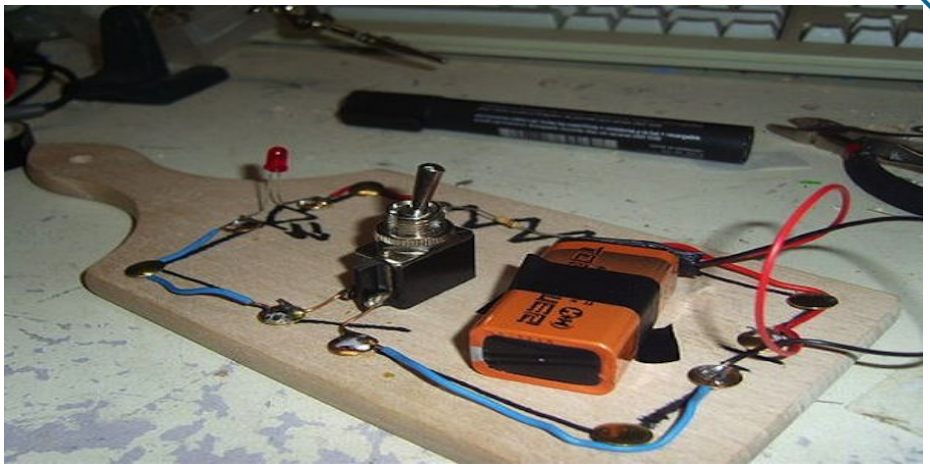
$$L_{parallel} = \frac{1}{\frac{1}{L_1} + \frac{1}{L_2} + \ldots \frac{1}{L_n}}$$

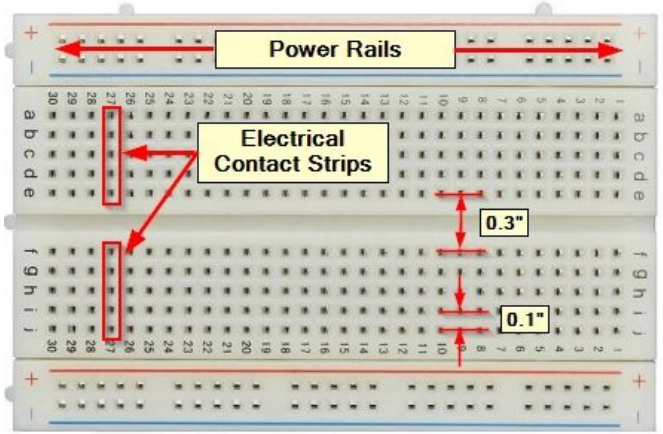
Where,

L = Inductance in henrys

Breadboards

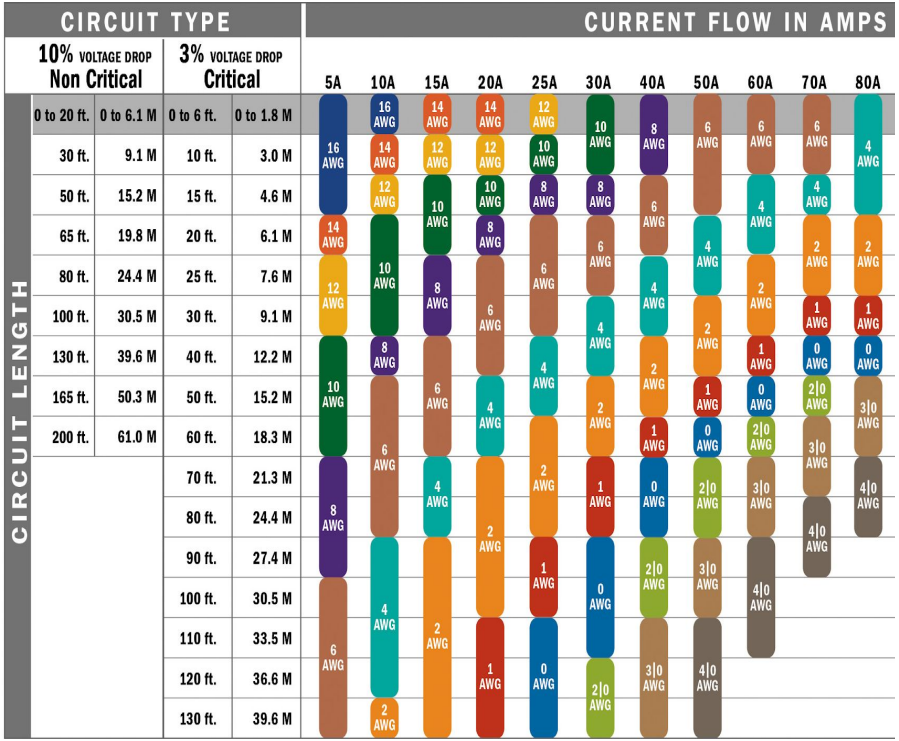
- What are breadboards
  - “Circuit Builder”
  - Plastic board with arrays of metal contacts
  - Easy access through the holes
- Accept 22 American Wire Gauge (AWG)





Breadboard- continued

- What is American Wire Gauge (AWG) ?
  - Logarithmic Stepped Standard wire gauge
  - Copper wires
    - Best and cheapest conductor
    - Smaller the number the thicker the wire
  - Common AWG we use is 18-24 (AWG)



Breadboards - continued

- Why Breadboard
  - It is solderless circuit board
  - Good using before moving into an actual circuit board.