

# **Circuit Building Course Syllabus**

## **(Prepare for PLTW Principles of Engineering and Digital Electronics courses)**

### **General Learning Process**

- For each concept learned, there will be exercises for students if mathematical/logical or an application using the circuits
- Optional homework will be assigned, mostly to experiment with circuits and think about new schematics

### **Circuits Introduction**

#### **Basic Breadboarding**

- Understand how to safely and securely plug in jumper cables
- Understand how electric current flows in the breadboard
  - Current going across
  - Current going vertically (common ground and power)

#### **Understanding Circuit Components**

- Explain diodes, resistors, pushbuttons, power, transistors, motor controllers, sensors, etc.
- Show students examples of each component and what they are used for

#### **Reading a Circuit Schematic**

- Show students how to read a circuit schematic
  - Understand symbols of each component
  - Be able to recognize which direction current flows

# **Math Behind Circuits**

## **Series vs Parallel Circuits**

- Be able to distinguish the difference between series and parallel circuits

## **Ohm's Law and Kirchoff's Law**

- Understand current, voltage, resistance, power
- Understand formulas for both laws
- Apply knowledge of Ohm's Law and Kirchoff's Law to series and parallel circuits
  - Complete problems asking students to solve for different values

# **Building Basic Circuits**

## **Online Circuit Builder**

- Begin by building circuits online before working with components
- Understand how to use LEDs and resistors safely
  - Apply series vs parallel from Kirchoff's Law

## **Building Circuits based on Schematics**

- Be able to read a schematic and identify which components to use
- Safely and accurately build circuits using LEDs, pushbuttons, resistors, buzzers, etc.

# Building Complex Circuits

## Building Logic Gates

- Understanding boolean logic behind logic gates
  - Or, And, Xor, Not, etc.
- Using transistors in circuits to build logic gates

## Creating Complicated Circuits

- Use knowledge of logic gates and basic circuit components to develop more complicated projects
  - TBD based on further research

## Timeline

Class #	Topics
1	<ul style="list-style-type: none"><li>• Basic Breadboarding</li><li>• Understanding Circuit Components</li><li>• Reading a Circuit Schematic</li></ul>
2	<ul style="list-style-type: none"><li>• Math Behind Circuits</li><li>• Online Circuit Builder</li></ul>
3	<ul style="list-style-type: none"><li>• Building Basic Circuits based on Schematics</li></ul>
4	<ul style="list-style-type: none"><li>• Building Basic Circuits based on Schematics</li></ul>
5	<ul style="list-style-type: none"><li>• Logic Gates Understanding</li><li>• Building Logic Gates</li></ul>
6	<ul style="list-style-type: none"><li>• Building Logic Gates</li><li>• Begin Logic Gates Project</li></ul>
7	<ul style="list-style-type: none"><li>• Begin Logic Gates Project</li></ul>
8	<ul style="list-style-type: none"><li>• Complete Logic Gates Project</li></ul>