

The 1 day lesson plan outlined below is the plan we use on a daily basis in the lab. Although it is designed with our lab and time frame in mind, this is a lesson plan that could be used in any scenario where you have a solid 4 hours to complete all of the activities. If you are looking to implement our lesson plan in your classroom over a longer period of time, say 1 hour a day for 5 days, look for our 5 day lesson plan.

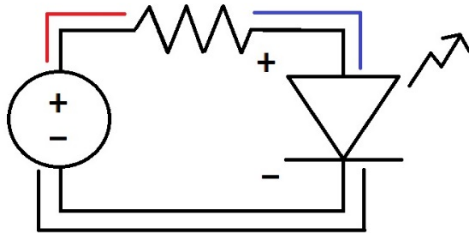
1. Circuits: human circuit activity – have students stand in a circle holding hands, insert the battery, have each student disconnect one at a time to break the circuit and then reconnect
2. Move into the lab, find a seat, answer questions
3. 3 sectors of engineering we will discuss today:
 - Electrical Engineering – like the blood in our body, 1 heart that pumps blood out and back, just like 1 power source powers all the different parts of our device, electricity needs to go out and back (a complete circuit)
 - Computer Science (Software Engineering) – like our brain, this is the brain of the device, just like you can't do anything without your brain, your device can't do anything it wasn't coded to do, some things are automated and some rely on inputs to give outputs
 - Mechanical Engineering – like our bones, this is our structure

4. Program LED

- a. Draw circuit: "Schematic" is a plan for building a circuit much like a blueprint is a plan for building a house.

"Start with a battery, then the resistor (to resist the flow of electricity), then the LED (which has a positive side and a negative side and light emitting from it, light emitting diode)"

Note: Red, black, and blue lines are drawn in while constructing the circuit to help students understand where the wires are going and how they connect.



- b. Make circuit:

- i. Connect Arduino to computer with USB cable, making sure the power comes on on the Arduino (if not you will need to power up the computer first)
- ii. Red wire: Vin to red row
- iii. Black wire: Gnd to black row
- iv. Resistor: Red row to blue row
- v. LED: Long end in Blue row, short end in black row

- c. Upload "Blink" code
 - i. Open Arduino program
 - ii. Select correct port: Tools -> Port -> Select Com# with (Arduino Uno) next to it, if there are 2, select the larger one
 - iii. Open Blink code: File -> Examples -> Basics -> Blink
 - iv. Upload code (arrow button in the top left corner)
 - v. Change red wire to pin 13
- d. Go over the lines of the blink code and what each line means.
- e. Change both delays in the blink code until the blink is no longer visible (usually a delay of 10)

5. Program Servo

- a. Start a new sketch and erase any code already there
- b. `#include <Servo.h>` Sketch -> Include Library -> Servo
- c. `Servo myservo;` "Capitalize Servo, myservo is the name of the servo, but we could have called it whatever we wanted, so if we had 3 or 4 servos, it would make sense to name them differently"
- d. `void setup(){` "This is where we setup our Arduino and tell it where we are
`myservo.attach(9);` plugging in our Servo, in this case, into pin 9"
`}`
- e. `void loop(){` "This is where we tell the servo what action to take and it will
`myservo.write(0);` repeat this action forever."
`delay(2000);`
`myservo.write(180);`
`delay(2000);`
`}`
 *For a regular servo, this code will make it go to 0° for 2 seconds, then to 180° for 2 seconds and repeat FOREVER.
 *For a full rotation servo, this will make it spin fast to the left for 2 seconds then fast to the right for 2 seconds and repeat FOREVER.
- f. Attach the wires to the Servo (red to red, black to black, white to white), then connect to the Arduino
 - i. Red -> Vin (positive side of power)
 - ii. Black -> GND (negative side of power)
 - iii. White -> Pin 9 (from the line "`myservo.attach(9)`")
 Have students attach both types of servos and see how they work and decide what type they want to use. Use the Thinkabit Notebook or one page Servo notes to describe the action of the Servo.

6. Crafting Time!

- a. Working in pairs, students use crafts and glue guns to make a project using one of the Servos. 45 minutes is the ideal time for creating projects, but this time could be shortened or extended based on timing.

7. Clean Up

- a. Give about 5 minutes to clean up the room before presentations.

8. Presentations

- a. Groups will present their projects to the class with a brief explanation. As an alternative if you are short on time, you could have the students leave their projects on their tables and do a "gallery walk" where everyone walks around to view other projects. They can leave comments if they want.