circuitry & electronics_
powered by mouse

Mouse Create: Circuitry & Electronics Course

The Circuitry & Electronics course encourages teams to design, create, tinker, and build with technology. Youth build analog circuits using LEDs, transistors, and sensors, and learn to program an Arduino microcontroller to create a digital music maker and light chaser. The course ends with participants designing and building a digital circuit prototype. All Mouse projects are aligned to national standards.

Projects

	Project Name	Description
1	**The Human Circuit**	Discover how electricity flows in a circuit using your own body's conductivity.
2	**Light-Up Creature**	Create an LED light-up creature to learn how simple circuits work.
3	**Building with a Breadboard**	Build a simple lamp that lights up with the push of a button while learning the basics of prototyping and powering circuits on a breadboard.
4	**Light Dimmers and Intelligent Sensors**	Control the resistance of an LED circuit with a dimmer (potentiometer) and a light sensor (photoresistor), seeing first hand how Ohm's Law works.
5	**Transistor Nightlight**	Make a circuit with a transistor that turns an LED light on when it is dark.
6	**Intro to the Arduino**	Create and program a digital blinking LED light circuit with the Arduino Microcontroller.
7	**LED Light Chaser**	Program an Arduino microcontroller to make an LED light show and edit the code to come up with your own light designs.
8	**Arduino Sound Machine**	Build and code a music-playing circuit with an Arduino.
9	**Arduino Nightlight**	Build a digital nightlight with an Arduino and write a program that reads and processes light data from an analog photoresistor.
10	**Design your own Digital Circuit**	Design and plan your own Arduino-controlled invention by researching, brainstorming and creating a detailed parts list and blueprint.
11	**Build your own Digital Circuit**	Turn an original idea into a real digital circuit prototype by building and testing and improving over several iterations.
6a	**Physical Computing with Raspberry Pi**	Create and program a digital blinking LED light circuit with the Raspberry Pi.

7a	**Raspberry Pi Light Chaser**	Program an Raspberry Pi to make an LED light show and edit the code to come up with your own light designs.
8a	**Raspberry Pi Sound Machine**	Build and code a music-playing circuit with an Raspberry Pi.
9a	**Raspberry Pi Nightlight**	Build a digital nightlight with a Raspberry Pi and write a program that reads and processes light data from an analog photoresistor.

Badges:

Materials List (combined)**

These materials are needed for each individual or small group (2-4 students) to complete every project within this course:

- 1 Energy Stick (like this one on Amazon) per class/large group. Note: 1 energy stick is included in every Mouse Start-up Kit.
- 2 3V Coin cell batteries
- 4 AA batteries
- Battery Holder for 4 AAs
- 1 Breadboard
- 10 or more Jumper wires
- 1 Momentary push-button switch
- 7 220Ω resistors
- at least 1 of each: 1kΩ, 2.2kΩ, 4.7kΩ, 10kΩ, 100kΩ Resistors
- 1 100kΩ potentiometer labeled “104”
- 1 Photoresistor
- 10 or more LEDs, note: 50 LED lights are included in every Mouse Start-up Kit
- 1 NPN Transistor
- A computer with a USB port, with the (free) Arduino software installed- only runs on Mac OS X, Windows and Linux
- One of the following:
  - 1 Arduino Uno REV3 + USB cable for connecting to a computer
  - Raspberry Pi Kit
    - Raspberry Pi
    - Raspberry Pi Micro USB Power Supply
    - Micro SD Card
    - Male to Female jumper wires
    - HDMI Cable*
    - HDMI Display*
    - USB Keyboard*
    - USB Mouse*
    - Items marked with * are optional if you are plan on using SSH to connect to the Raspberry Pi over a network (advanced).
- 1 8Ω Speaker
- 2 Pieces of Aluminum Foil (optional)
- Craft materials:

- Paper or plastic cup (for LED Creature)
- Scissors
- Masking or electrical tape

Optional extra materials:

- Craft supplies for designing and decorating circuits: pipe-cleaners, construction paper, markers, etc.
- Prototyping materials for making circuit enclosures: recycled plastic food storage containers, cardboard, paper, etc.
- Variety of analog sensors for more advanced/interactive final projects: Sharp IR distance sensor, Temperature sensor, Accelerometer, Force/Pressure sensor..

****Note:** These are materials needed to do the entire course, if you are only working on a few of the projects, you can find a specific materials list in the Background step of each project.

How & where can I buy these items?

1) You can also buy a Sparkle Labs Discover Arduino Bundle kit for each small group of students (2-4). This kit has almost everything you will need for the course. Email info@sparklelabs.com, and ask for the Mouse discount. For NYC sites, Sparkle Labs' NYC DOE Vendor ID is #SPA11805.

2) Purchase each item individually at sites like Adafruit, SparkFun, Mouser, Digikey or Amazon.