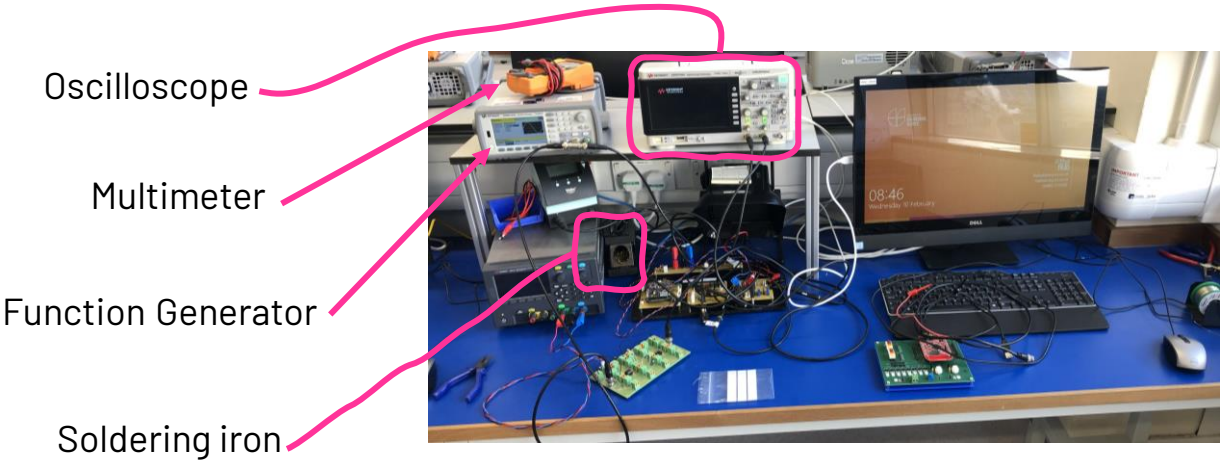
Electrical Lab

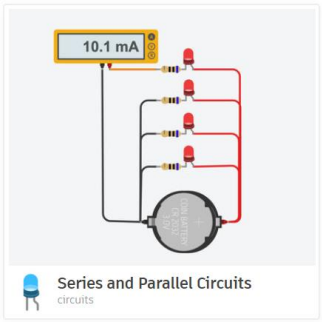
The first year Electrical Lab builds on what has been taught at school about simple electronic components such as resistors. You learn how to use laboratory equipment to test circuits and make measurements. The practical work re-enforces material covered in lectures. You learn to use a programmable microcontroller development board, programming the heart of a music box which responds to different inputs and generates outputs. This is an example station in the Electrical Lab:

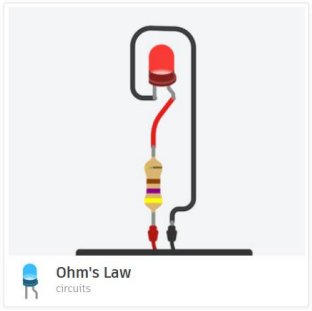


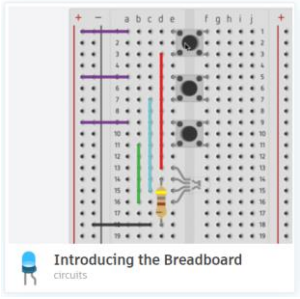
Things to try out at home:

If you do not have much experience with electronics you may want to practice with some simple circuits or learn about some of the equipment you will be using. The links below will give you a taster:

- **Experiment with electronic circuits easily online:**
  - The TinkerCAD website has a free online electronics lab.
  - Simple projects introduce the interface and components like resistors
  - You can even practice programming a microcontroller on TinkerCAD (other sites like Adafruit have full beginner guides).







- **Try out an Oscilloscopes online:**
  You will use these lots in the lab, helping make measurements of your circuits.
  - Try a simple interactive oscilloscope demo online
  - Find out why we use oscilloscopes rather than multimeters
  - Have an in-depth introduction to oscilloscopes.

Computing Lab

The first year Computing Lab does not require any prior experience of coding. It is a course to introduce everyone to the very basics of coding. You learn how to use MATLAB, a programming language focused on engineering and mathematics. You will start with using it like a scientific calculator, and by the end of the course use it to model a powered-descent lander like the SpaceX reusable rockets.

Some students may have already done some coding, which will put them at an advantage. A lot of the computing lab content is in the Computer Science GCSE or A-Level curriculum, but we will introduce it through an Engineering perspective.

Things to try out at home:

- **Practice Computational Thinking by using MIT's** Scratch
  If you are new to coding, spend some time being creative with Scratch: a visual programming language. It may look "childish", but it is for everyone and is used by MIT in undergraduate courses. Experimentation is simply the best way to understand these fundamentals such as variables, loops and conditionals.

- **Get a head start with MATLAB**
  You will not be able to access the full MATLAB suite for free, until you come to University. However, you can:
  - Find out what engineers use MATLAB for via a 10min introductory video
  - Complete MATLAB On Ramp – a brilliant interactive course to get you started with the basics. It is online, free and self-paced.

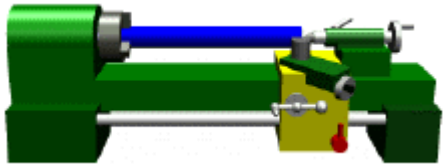
  - Continue using MATLAB via the MATLAB Mobile app

- **Do any programming practice!**
  Although you will be using MATLAB in your first year, you will go on to use Python and other languages. There is always benefit in practicing coding in any language. If you've used Python and want to see how it is used for Scientific Computing, try freeCodeCamp.org or find your tech match at Codeacademy.

Workshop Practice

We have a workshop in the Department that staff and students use. This workshop has a range of machining tools. In your first year, you will do the Workshop Practice Lab, and will use one of these machine tools called a **Lathe**. It is used for creating custom metalwork. You may have seen woodturning before, where wood is shaped as it spins (see below left). Lathes can be used to shape metal in a similar way (see below right).

Larger forces are required to machine metal and you want higher precision than you can get manually. So instead of holding the tool by hand, the cutting tool must be held in place on a post. In the image below, on top of the yellow **carriage** there is a green block at an angle: the **Tool Post**. The yellow carriage moves automatically at a defined rate. In the top right image you can see how moving constantly creates a screw thread.



Different cutting tools can be used and there are Computer Controlled (CNC) lathes.

Things to do at home:

You may not have a Lathe at home, but if you want to understand a bit more about how they work, you can:

- Watch a demo of metal working with a 'mini lathe'
- Watch a demo of full size lathe (like the ones we have in the Department)

Note in these videos there is no 'guard' in use around the tool and work piece which is not safe! When you do the Lab, you will be using lathes that have clear plastic guards so that you can see the work, but will be protected from the metal 'swarf' that is produced.

For those who want a real challenge
try a lathe from home!

There are full 3D simulators, so you can try out a lathe from home! There are some available on the App Stores: e.g. Google Play and Apple (more of a lathe game). With a full simulator you may find it easier to follow along with a video.