

## Topic 5

### Introduction to Home Laboratory Kit

Professor Peter YK Cheung  
Dyson School of Design Engineering

URL: [www.ee.ic.ac.uk/pcheung/teaching/DE1\\_EE/](http://www.ee.ic.ac.uk/pcheung/teaching/DE1_EE/)  
E-mail: [p.cheung@imperial.ac.uk](mailto:p.cheung@imperial.ac.uk)

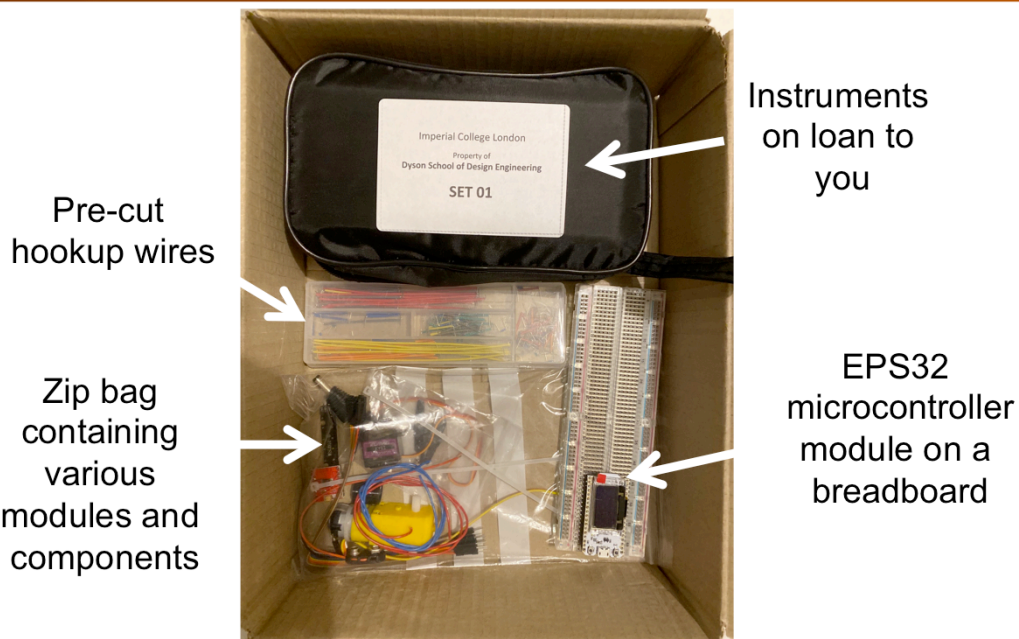


The purpose of this lecture is to prepare you to receive the Home Laboratory Kit and get ready for the practical lab work related to this module.

The plan is to have DHL to pick up the Kit for delivery on Saturday 9 May. For those who are in the UK and most of Europe, you should get this by Monday. For most of the rest of the world, they expect to deliver in 2-3 days.

You must complete an “assignment” survey on MS Teams to let me know that your kit has arrived.

## What's inside Home Lab Kit Parcel?



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Inside the Home Lab Kit (HLK) are:

- A black pouch contain various instruments, probes etc, which you are required to return to the Department when you next on campus (probably in the Autumn).
- A box containing pre-cut and pre-stripped hookup wires of different colours and lengths.
- An ESP32 Heltec Wifi 32 kit module already plugged into a breadboard, ready for use. You are also expect to return this to the Department for use by next year's first year students.
- A zip bag containing many different modules and components. Most of the components are not re-usable. However, you are very much encouraged to return the modules for re-use.

We strongly believe in recycle and sustainability. Therefore we want to avoid wasting resources and would like you to recycle as much of the items that can be used by others. For this reasons, please **DO NOT** destroy the cardboard box. Instead, you should use the box to store your various items, and eventually bring it back with you containing all the returned items.

## What's inside Black Pouch?



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Each pouch is numbered and there is an item list on the inside.

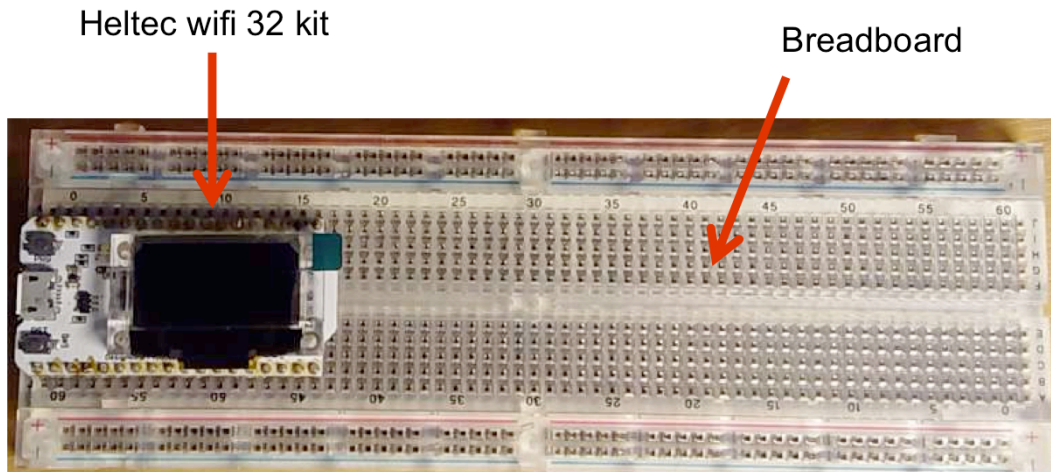
Inside the Instrument pouch are:

- A multimeter – you need to open the back (there is a screw) and install a 9V battery before using this. The multimeter has two probes – red and black.
- A single channel oscilloscope – you will learn how to use this and the multimeter in Lab 1. The scope also come with a high impedance probe (don't worry about this for now).
- A microUSB cable to connect your computer USB port to the ESP32 module.
- A USB to 9V converter cable. This is used to provide 9V power supply to the oscilloscope. The USB end can be plugged into your laptop, or better, to a USB power pack.

Remember, the contents of this pouch is only on loan to you for remote teaching. You are required to return it to us when you return to Imperial College in person, hopefully in October.

Please take a photo of the content of the pouch immediately after you open it, so that you know how its contents are packed. In this way, you will know how to re-pack everything before returning it back to us.

## The ESP32 module and the Breadboard



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You will be using a powerful 32-bit microprocessor known as the ESP32. This microcontroller is both powerful and is full of useful features. The module itself even has a 128 x 64 pixel OLED display.

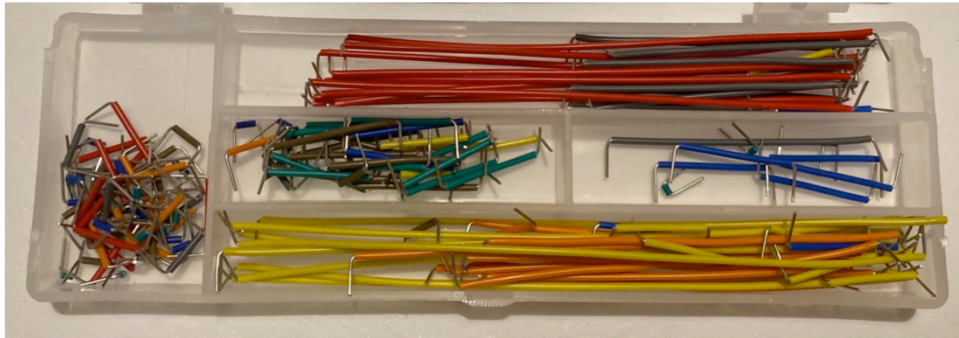
The ESP32 module is already installed onto the breadboard. You will be building your own circuits using this prototyping board by plugging into the connection holes electronic components, modules and hookup wires.

**WARNING:** You must be extra careful in checking your connections before applying power. If you blow up a component, it may not be possible for us to supply you with a replacement.

## Hookup wires

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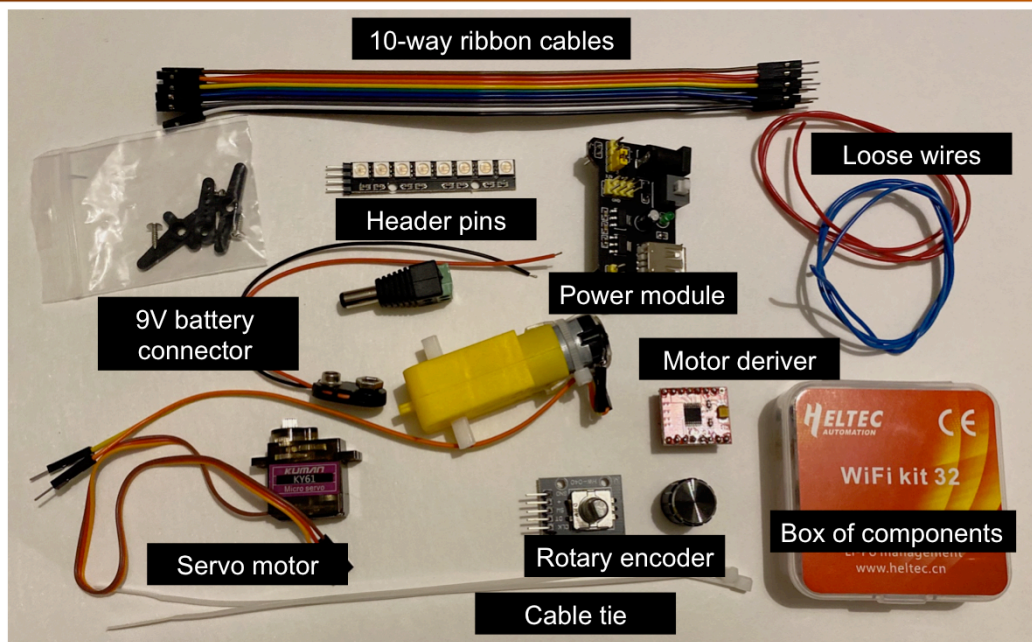
RED - +ve supply  
BLUE - Ground



You are provided with a box of pre-stripped and pre-cut wire for your to build circuits using the breadboard.

It is important that you stick to a colour convention. Also connect +3.3V supply (or 5V supply) with RED wires. Always use BLUE wires for ground connections.

## Inside the zip bag



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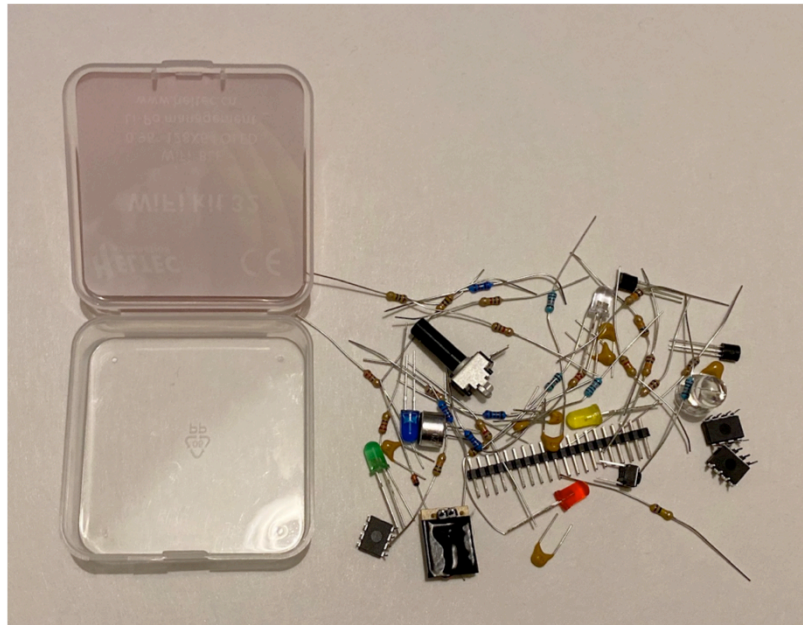
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Inside the zip bag is a plastic box (which was used to transport the ESP32 module) containing resistors, capacitors, transistors, integrated circuits and many other small components.

There are various wires for connecting circuits. There are two motors, a rotary encoder for input, some header pins to be used with the breadboard, a power module that provides external supply to the breadboard, a motor drive module (known as a H-bridge).

## Various components



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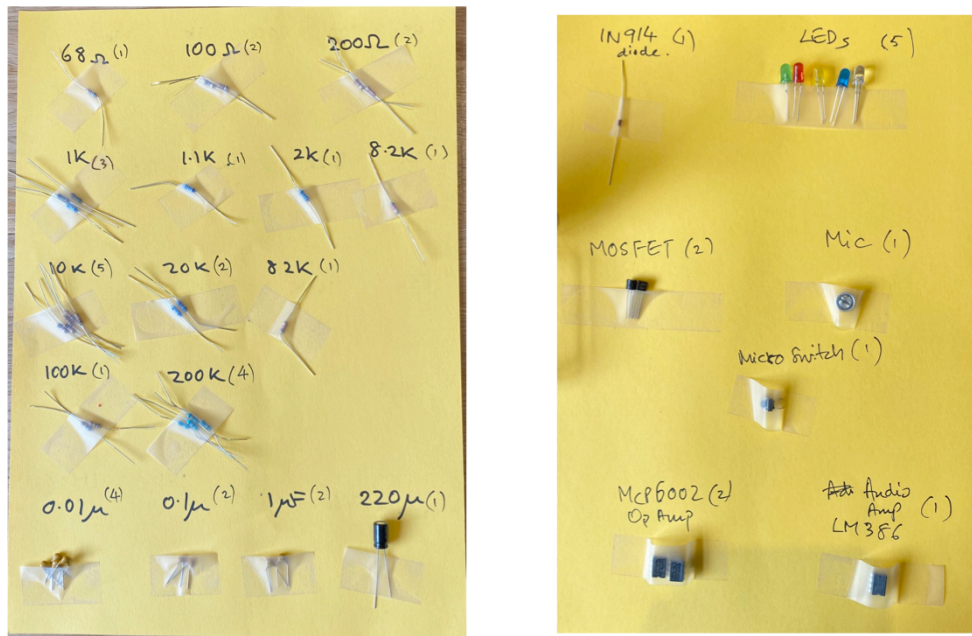
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The plastic box contains many small components. There are resistors, capacitors, header pins, switches, transistors, integrated circuits, a microphone, a small speaker and many others.

Make sure you DON'T loose any – this box of components are easily misplaced, and yet they have to last you for the rest of the term!

## Your first job!



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To avoid you losing these tiny components, you must immediately sort all components and check that they are all there.

Go and find a cardboard (shopping box or stiff card will do – DO NOT cut up the box that the Home Lab Kit comes in. You will need to store your stuff and to return items back to the Department). You must either read the resistor values (using the colour band) and/or check the values using the multimeter. (Don't forget to install a 9V battery in the multimeter before use). The multimeter also measures capacitor values, but with limited accuracy.

Use tape to stick components onto the cardboard and label each accordingly. Throughout the Home Lab sessions, always return your component to these cards after use, so that you can use them again later for a different circuit.

Remember YOU MUST BE VERY DISCIPLINED in keeping this personal store. If you do not, you will find that a few weeks later you cannot find that elusive 2k ohm resistor anywhere.

You will find a list of all components and contents of the Home Lab Kit on the course webpage.