

## Introduction to Arduino IDE and getting started with the ESP32 microcontroller

### Introduction

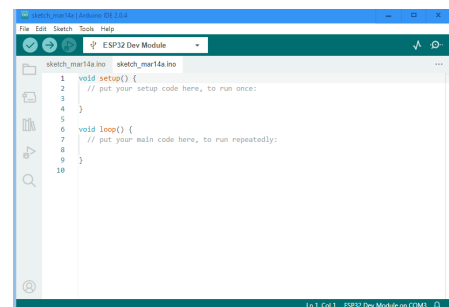
Dr Ian Grout  
 Department of Electronic and Computer Engineering  
 Faculty of Science and Engineering  
 University of Limerick  
 Limerick, V94 T9PX  
 Ireland

Email: [Ian.Grout@ul.ie](mailto:Ian.Grout@ul.ie)



## Introduction

- This one-hour webinar is aimed at providing an introduction to:
  1. Using the Arduino Integrated Development Environment (IDE) with the ESP32 microcontroller.
  2. Investigate specific Input/Output (I/O) supported by the microcontroller that can be used to connect to external peripheral devices.
- Arduino IDE 2 (any version) will be used:
  - <https://www.arduino.cc/en/software>



## Don't panic

- We will cover a lot of material in the one-hour.
- It is not necessary to immediately understand everything covered.
- It is a progressive learning experience.
- Take time to understand and ... **don't panic**
  - *With reference to the Hitchhiker's Guide to the Galaxy*

## Webinar topic 1

- Basics of the Arduino IDE:
  1. Getting started with the Arduino IDE.
  2. Using the ESP32 with the Arduino IDE.
  3. Walkthrough example: on-board LED "Hello world".

## Webinar topic 2

- Developing Arduino sketches with multiple files:
  1. The basics of an Arduino sketch.
  2. Folder and file structure.
  3. Managing a project: folders and files. Importance of commenting and formatting code.
  4. Walkthrough example: developing an Arduino sketch with multiple files.

## Webinar topic 3

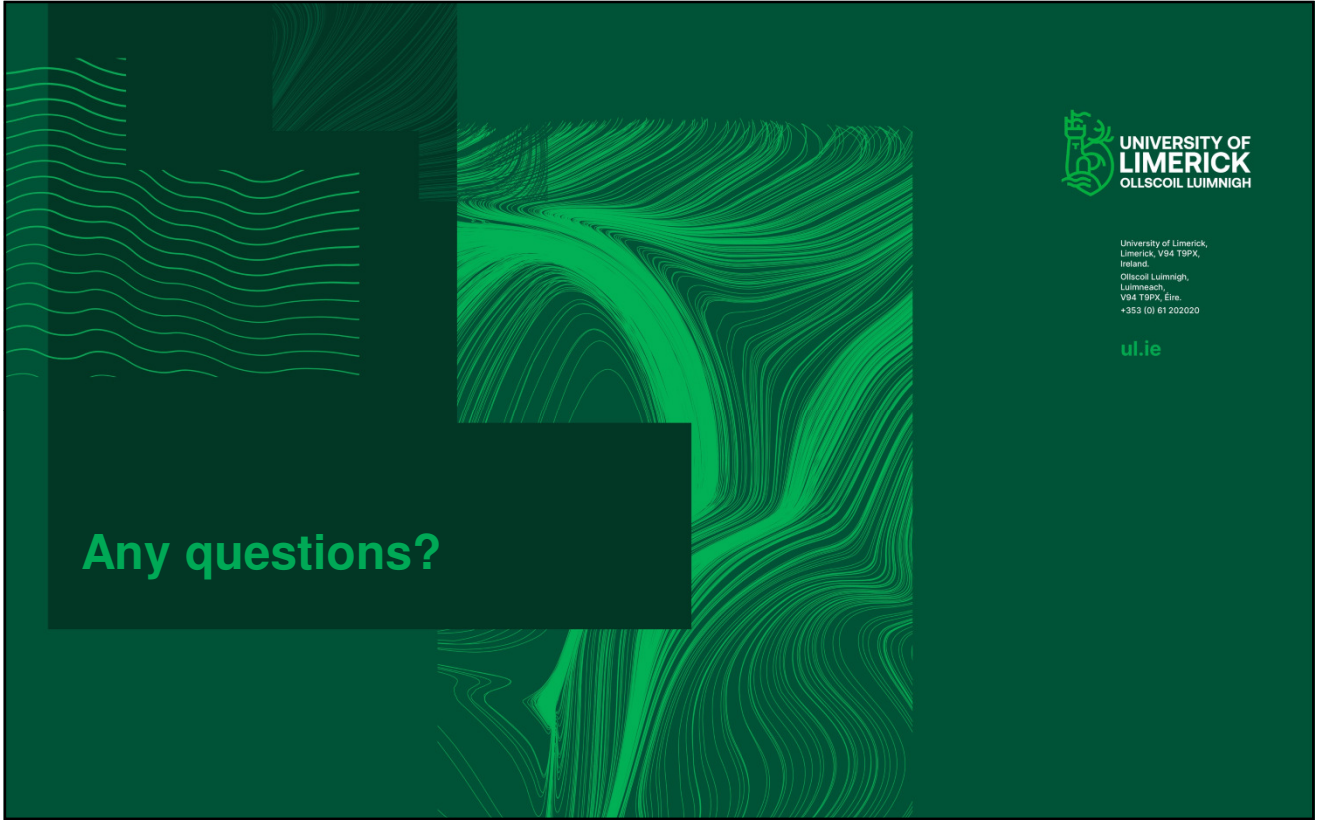
- Summary of the different pins on the microcontroller (power supply, digital GPIO, analogue I/O, UART/USART, SPI, I<sup>2</sup>C,) and their uses:
  1. Connecting the microcontroller to external peripherals:
    - a) Power supply.
    - b) Digital GPIO (General Purpose I/O).
    - c) Analogue I/O ... including PWM (Pulse Width Modulation).
    - d) UART (Universal asynchronous receiver/transmitter) / USART (Universal Synchronous/Asynchronous Receiver/Transmitter).
    - e) SPI (Serial Peripheral Interface).
    - f) I<sup>2</sup>C (Inter-Integrated Circuit (IC)).
  2. I/O pins on the ESP32:
    - a) The available I/O pins.
    - b) Serial communications: using the UART.

## Webinar topic 4

- Receiving strings from the computer and string manipulation to extract values from the string. Walkthrough example.
- Send the extracted values back to the PC:
  1. The microcontroller receiving and sending serial data using serial communications (UART).
  2. The microcontroller receiving strings.
  3. The microcontroller extracting values from a string.
  4. The microcontroller formatting and transmitting data.
  5. Walkthrough example using the Arduino IDE Serial Monitor and then in Python.

## Webinar topic 5

- Performing a calculation within a calculation function using values received from the serial port and transmitting the results back to the PC.
- Student exercise to modify the walkthrough example developed in part 4.
- Video example of using Python instead of the Arduino Serial Monitor.



Any questions?



University of Limerick,  
Limerick, V94 T9PX,  
Ireland.  
Ollscoil Luimnigh,  
Luimneach,  
V94 T9PX, Éire.  
+353 (0) 61 202020

[ul.ie](http://ul.ie)