

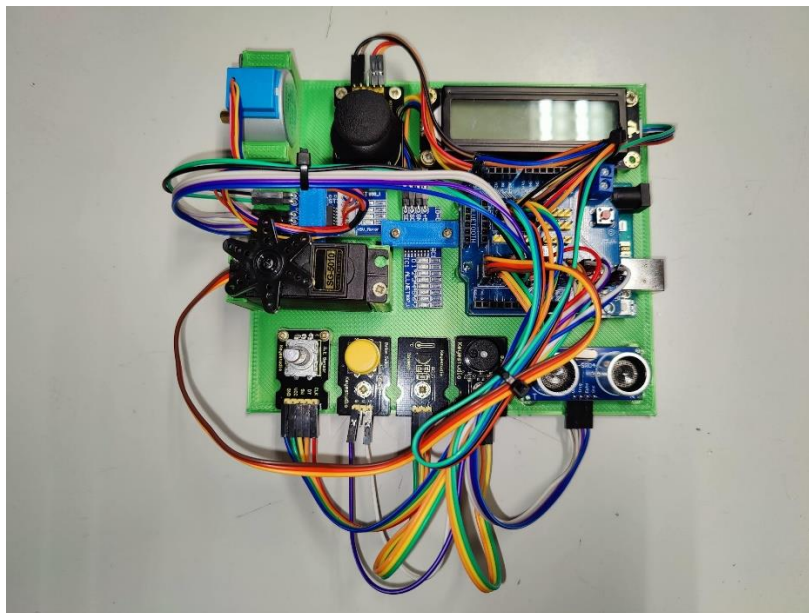
# Embedded systems

## **2<sup>nd</sup> Practical Work (Arduino and hardware)**

## Objectives:

The objective of this work is the development of an embedded system based on Arduino platform. The main objective is to use different type of sensors and actuators. The hardware (presented in next figure) will be available to be used and programmed by students. The Arduino UNO board must be programmed in C language using Arduino IDE or VSCode (platformio).

There will be some hardware kits where students should apply the code.



The following table presents the hardware connections for the sensors and actuators.

Encoder	Arduino UNO
Pin CK	D7
Pin DT	A2
Pin SW	A3
Push Button	
Pin S	D8
DS18B20	
Pin S	D9
Buzzer	
Pin S	D3

<b>HC-SR04</b>	
Pin Trigger	D11
Pin Echo	D12
<b>Servo Motor</b>	
Pin PWM	D10
<b>8 LED PCB</b>	
PCF8574	A5, A4 (SDA, SCL)
<b>Step Motor</b>	
A	D2
B	D4
C	D5
D	D6
<b>Joystick</b>	
Pin X	A1
Pin Y	A0
<b>LCD 16x2 (I2C)</b>	
DFRobot_RGBLCD1602.h	A5, A4 (SDA, SCL)

## Procedure:

The groups must contain **up to** three students. There should be allocated three practical lessons for this practical work development. Besides that, it is expected that the group use the non-face-to-face hours of the class to develop the work.

Week 1: Plan the objectives and presentation during the practical lesson.

Week 2: Develop the code using simulation environment Wokwi or Tinkercad.

Week 3: Implement the solution in the Arduino hardware.

## Report

A file named “PW2.pdf” should be submitted to the virtual before **9<sup>th</sup>** June. Each group must create a report on pdf (maximum of 5 pages excluding code and indexes) containing schematics, code and the development steps of the work, including the code. Only one report for each group. Include the name of students on the first page. Reports should be uploaded on the virtual.ipb.pt platform. For each day of delay, there will be a penalization of 10% each day.

## Evaluation, deadlines and presentation.

Classification for each group will be established in each week according to the class performance and result.

**Similar works will be disqualified.**

Each group should be present in the same practical lesson during this work (do not jump between different practical lessons).