

# Optional: Setting Up a Physical Lab

This document explains how to set up a physical lab for the *Microcontrollers & IoT: Learn with Real Online Hardware* course.

While it is possible to set up your own physical lab, we **do not recommend it**. We strongly recommend using LabsLand instead. The course includes free online access to real hardware for a week, and additional access can be purchased affordably. LabsLand ensures consistency in setup, avoids hardware issues, and simplifies debugging, making it the preferred option for this course.

Nonetheless, if you want to physically set up a local lab or if you already have access to one (through your university, for example), it is also possible and this document describes what you need.

## List of items

Below is the list of recommended items for setting up a physical lab. While not all components are required for every assignment, using the same pin assignments as in the course materials is highly recommended for consistency. If you do not have access to a lab power supply, alternatives such as USB power may work for some exercises.

Item	Quantity	Approx ppu	Approx total p	Notes
STM32 Nucleo WB55RG	1	\$60	\$60	
SG90-like Servo Motor	1	\$3	\$3	
Green LEDs	10	\$0.5	\$5	
RGB LED	1	\$3	\$3	
NHD-2.7-12864WDW3 Newhaven Display	1	\$50	\$50	
Through-hole Switch	7	\$2	\$14	
Potentiometer	8	\$2	\$16	
Button	4	\$0.6	\$2.4	
Resistors 220 Ohm	10	\$0.2	\$2	
Protoboard	1	\$10	\$10	

Lab power supply	1	\$200	\$200	
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## Setup

You will need to setup the equipment as depicted in the following Fritzing diagram:

[https://stm32-nucleo-ccpp.ide.labsland.com/static/img/labs/st/Nucleo\\_WB55RG\\_Lab\\_bb\\_empty.png](https://stm32-nucleo-ccpp.ide.labsland.com/static/img/labs/st/Nucleo_WB55RG_Lab_bb_empty.png)

Not all components are needed in every assignment, so feel free to only set up the ones you need. It is recommended that you respect the pin names though, since they will be the ones used throughout the course and in the assignments.

## Smart Parking final assignment

The Smart Parking final assignment is designed to take advantage of LabsLand's Hybrid Lab technology, which enables real-time interaction between a real microcontroller and a simulated parking environment. This setup allows for a fully interactive experience where your program controls real hardware while responding to virtual sensors and actuators.

If you choose to set up a physical lab instead, you will not be able to replicate this hybrid simulation fully. However, you can approximate it by using LEDs and buttons to **manually** simulate the parking environment:

- **Buttons as sensors:** Physical buttons can be used to emulate virtual presence sensors, such as detecting when a car enters or exits.
- **LEDs as actuators:** Instead of controlling virtual parking barriers, LEDs can be used to indicate when an action would occur (e.g., an LED turning on to represent an open gate).

While this method can help you test your logic, it lacks the dynamic, real-time interaction of the Hybrid Lab. Even if you set up a physical lab, we **strongly recommend using LabsLand** for this final assignment to get the full experience.