

Lab 0: Lab Introduction

1 Introduction

This lab has four different lab activities that cover Basic about Raspberry Pi operating system, general GPIO, interrupt, analog to digital and digital to analog with a microcomputer, and sensor reading.

Each group allows up to three people, and two is strongly recommended. You are encouraged to start working on lab activities as early as you can. The time between two consecutive demos is exactly **one week**. The lab activities were designed based on the assumption that you have some programming practice with C++/C/Python and have some experience with the Linux operating system. Programming was not part of the learning objects.

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TA Office: Online via ZOOM by appointment

2 Safety

Electrocution and fire hazards can happen even at low voltages. Please also observe the safety tips related to electronics benches in the lab. Always have a partner, and let people know that you are in the lab when you come to the lab after the regular hours.

3 Lab Rules

1. Do your lab assignment at home. Come back online for grading during your lab session hours. You are allowed to bring RPi Toolkit home. You may be subject to significant grade loss for missing the lab time submission.
2. The lab is an open, (student) self-managed space. Your attitude in caring for the equipment and space will directly translate to our costs and future students' privilege in enjoying this freedom.
3. **Lab partner dispute:** It is your responsibility to report to the instructor or TAs any partnership concerns. Team members will share the grade responsibility if you do not report the issue on time.
4. Return all toolkits in original conditions by the end of the lab section, except for normal wear and tear. Report damages of parts ASAP.
5. There is no restriction of which table you use during the lab assignment phase
6. Clean up and return the tools to where you find it.

4 Submission

1. Each Team will need to submit **one** lab report and to do an **online demo** with TA during the regular lab sections. You can find deadlines on **the eCampus submission portal**. **If you failed 3 labs (score<6), you will fail all.**
2. **Grading Criteria:** The criteria will follow each lab's submission policy. The demonstration usually takes up to 50% of each grade, and the report will be the rest.
3. **Late submission:**
 - a. **For Demo:** The Demo is usually worth 50% of each lab assignment grade. If you can't demo by the due date, you will still have a chance to demo the lab at the next lab section with a 50% penalty on the demonstration grade. For example, if you can't complete lab 1 on Feb 8th, you submit the report on time, and you can still demo your lab 1 on Feb 15th. By doing so, you can still earn up to 7.5/10 for your lab 1 grade.
 - b. **For Report:** The lab report is due by the end of every demo day. The report will have 50% on the lab report grade penalty per day.
 - c. **Late with excuse:** if you have a reasonable excuse that is approved by Dr. Liu, you will not receive a grade penalty on late submission. (You have to Email Dr.Liu and CC' the TA with details before the deadline)

5 Package

Each group will obtain a box of equipment. The equipment box will contain:

- 1 X Raspberry Pi 3
- 1 X SD Card(8GB or 16GB)
- 1 X SD Card case
- 1 X Ribbon Cable
- 1 X power supply (with/without charger)
- 1 X breadboard

Each group will be given a bag of small electric parts. It contains:

- Several Wires
- 4-5 X random value resistor
- 2 X RGB LEDs
- 2 X push buttons
- 1 X ADC MCP3008 chip
- 1 X DAC MCP4725 chip
- 1 X 7 segment display
- 1 X MPU 6050 IMU chip
- 1 X Plastic Box

Return and check out the package with TA by the end of the last lab activities. Report any loss or damage to TA before handling in the box.

6 Lab Setup

6.1 Raspberry Pi Hardware

CPU	-Quad-Core 1.2GHz Broadcom BCM 2837 -Not compatible with traditional PC software -Low power draw
RAM	-1 GB
Display & Audio	-full-size HDMI -3.5mm jack -4 USB 2 ports -CSI camera port for connecting a Raspberry Pi camera -DSI display port for connecting a Raspberry Pi touchscreen -Micro SD port -wireless LAN and Bluetooth on board
GPIO	40-pin extended GPIO

6.2 Storage & installation: Micro-SD card

1. Insert your Micro-SD card we provided into your computer.
2. **You need to FORMAT your SD card** (even if it is a brand new micro SD card, formatting is recommended). Format the disk FAT32. Overwriting the disk is recommended (this will take a while). Most computers have built-in disk formatting tools. If not, the software package can be found here:
https://www.sdcard.org/downloads/formatter_4/
3. Download Noobs: <https://www.raspberrypi.org/downloads/noobs/> (You need to download the full version which contains **Raspbian**).
4. Unzip the Noobs file into your micro-SD card.
5. Take the micro-SD card and insert it back into your Raspberry Pi 3.
6. Power on your Raspberry Pi 3, the installation process will start automatically. Select **Raspbian** to start the installation. It will take a while.

7. Finish your installation and Raspberry Pi 3 will auto-restart and you are done!