

ELEC 335 - Lab #1

Objective

The objective of this lab is to

- get familiarized with the development board,
- understand all the components and their connections with the microprocessor
- practice assembly language, and write basic programs,
- work with the debugging tools for analyzing program flow.



Setup

Install STM32CubeIDE and implement problems on the breadboard. For that, use the **asm** project from the g0 project repo (<https://github.com/fcayci/stm32g0>) and follow

https://youtu.be/UYk_NANdJlw. You can use one of the undergraduate laboratories for using the scope and measuring the necessary voltages if needed.

- For this lab you do not need to worry about clocking the peripherals (and that is fine if you don't even know what that means).
- **For each coding problem**, you are required to create a flowchart that shows software operation and a block/connection diagram that shows how things are connected and what modules are in use. You can use online tools to do that. One example is lucidchart (<https://lucid.app>)
- **All codes should be written in assembly.**
- If a specific pin number is not stated, you are free to pick any appropriate pin to connect your components. Make sure to include this in your block/connection diagram.

Submission

You should submit the following items organized in a folder:

- **Lab report** - Written in English. PDF file. Should include
 - a cover page
 - for each problem
 - a flow chart
 - a block/connection diagram
 - pictures/photos if any/requested
 - code listing
 - at least one paragraph explanation/comment about that problem, code listing
 - final lab conclusion about what you've learned.
- **Source files** - should have proper comments and pin connections if there are any external components.
- **Elf files** - generated elf file with debug information.

Problems

Problem 1 [10 pts]. In the Nucleo G031K8 board

- identify all the components and explain their usage.
- explain all the connected peripherals and their pin connections with the microcontroller.

Problem 2 [15 pts]. In this problem you are asked to write code that will light up the on-board LED connected to pin PC6.

- Using a voltmeter, measure the voltage on the PC6 pin when the LED is on, and when the LED is off. Explain and justify the results.
- Find out the nominal voltage and absolute maximum voltage values of your microcontroller pins. You will need to look at the datasheet for these values. Do not trust online resources.

Problem 3 [20 pts]. In this problem you are asked to write code that will light up 4 external LEDs connected to the board.

- Power off your board, then power back on. (Disconnect the cable) Are the LEDs light up again? Explain and justify the results.

Problem 4 [25 pts]. In this problem you are asked to write code that will light up 1 external LED connected to the board using an external push-button. Whenever the button is pressed, the LED should be on, and whenever the button is released, the LED should be off.

- Using an oscilloscope, capture your button press, and see if you can spot any bouncing happening. Include a picture of this setup and capture in your report and comment on the result. Try with different buttons if you have more than one and compare the results.

Problem 5 [30 pts]. In this problem you are asked to write code that will blink 1 external LED at roughly 1 second intervals.

- Using an oscilloscope, capture and measure the blink interval. This should be around 1 sec.
- Try to estimate the CPI (Cycles per Instruction) and comment/justify the results.