# EE212-Microprocessors Off-Lab Assignment 4

Spring 2022

## 1 Introduction

In this lab, you will implement a basic integer calculator that takes a number, an operation and another number. Using this information, you will print the result of the two operations on the screen. For reading inputs, the keypad will be used and for the display, 16x2 LCD should be used.

Operations will be mapped as follows; "A" will be addition, "B" will be subtraction, "C" will be multiplication, "D" will be division and, "#" will be used for printing the result

## 2 Implementation

Follow the steps below for implementation

1. Demo code **link**
2. Connect LCD and keypad to the board. Pin connections are provided within the code.
3. LCD requires extra supply. Connect the voltage supply (5V-2A Adapter, or you can use the power supply in lab) to the LCD (**NOT TO THE BOARD**). Connect only the **GND** of the power supply to a **GND** pin on the board. Check [1] for more details on LCD display.
4. Make sure that demo code works properly on your setup.
5. Read a 6-digit(at most) number, an operation (add, subtract, multiplication, division) and another 6-digit(at most) number with the keyboard.
6. Check the numbers and operation you read. You can use debugging function of keil.
7. Obtain the result with the numbers and operation.
8. Display the result on the screen.

9. If you want to proceed with the bonus, finish all of the steps above and make sure that they are correct.

## 3 Bonus 1 (+5 Points)

For the first bonus, you should prevent the device to take repeated input when a key is pressed. In other words, when a key is pressed once, it should take that value once.

## 4 Bonus 2 (+10 Points)

As the second bonus, you will implement a delete button with the remaining key on the keypad. When "*" is pressed, you will erase a character at the end from screen. If another key is pressed, the code should take that as an input and print the new character on the screen. When "#" is pressed. The result should be printed on the screen.

## 5 Assumptions and Requirements

- Numbers fits the LCD screen.
- Inputs are two unsigned integers, up to 6 integer digits.
- Print the numbers and operation on the screen while taking input.
- Show the result on the second row of the LCD.
- To clear the screen after printing the result, reset key on the board will be used.
- Example Display:
  **LCD ROW1:**123+321=
  **LCD ROW2:**444

## References

[1] *In-Depth Tutorial to Interface 16x2 Character LCD Module with Arduino*. [Online; accessed 12. Apr. 2022]. Dec. 2020. URL: `https://lastminuteengineers.com/arduino-1602-character-lcd-tutorial`.