EED308　　　　　　Embedded Systems Hardware　　　　Spring 2021

Experiment 5　　　　　　　　**Basic Features of Arduino**

(This write is prepared for physical classroom but this time there is no physical classroom so this whole experiment we will perform on <u>https://www.tinkercad.com/</u> website)

Before coming for your lab session, you must go through the data-sheet of the Arduino Uno board and practise **writing simple Sketches** using Arduino commands.

1. **KNOWING THE ARDUINO BOARD –** Become familiar with the Arduino board, and identify all the pins as described in the data-sheet. Connect the Arduino board to your laptop through USB.

2. **GETTING STARTED –** Learn how to enter, compile and upload a **Sketch** on Arduino by going through the process for the given code, which generates a **Blinking LED**.

3. **SERIAL MONITOR –** Set up the Laptop as the Serial Monitor for the Arduino. Enter and run the given example code for displaying "**Hello world**" on the Laptop.

4. **DIGITAL INPUT/OUTPUT** – Connect three switches from the Digital Kit to Pins 5, 6 and 7 of the Arduino board. Write, execute and demonstrate the result generated by a code to create a Full Adder with Inputs coming from Pins 5 (C_0), 6 (A) and 7 (B), and Outputs Carry and Sum displayed on two LEDs on the Digital Kit.

5. **DIGITAL TO ANALOG CONVERSION –** Write and execute a code to generate a Pulse Width Modulated (**PWM**) output on Pin 9 corresponding to the values 1V, 2V, 3V and 4V according to the four different combinations of the bits applied to Pins 6 and 7 through two Switches on the Digital Kit. Using a multimeter, measure the average values of the PWM output voltage appearing on Pin 9 for the four digital inputs, and verify that they correspond to the respective binary-coded inputs.

6. **ANALOG TO DIGITAL CONVERSION –** Apply a voltage adjustable over the range 0-5V generated by a 10kΩ Potentiometer to one of the Analog Input Pins. Write and execute a code to display the Digital value (10-bit) of the voltage on your laptop. Use the **myMultiplyFunction** to perform the computation: Analog value = 5*(Digital Value)/1023. Tabulate these calculated analog values and the actual analog values of the voltage measured by a multimeter up to 3 significant digits for 5 different settings of the potentiometer.

7. **ANALOG TO PWM CONVERSION –** Using the same setup as used in **step 6**, combine the codes written in steps 5 and 6 to generate a PWM output on Pin 9 corresponding to the value of the applied Analog voltage. Connect an LED with a 470Ω resistor in series to the PWM output and observe how the intensity of the LED changes as the Analog Input voltage is varied.