Experiment 3

Fade in / Fade Out of the LED using PWM using MATLAB / Simulink.

Objective:

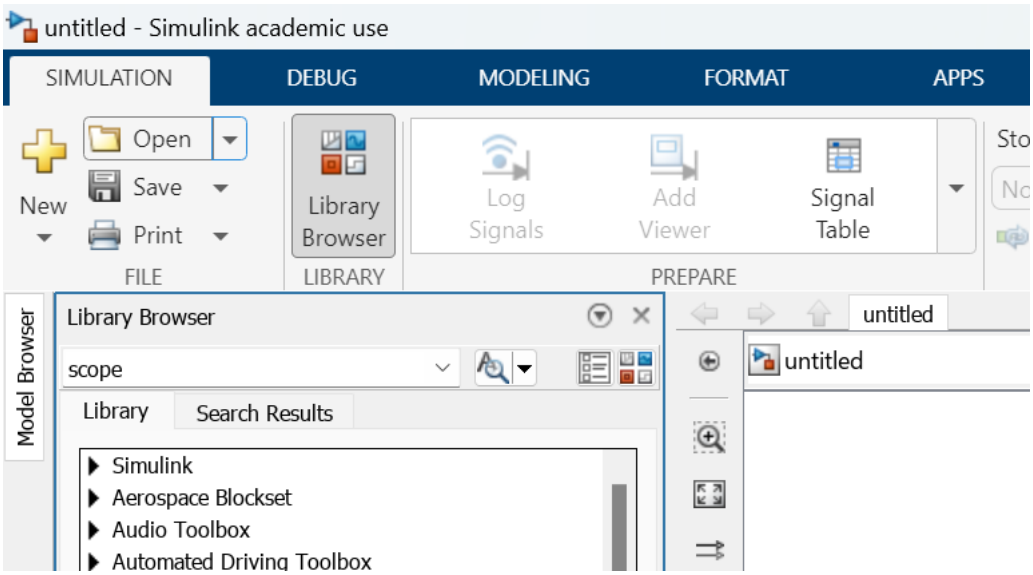
To build and simulate a model to control the brightness of the LED on the Arduino hardware using pulse width modulation (PWM) through Matlab Simulink.

Setup Required:

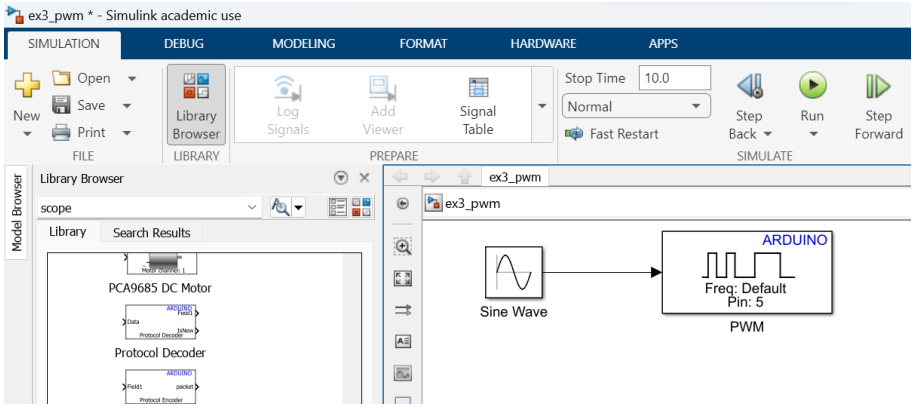
- Matlab software
- Arduino Uno with USB cable – 1 No.
- Breadboard – 1 No.
- Resistor – 220 ohm – 1No.
- LED – 1 No.
- Jumper wires – few Nos.

Procedure:

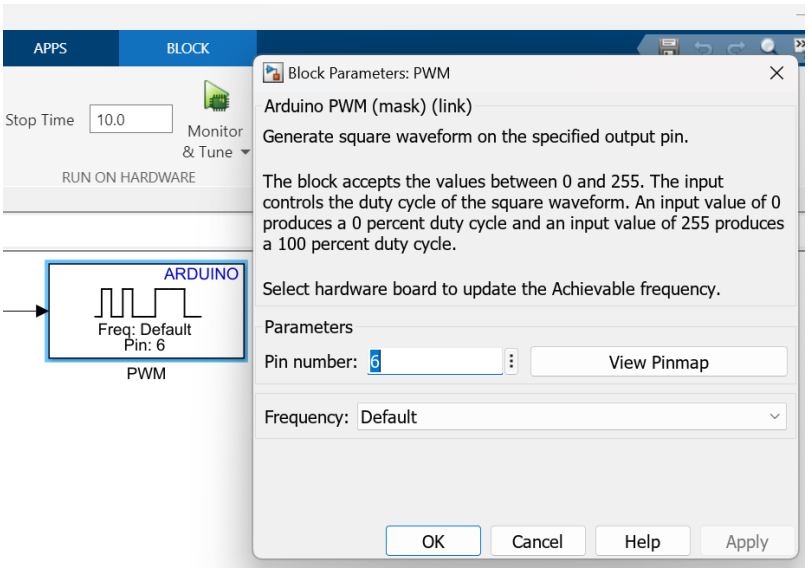
Go to Matlab -→ Simulink -→ open Blank Model, as shown below. Open the Simulink library browser.



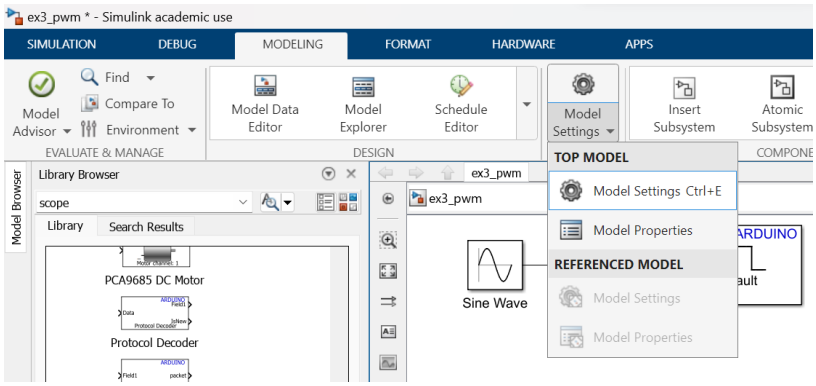
From the library browser drag & drop the following blocks:
sources -→ sine wave block, Simulink support package for Arduino -→common -→PWM block. Connect the blocks and save the file (without any spaces).



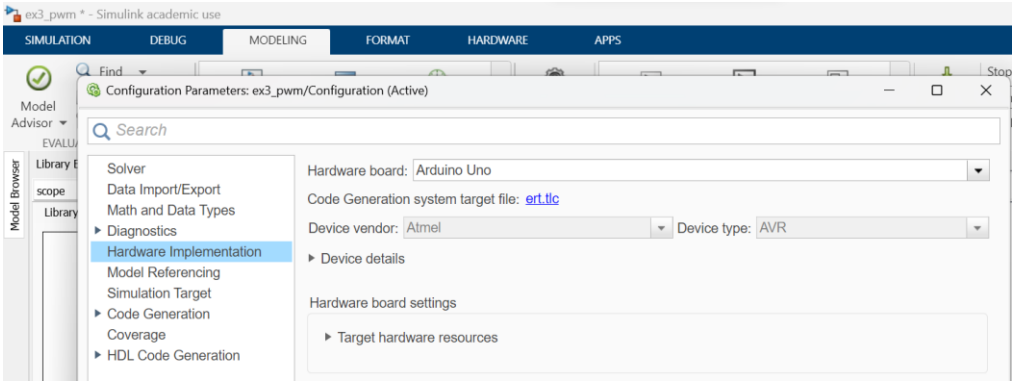
Connect the blocks as shown below and double click the sine wave to change the parameters as follows.



Double click the PWM block and set the pin to which you will connect the LED in the Arduino UNO. So here the pin is set to 5 as we use LED in 6th pin in the Arduino.



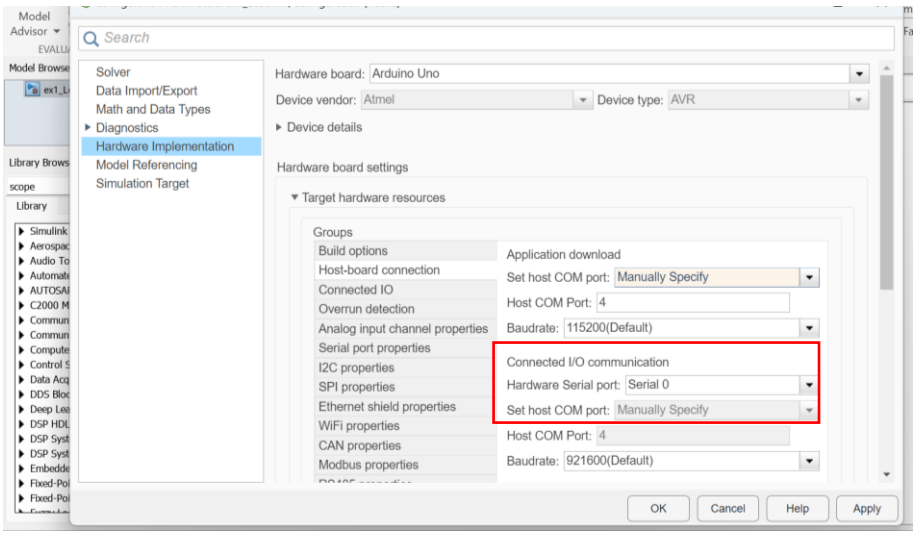
Go to Modelling tab -→ model setting -→Configure the parameters for the hardware. Select the hardware as Arduino Uno in the hardware board as shown below.



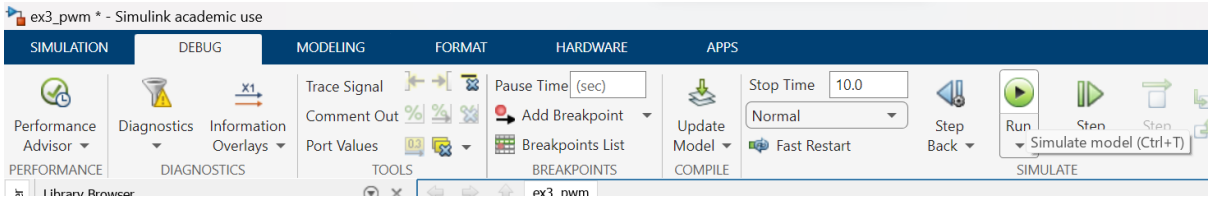
Under hardware board settings, specify the COM port number, at this time the hardware i.e. Arduino uno must be connected with the laptop using a usb cable. Check the port number in the command window using the following command.

>> a = arduino

```
Arduino Uno detected.
This device is ready for use with MATLAB Support Package for Arduino Hardwar
This device is ready for use with Simulink Support Package for Arduino Hardw

>> a=arduino
Updating server code on board Uno (COM4). This may take a few minutes.

a =

  arduino with properties:

                Port: 'COM4'
               Board: 'Uno'
       AvailablePins: {'D2-D13', 'A0-A5'}
  AvailableDigitalPins: {'D2-D13', 'A0-A5'}
     AvailablePWMPins: {'D3', 'D5-D6', 'D9-D11'}
   AvailableAnalogPins: {'A0-A5'}
    AvailableI2CBusIDs: [0]
             Libraries: {'I2C', 'SPI', 'Servo'}
Show all properties
```



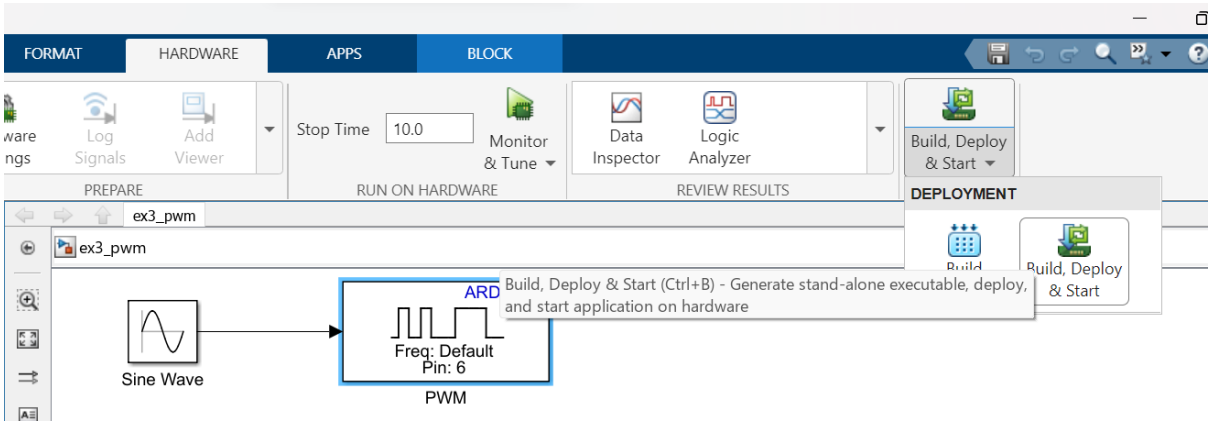
Give apply and OK. Save the model. Go to simulation tab and simulate the model.



Do the connections as shown in the schematic diagram shown below.

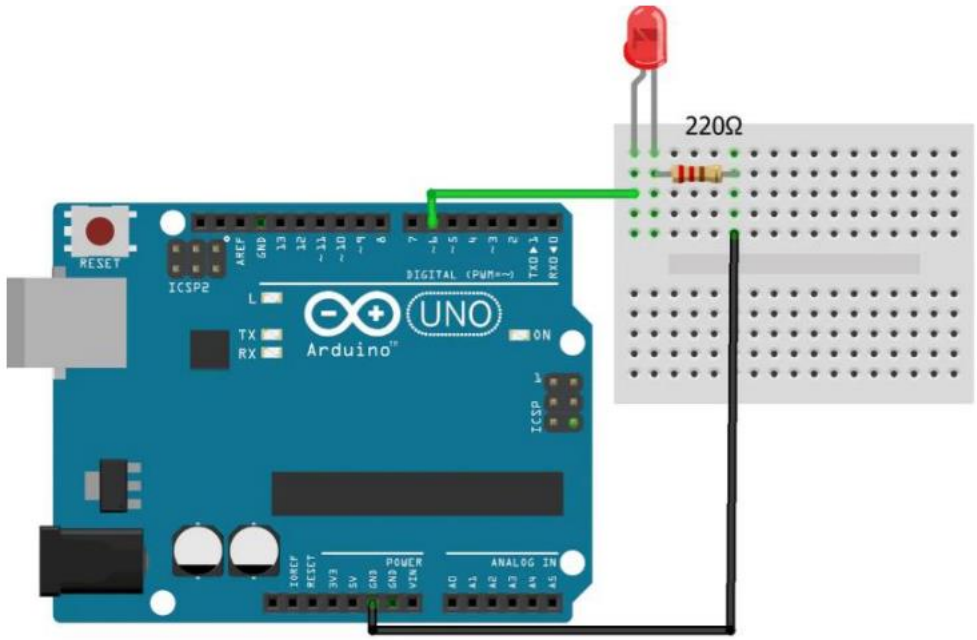
- Place the Arduino UNO and breadboard on the table.
- Place the LED on the breadboard such that the legs are placed one beside each other.
- The Anode of the LED is connected to Pin6 (PWM Pin) of the Arduino Board using a Jumper wire.
- The Cathode of the LED is connected to one end of the 220Ω resistor.
- The other end of the resistor is connected to GND Pin of the Arduino Board.

Go to Hardware tab -→click build deploy and start.



YouTube video for the procedure: https://www.youtube.com/watch?v=FfaV7QVkM-4

Schematic Diagram:



Without anything done the Brightness of the LED automatically fades in and out based on the concept of the Duty cycle change of the Input signal.

Conclusion:

Thus, a Matlab Simulink model was built and simulated to control the brightness of the LED using PWM on the Arduino UNO through Matlab Simulink.