Electronics II
exercise 3

Deadline: Thu 12.2.2026 14:00

Shift register, IR sensor

Task 1 – Shift register (1+1p)

a) Use the 74HC595 shift register to display a message of your choice on the 4-digit 7-segment display. (It would be possible to drive the display without a shift register but it requires more pins.)

b) Measure the temperature with a thermistor and display it on the display you've just built with 0.1 °C resolution.

Task 2 – Interrupts revisited (1.5p)

Take the following code block and add an interrupt service routine which counts the number of falling edges on a pin.

Write a `displayNumber(byte number)` function which writes the input argument on the 7-segment display. You can connect either a button or the tilt switch to the pin to produce the edges. Use the loop and variable given below.

```
volatile byte fallingEdges = 0; //why volatile?

void loop(){
  delay(5000);
  displayNumber(fallingEdges);
  fallingEdges = 0;
}
```

Task 3 – IR sensor (1p)

Light up an LED for 5 seconds when a passive IR sensor detects movement. Set range to around 3m and make the trigger repeatable.

NB: You need to power the IR sensor from the 5 V pin of the ESP32. **Make sure that 5 V goes only to the IR sensor.**

Task 4 – Capacitive button (1.5p) [Arduino][1]

Make a capacitive button without any external components. To test it make a reaction time tester. The tester should have two modes: Idle and running.

During idle mode, the LED should be lit, and the Arduino should wait for input from the serial monitor.

Once an input has been given, the LED should go dark, and after a random 1-2 second delay, light up again. Measure and print the time it takes for you to touch the capacitive sensor.

Hint: Native Capacitive Sensors without additional Hardware (arduino.cc)

[1] This task must be completed with the Arduino.