

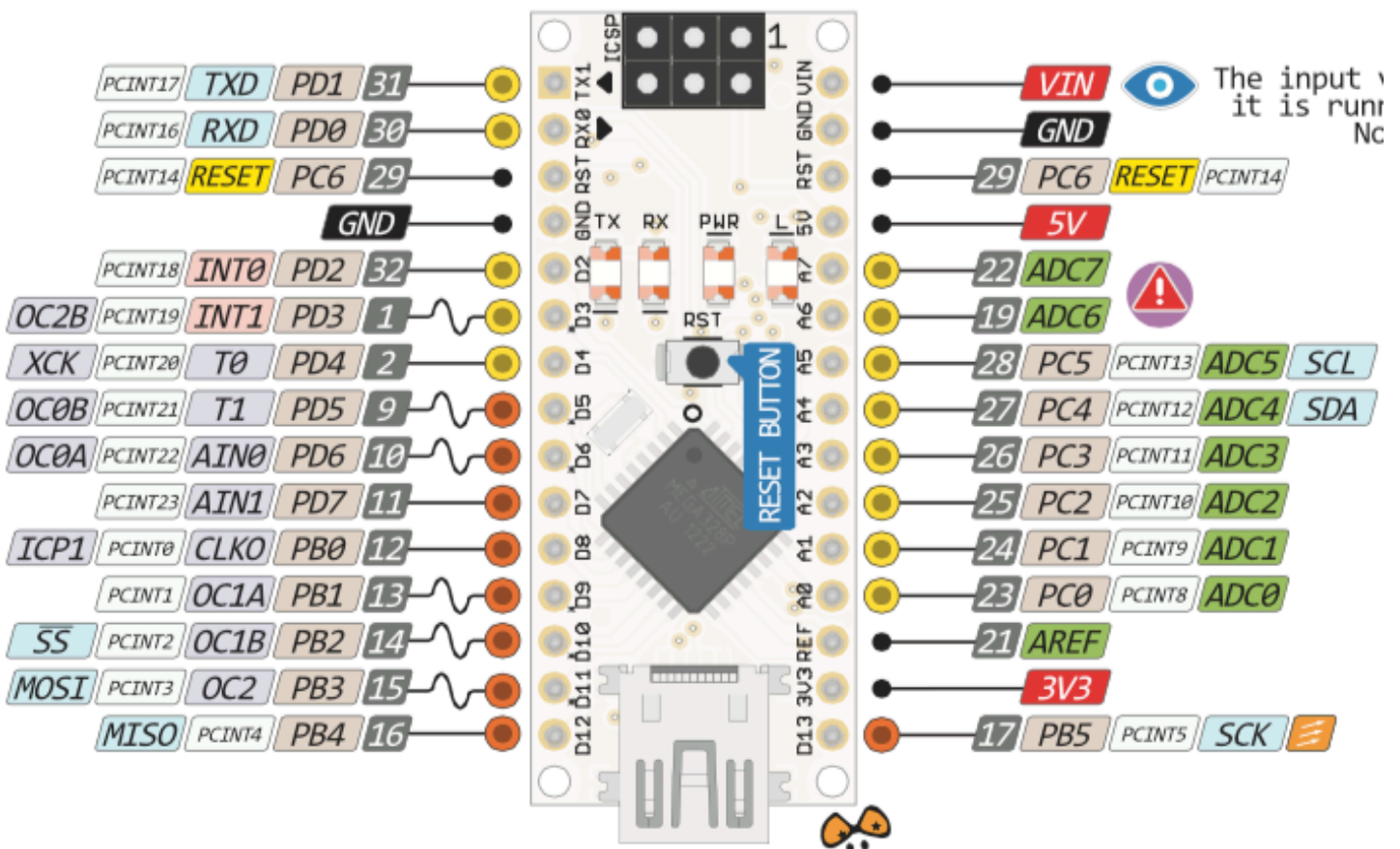
Digital & Embedded Systems

ELEC4403

Lab Assignment 4 – Microcontroller

Points: 10

EQUIPMENT: Breadboard
 Power supply with cable
 Wires, resistors, pushbuttons, 7-segment display
 Arduino Nano



Build a Decision Circuit using a Microcontroller

EXPERIMENT 1 (3 points)

Which button was pressed first?

Two players, A and B have a push button in front of them. After a signal from the referee, both players try to push their button first. The system should record the first button push and display the player's number. Subsequent button pushes should be ignored.

All programming has to be done in **Assembly** language.

The controller needs to be connected to two input buttons (A and B), as well as a two LEDs for output.

Use the controller's reset button for resetting the application.

Note: You will *not* need any gates, flip-flops or a display-decoder, but you *will* need resistors for inputs and outputs.

If input A goes from 0 to 1 first, then X is set to 1 (and stays there).

If input B goes from 0 to 1 first, then X is set to 2 (and stays there)

EXPERIMENT 2 (2 points)

7-Segment Output

Extend your solution from experiment 1 by replacing the output LEDs with a 7-segment display (with or without a decoder chip). *On the 7-segment display show: 0 (none pressed), 1 or "A" for A, 2 or "b" for B*



EXPERIMENT 3 (5 points)

Stop Watch

- Connect two buttons (START and STOP) and the 7-segment display to the Nano
- Pushing the START-button will reset the counter to 0 and start it running
- Every 0.1 sec roughly, advance the counter by 1 and display its value in the display as a single **hex digit** on the 7-segment display (range 0 .. 15).
- Pushing the STOP button, will stop the counter.