

# ME 310 : Microprocessors and Automatic Control Lab

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## Experiment 2: Programming XEP 100: Port Integration Module (PIM) digital input output interface (GPIO)

“I read and I forget, I see and I remember, I do and I understand” –author unknown

### Objectives:

1. To learn various aspects (debugging mode, observing registers, observing various signals and plotting them) of Code warrior environment for XEP 100 programming
2. Develop familiarity with XEP 100 datasheet and learn technique of isolating useful data required for given task from all that is given
3. Specifically learn (PIM) or digital input output interface (also called General purpose input output (GPIO) interface) of XEP 100 and program it for useful tasks

### Background knowledge required:

1. Thorough understanding of slides posted on moodle
2. C programming fundamentals

### What to do?

1. Explore yourself with help of TA the programming environment Code warrior of XEP 100 microcontroller. Specifically you should be able to
  - a. Open a new project with proper settings so that your program is compiled and sent to XEP 100 rather than simulating in computer itself without anything happening on microprocessor.
  - b. See various files (coming by default inside a project created in a.) and main file where you will write program. Write some simple code for assigning values 0 to 100 for a variable x in a loop and execute.
  - c. See execution results of program in the debugging mode. Observe variables in Data 1 window of debugging mode and see them varying. See variation of the variable x in part b to confirm what is expected. (you will need to put a small delay to observe things properly)
  - d. Explore any other aspects you like to.
2. Read input output interface details (start with Section 2.4) for XEP 100 microcontroller and identify “control registers” and “working registers” needed for setting pins of Port A in output mode. (we would like to have desired output on pins of Port A). Set all pins of Port A as output pins.
3. You are given a seven segment display with its connections. Connect it appropriately to Port A pins and display number 0 on the same.

4. Now develop program to display roll number of one person in the group in continuous rolling fashion? (Hint: you will have to create an artificial delay to see the numbers stay for a duration that your eyes can resolve 😊)  
) Delay can be created by using looping operations in C.
5. Use appropriate control register now to configure ALL pins of Port A as input pins. Give input by connecting Port A pins to ground or Vcc of microcontroller board and read the value. **DO NOT USE POWER SUPPLY.**
6. **(challenge part)** Program one of the pins of port B to give a square wave output with visually detectable period. Observe that as blinking LED on PCB given to you. What would you think of algorithm to introduce delay for visual detection. In this algorithm change variable type from int to double and observe its effect and reason out.

**Material given:**

1. A PCB with 7 segment display, LEDs and connectors to connect to I/O port
2. Handout for expt 2
3. Datasheet of XEP 100 microprocessor