CSE321 Project 2

Assigned: September 20, 2020
Project Due: October ~~18~~ 25, 2020, 11:59 pm ET
Project Close: October ~~19~~ 26, 2020, 11:59 pm ET

Objective:
You will be implementing an embedded system. Specifically, you are going to make a basic security system.

THIS IS AN INDEPENDENT PROJECT!

A score of at minimum 50% must be earned to maintain eligibility to pass the course.

Problem:
Design a security system that locks or unlocks based on a 4 digit code.

Constraints/Specification Requirements:
- 4 digit code = last 4 digits of your person number
- Code entered via matrix keypad
- Everytime a value is entered, an LED lights up
- When 4 values are entered it will lock or unlock
- Lock/unlock mode will display on the LCD
- Must have a response of some kind if the wrong code is entered
- Must run “forever”
- BONUS: Add in a password reset to allow user to restart entering their password at any point
    - 10 Points for inclusion in Documentation
    - 10 Points for Code
    - 10 Points for implementation

Implementation Method Requirements
- All registers need to be controlled bitwise for general control not tied to the output of the LCD or an interrupt
    - ~~No API other than using provided LCD Libraries~~
        - If taught using bare metal register control, you must use that approach

        - Only Mbed OS API- except for the LCD
            - Posted in the Projects area on UB Learns
- Bounce needs to be addressed
- Have at least 1 interrupt and ISR
- Proper commenting

Submission and Evaluation:
There are multiple parts to this project that you will be evaluated and require different submission methodologies.

1. Development Process (20 Points)
    a. This is your commits
        i. 1 commit with at minimum a complete header by 9/27 (10 Points)
        ii. 1 commit with progress by 10/9 (10 Points)
        iii. Final commit due with project
2. Documentation (120 Points)
    a. Table of Contents for your work
        i. Cover Page
        ii. Specifications
        iii. Features
        iv. Applications
        v. Block Diagram
        vi. Functionality Diagram
            1. ASM, FSM State Diagram, or Flow Chart pick 1
        vii. BOM
        viii. Schematic
        ix. Test Plan
3. Code (150 Points)
    a. Code will be evaluated for
        i. Commenting (30 Points)
        ii. Implementation technique requirements (60 Points)
        iii. Functionality (60 Points)
            1. Yes partial credit is a thing
4. Implementation (150 Points)
    a. This will be done with a live demo that you schedule
        i. Note if your code doesn't work, you can't get these points
        ii. A sign up will be done for you to select a time on 10/18 or 10/19
        iii. 15% overall score penalty if demo is not done
    b. Runs (10 Points)

c. Keypad (30 Points)
    i. Causes a response of some kind (20 Points)
    ii. Bounce addressed (10 Points)
d. LEDs (30 Points)
e. LCD (30 Points)
f. Functionality (50 Points)

Detailed Grading Rubric and Submission Instructions Coming Soon

Documentation (120 Points)

	Beginning	Developing	Accomplished
Cover Page	Missing or substantially incomplete or incorrect or unprofessional(0 Points)	Missing some components or all components are there but not professionally presented. (5 Points)	Appropriate standard content (name, course, purpose, term) that is professionally presented. (5 Points)
Specifications	Not done or significantly unclear or incomplete (0 Points)	Some unclear aspects or incomplete (5 Points)	Clearly presented and complete (9 Points)
Features	Not done or significantly unclear or incomplete (0 Points)	Some unclear aspects or incomplete (5 Points)	Clearly presented and complete (9 Points)
Applications	Not done or significantly unclear or incomplete (0 Points)	Some unclear aspects (5 Points)	Clearly presented and complete (9 Points)

Block Diagram	Not done or hand drawn with missing elements (0 Points)	Correct and complete but not digitally created. Or missing some elements. (5 Points)	All key blocks and interactions shown Labels present as appropriate. Digitally created. (9 Points)
Functionality	Not done or issues with clarity (0 Points)	Some ambiguity (5 Points)	Clearly defined how the system will work and how to interact with it. (9 Points)
Diagram	Not done (0 Points)	Complete and correct. Properly labeled. Created by hand. Or some errors in completeness/correctness/labels Created digitally. (5 Points)	Complete and correct. Properly labeled. Created digitally. (15 Points)
BOM	Not done (0 Points)	Partially complete (5 Points)	Present and complete (10 Points)
Schematic	Not done Substantial issues. (0 Points)	Not 100% clear, either confusing in spots or missing steps. Hand drawn figures present but can successfully follow your schematic. (5 Points)	Able to create your implementation. Figures (created digitally) used as appropriate to aid in creation. (15 Points)

Test Plan	Not done (0 Points)	Slightly Incomplete and/or some inappropriate aspects (10 Points)	Complete and appropriate (20 Points)
Professionality - Figures	Not digitally created and/or difficult to read. (0 Points)	Created digitally but a bit of a challenge to read. (2.5 Points)	Created digitally, easy to read. (5 Points)
Professionality - Language	Substantial issues (0 Points)	Observable issues but still readable. (2.5 Points)	Clear, concise, easy to read, no errors that make it difficult to read. (5 Points)

Code (150)

	Beginning	Developing	Accomplished
Commenting- Header	Not done or missing many things (0 Points)	Present but missing a couple things (5 Points)	Present and complete (10 Points)
Commenting- Code	Not done or significantly insufficient. (0 Points)	Slightly insufficient in comment content and/or insufficient amount of comments. (10 Points)	Commenting is present and complete. Can determine what is happening without reading code. (20 Points)
Technique Requirements- Authorized methods only	2 or more methods used that are not approved (0 Points)	Used one not approved. (5 Points)	Approved methods only. (10 Points)

Technique Requirements- ISR written	No ISR (0 Points)	A ISR is created but is either not used or not helpful. (5 Points)	At least one ISR created for a purpose that helps with the assignment and gets used. (10 Points)
Technique Requirements- Interrupt configured (as taught)	Substantial errors or not done (0 Points)	Slight errors. (5 Points)	Configured correctly. (10 Points)
Technique Requirements- Used correct API for LCD	Substantial Errors (0 Points)	Some errors/incomplete (5 Points)	Incorporated and used correctly (10 Points)
Technique Requirements- Bare-metal interfacing for remaining configurations	Use of non-MBED OS API (beyond provided) or three or more APIs used when bare metal method was taught (0 Points)	Replaced one or two with a MBED OS API (5 Points)	Yes (10 Points)
Technique Requirements- General structure	Substantial errors (0 Points)	Minor errors (5 Points)	Correct (10 Points)
Functionality- Runs no errors	No (0 Points)	----------	Yes (5 Points)
Functionality- Interrupt Configuration	Not configured or substantial errors (0 Points)	Slight errors (5 Points)	Configured correctly and works in line with the problem assigned (10 Points)
Functionality- Interrupt ISR	Doesn’t work (0 Points)	Attempted but doesn’t work fully (5 Points)	Configured correctly and works in line with the problem assigned (10 Points)

Functionality- Outputs	Substantial errors beyond the partial credit criteria (0 Points)	One output is not not functioning correctly (5 Points)	All outputs work correctly and align with the problem for the project. (10 Points)
Functionality- Inputs	Substantial errors beyond the partial credit criteria (0 Points)	Slight errors (5 Points)	All inputs are correctly captured (10 Points)
Functionality- Bounce addressed	Not done or doesn't work at all (0 Points)	Attempted but doesn't work properly (5 Points)	Yes and it does it correctly (10 Points)
Functionality- LCD integration	Does not have any updating (0 Points)	Some errors (5 Points)	Integrated and works appropriately as defined in the problem for this problem. (10 Points)
Functionality- runs forever	No (0 Points)	----------	Yes (5 Points)
Functionality- Wrong response	No (0 Points)	----------	Yes (5 Points)

Implementation Demo (150)

Note- if code submitted does not run you forfeit these points
(which was always stated above as a rule)

Note- if you do not do this part there is a 15% penalty overall

You should have your implementation constructed before logging in to your demo.

	Beginning	Developing	Accomplished
Runs	No (0 Points)	----------	Yes (10 Points)
Keypad	(0 Points)	Some responses but not all (10 Points)	Causes Response (20 Points)

Keypad	Not done (0 Points)	Slightly addressed but not entirely correct (5 Points)	Bounce Addressed (10 Points)
LEDs	No (0 Points)	----------	LEDs work (10 Points)
LEDs	No (0 Points)	Couple small errors (10 Points)	LEDs match project design in connections (20 Points)
LCD	Not able to turn on (0 Points)	Able to power but no behavior (5 Points)	Turns on and initializes (10 Points)
LCD	No updates (0 Points)	Updates at least once but not as needed (10 Points)	Updates as it should (20 Points)
Functionality- Code Digits	Substantial errors or no code entry (0 Points)	Small errors (2.5 Points)	Digit behavior matches requirements (5 Points)
Functionality- Keypad response	No response in program (0 Points)	Incomplete but does something (5 Points)	Appropriately reads in and causes expected response (10 Points)
Functionality- LED response	No response associated with the program (0 Points)	Incomplete but does something (5 Points)	Correct (10 Points)
Functionality- LCD response	No response associated with the program (0 Points)	Incomplete but does something (5 Points)	Correct (10 Points)

Functionality- forever	No (0 Points)	----------	Yes (5 Points)
Functionality- Wrong response	Substantial issues or doesn't work (0 Points)	Slight errors but tries to work (5 Points)	Yes (10 Points)