

PRG155 – Programming Fundamentals Using C

Prof. W Hesham

PRG155 Final Project

Marks: 15

Due Date: July 30, 2026 lab class (Beginning of the class) In person presentation.
Late Policy: ALL LATE SUBMISSIONS WILL RECEIVE A GRADE OF ZERO (NO CREDIT)
Assignment Delivery Method: Electronic Submission to Blackboard (“Assignments Folder”)

Objective:

Creating a working C program that simulates a functional Home Security System using the DeviceAlpha development board. This project applies students' knowledge of control structures, input/output handling, timing functions, and sensor interfacing in the C programming language. The system integrates pushbuttons, LED indicators, a buzzer, a temperature sensor, and the seven-segment display to demonstrate the core principles of a real-world embedded system.

Program Operation:

The program begins by prompting the user to enter the character 'Y' to start. It accepts either uppercase or lowercase input, allowing 'Y' or 'y'. The program will only proceed if the correct character is entered; otherwise, it will continue to prompt the user until a valid response is received.

Once started, the system initializes all components on the DeviceAlpha board and immediately displays the current temperature (in Celsius) on the seven-segment display, allowing the user to observe the ambient conditions before operation. After a short delay, the display clears, and the system enters an idle (disarmed) state, waiting for user input through the pushbuttons.

Pressing PB1 activates the arming sequence. The seven-segment display shows a three-second countdown, during which the YELLOW LED blinks to indicate that the system is preparing to arm. When the countdown reaches zero, the GREEN LED turns on, confirming that the system is now armed and ready to detect motion.

If PB2 button is pressed while the system is armed, it simulates a motion detection event. This triggers the alarm state, illuminating the RED LED and activating the buzzer to signal an intrusion. The alarm will remain active until the user disarms the system.

To disarm the system, the user presses PB3. This action immediately resets the system by turning off all LEDs, silencing the buzzer, and clearing the seven-segment display. The system then returns to the disarmed state, ready for another cycle of operation. *(Optional: You may add a secret code sequence to disarm the system for added complexity.)*

PB4 button is used to exit the program. If the system is armed or an alarm is active, pressing PB4 will instead display a message reminding the user to disarm the system first.

C Language Requirements:

The program must demonstrate the use of the following C programming constructs:

- User-defined functions
- Loops (at least two different types, e.g., for and while)
- Decision-making structures (if and switch statements)
- Input validation for all user inputs to ensure reliable program operation

NOTE: You will be required to present your project and answer questions about your code to demonstrate your understanding. If you are unable to explain your code and show a full grasp of its functionality, you will receive zero marks for the project.

File to submit: Source code (.c file) named finalproject.c (files submitted with any other extension will receive a grade of ZERO)