# Embedded Systems Project Proposal

**Team Number:** 1

**Project Name:** Secure Elevator Control System

**Team Members:**

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**Submitted to**

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# Idea Description

A secure system that controls an elevator by operating the lift motors and the elevator door. The elevator uses passwords (encrypted by AEGIS) to authenticate users.

# System Features

- Control the elevator lift motor to move the elevator up and down to the required floors (either in response to a user calling the elevator or after a user clicks a floor button).
- Control the elevator door motor to open and close the door.
- Authenticate users using a password (encrypted by AEGIS).
- Accept user required floor input through a keypad inside the elevator.
- Display the current floor through a 7 segment display.
- Detect obstacles if the door is closing & re-open the door.

# System Components

- Arduino (ATMEGA328P)
- Lift motor(s): move the elevator up & down.
- Door motor(s): open or close the elevator door.
- Keypads: for users to pick a floor and enter their password.
- 7 segment Display: display the current floor.
- Ultrasonic sensor: to detect obstacles while the door is closing.

## Component Test Cases

- Lift motor(s):
    - When the elevator needs to move up or down, the motor operates correctly to move the elevator until it reaches the required floor then it stops.
- Door motor(s):
    - When the elevator door needs to be opened or closed, the door motor operates correctly to open or close the door.
- Password Authentication:
    - Entered passwords are correctly encrypted and checked against stored passwords.
- Keypads:
    - The user input floor is read correctly.
- 7 Segment Display:
    - The current floor is displayed correctly.
- Ultrasonic sensor:
    - Any obstacles in the doorway are detected correctly.

## System Test Cases

- Calling the elevator:
  - If the elevator is not moving, it moves to the required floor.
  - If the elevator is moving and the floor is on its way, the elevator stops on the required floor then continues.
  - If the elevator is moving and the floor is not on its way, the elevator goes to its destination first, then moves to the required floor.
  - The door opens when the elevator reaches the required floor.
- Picking a floor:
  - The user is authenticated using their RFID tag.
  - User required floor is read through a keypad.
  - The elevator moves to the required floor.
  - The current floor number is displayed while the elevator is moving.
  - The door opens when the elevator reaches the required floor.
- Door control:
  - When the elevator arrives at a floor, the door opens.
  - After a certain delay, the door closes if no obstacles are detected.
- User authentication:
  - If a correct password is entered, the elevator accepts floor input through the keypad.
  - Otherwise, the elevator ignores any floor inputs.