**GE107(TINKERING LAB)**

**Smart Lock with RFID and Fingerprint**

**Group no: -06**

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**Introduction -**The Smart Lock with RFID and Fingerprint project utilizes an Arduino board to create a secure and convenient locking system. Integrating both RFID and fingerprint authentication methods, users can gain access to the lock using either RFID cards or their registered fingerprints. The Arduino board processes the authentication data, controlling the locking mechanism to either secure or release access. This project enhances security by employing dual authentication methods and provides users with flexibility and ease of use in accessing the lock**.**

**Components Requirement:**

1. Arduino Board (e.g., Arduino Uno, Arduino Mega, Arduino Nano)
2. RFID Module (e.g., MFRC522, RC522)
3. Fingerprint Sensor Module (e.g., R305, GT-511C3)
4. Motor or Servo
5. Relay Module
6. LEDs/Buzzer
7. Power Supply
8. Wires and Breadboard
9. Resistors, capacitors, etc. (as needed)

**Extra Components Required**

1. Connecting Cable for R305 Fingerprint Sensor
2. LCD Display

**Working:**

The Smart Lock system operates by first scanning for RFID cards/tags or fingerprint impressions presented by users. Upon detection, the system verifies the presented credentials against a pre-registered list of authorized users. If the credentials match, the solenoid lock or servo motor is triggered, allowing access. Feedback mechanisms such as an LCD display or buzzer provide real-time user feedback during the authentication process. Overall, this process seamlessly integrates biometric and RFID technologies to grant secure and efficient access control**.**

**Step-by-Step Guide:**

**Step 1: Setting up the Hardware**

1. Connect the RFID reader and Fingerprint sensor modules to the Arduino board according to their respective datasheets or pinout diagrams.
2. Connect the solenoid lock or servo motor to the Arduino to control the locking mechanism.
3. Optionally, connect an LCD display and a buzzer for user feedback.

**Step 2: Install Required Libraries**

1. For the RFID module, you might need to install the appropriate library for your specific module. Libraries like MFRC522 are commonly used for RFID readers.
2. For the fingerprint sensor, libraries such as Adafruit Fingerprint Sensor Library can be used**.**

**Step 3: Coding**

1. Write a sketch (Arduino program) that initializes both the RFID reader and Fingerprint sensor modules.
2. Implement logic to wait for a user to present either an RFID card/tag or a fingerprint.
3. Verify the RFID card/tag or fingerprint against a list of authorized users.
4. If the user is authorized, trigger the solenoid lock or servo motor to unlock the door.
5. Provide appropriate feedback to the user using the optional LCD display and buzzer.

**Step 4: Testing and Debugging**

1. Upload the code to the Arduino board.
2. Test the Smart Lock system with authorized and unauthorized RFID cards/tags or fingerprints.
3. Debug any issues that arise during testing.

**Step 5: Enhancements (Optional)**

1. Implement additional features like logging access attempts, adding/removing authorized users dynamically, etc.
2. Improve security by encrypting stored fingerprint templates or RFID card data.
3. Optimize the code for better performance and reliability**.**

**Conclusion**- In conclusion, the development of a Smart Lock with RFID and Fingerprint capabilities using Arduino offers a robust and convenient security solution for real-life applications. By integrating RFID and biometric authentication, this system enhances access control while ensuring ease of use. Its versatility allows for implementation in various settings, such as homes, offices, and smart buildings. With proper setup and enhancements, it can effectively safeguard valuable assets and sensitive areas, providing peace of mind to users. In essence, this technology represents a practical and reliable approach to modern security needs.

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