**IoT LABORATORY FILE**

**FOR IoT BASED SYSTEM (UEC715)**

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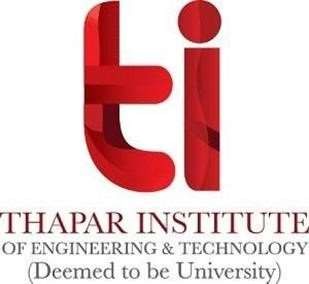
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**Smart Door Locking System**

**Motivation/introduction :-**

The rapid advancement of the Internet of Things (IoT) is transforming everyday objects into intelligent systems capable of communicating, automating, and improving daily life. In the realm of home automation, **Smart Door Locking Systems** offer enhanced security and convenience. The ability to control and monitor locks via IoT-enabled devices allows homeowners and businesses to manage access remotely, providing real-time data on lock status, security alerts, and visitor logs. This project utilizes IoT technologies to create an intelligent, networked door lock system that integrates seamlessly with smart home ecosystems, ensuring both user convenience and robust security.

**Research Gap :-**

Many modern smart door locking systems emphasize biometric authentication, cloud-based solutions, and smartphone integration. However, recent studies highlight limitations in energy efficiency, cybersecurity vulnerabilities, and challenges in seamless integration with broader IoT ecosystems.

While many systems offer basic IoT functionality, they often lack robust **low-latency** communication, **power-efficient designs**, and **end-to-end encryption**. Our project addresses these gaps by optimizing MQTT protocols for real-time control, integrating cloud services for data security, and ensuring low-power operation for continuous use.

**Component List :-**

|  |  |  |
| --- | --- | --- |
| S. No. | Name of component | Estimated Price (in Rs.) |
| 1. | nodeMCU v3 esp8266 ch340 Wireless module Lua WIFI development board with PCB Antenna and USB port | ₹300 – ₹350 |
| 2. | Robodo 12V Solenoid Lock for Doors and Cabinet | ₹600 - ₹800 |
| 3. | ESP32 (with Wi-Fi & Bluetooth) | ₹450 - ₹550 |
| 4. | RFID Module (RC522) | ₹200 - ₹250 |
| 5. | Servo Motor (SG90) | ₹150 - ₹200 |
| 6. | Power Supply (5V Adapter) | ₹150 - ₹300 |
| 7. | Push Button | ₹10 - ₹50 |
| 8. | LEDs | ₹5 - ₹10 per unit |

**Communication Protocol :-**

The core communication will leverage **MQTT (Message Queuing Telemetry Transport)**, a lightweight IoT communication protocol designed for low-bandwidth environments.

* **Wi-Fi Protocol**: The ESP32 microcontroller connects to the local network via Wi-Fi, enabling seamless communication between the lock and a cloud-based IoT platform.
* **MQTT Broker**: Acts as the central hub for communication, handling messages between the mobile app and the ESP32. Whenever the door lock status changes (e.g., locked, unlocked, or an unauthorized attempt), the ESP32 publishes the data to the MQTT broker, which then relays it to the mobile app.
* **Cloud Communication**: The system is connected to a cloud platform for storing data such as access logs, and remotely locking/unlocking the door.

**Methodology :-**

**IoT System Architecture**:

* The system connects the **ESP32 microcontroller** to a **cloud platform** via Wi-Fi, enabling remote monitoring and control.
* A smartphone app interacts with the system, allowing users to lock/unlock the door, monitor status, and receive real-time alerts.

**IoT Device Setup**:

* The ESP32 acts as the control hub, managing the RFID reader, servo motor, and other sensors.
* The system operates on the **MQTT protocol**, which facilitates efficient data communication between the lock and the user’s smartphone or web-based dashboard.

**RFID & Remote Authentication**:

* For local access, an RFID module authenticates users by scanning authorized RFID cards.
* For remote access, users can control the lock via the **IoT app** over the cloud.

**Cloud Integration**:

* The system stores user authentication data, access logs, and lock status on a **cloud server**, which can be accessed anytime for review.
* Notifications are sent to the user in real-time when the lock is accessed, tampered with, or manually overridden.

**Security Features**:

* In case of a potential security breach (e.g., unauthorized RFID card attempt or forced unlocking), an alert is triggered and sent via the IoT network to the user's mobile device.

**Circuit Diagram :-**

The circuit will include:

* ESP32 (with integrated Wi-Fi and Bluetooth for IoT communication)
* Connections to the RFID reader, servo motor, push button, and buzzer
* Power supply management and data communication lines to the MQTT broker or cloud server

**List of Students :-**

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| --- | --- | --- |
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