**PATUAKHALI SCIENCE AND TECHNOLOGY UNIVERSITY**

**COURSE CODE EEE-212**

**Electrical Technology Sessional**

**SUBMITTED TO:**

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Date of submission:Project title: **Metro Recharge Point**

**Metro Recharge Point**

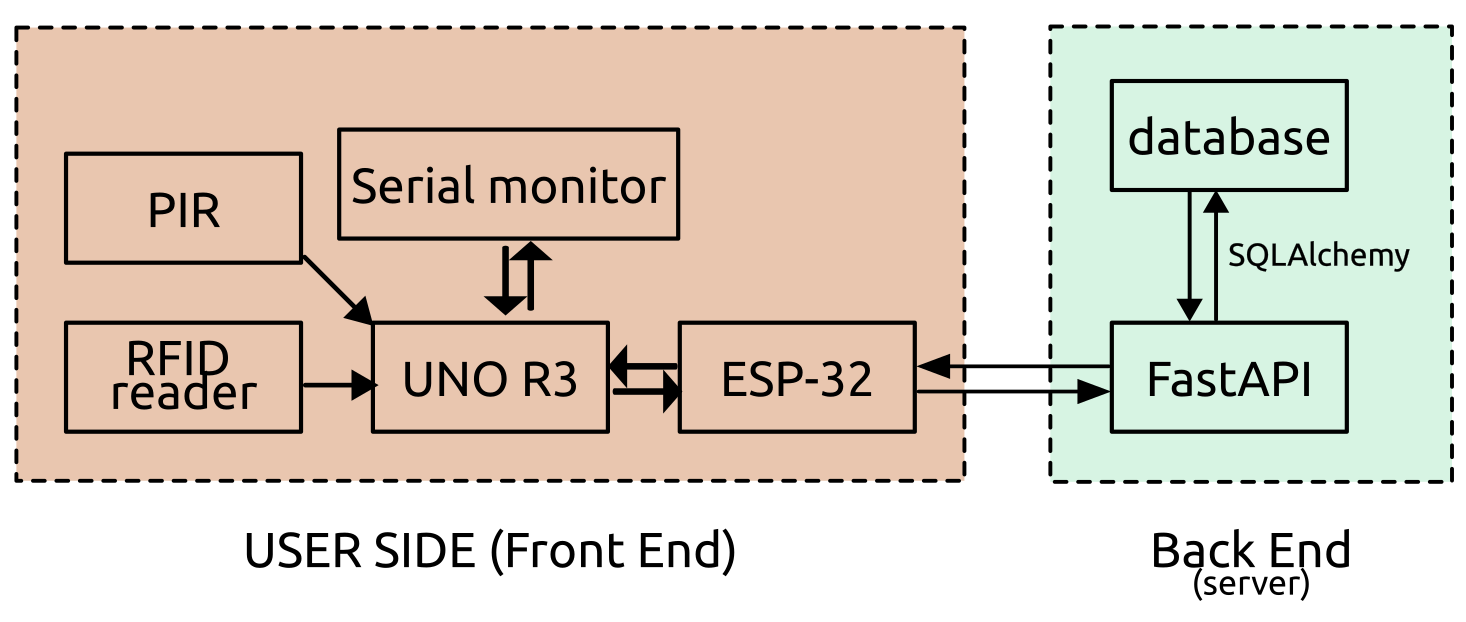
## ****Description****

Metro rail card's self recharging utility with mobile banking ability. Where users can scan their card and access their accounts with simple clicks.

## History

In general in a metro rail system, whenever a user wants to travel, he has to go to the ticket counter and form a query, in order to collect the ticket, which makes the whole entire process more time-consuming. To solve this issue, we can implement a backend server for database and API, and use our system as frontend.

## Objectives

1. Developing an Arduino-based system with RFID readers for identifying metro cards.
2. Integrate a secure mobile banking platform for users to recharge their metro cards on the go. Where user can use mobile banking/ any specific hardware to recharge cards.
3. Implement a backend system to track user balances, recharge, and discharge transactions using **FastAPI** and **SQLAlchemy**.
4. Ensure seamless communication between hardware components (Arduino, RFID reader) and backend services via HTTP requests.

## Scope

* **Hardware Integration**: Utilize components such as RFID Readers, ESP32, PIR sensors, and buzzers for card detection and system feedback.
* **Backend Development**: Develop a FastAPI-based RESTful API to handle user balance management, including recharge, discharge, and user creation functionalities.
* **Mobile Banking Integration**: Enable secure mobile banking transactions for recharging metro cards.
* **Real-time Data Processing**: Ensure real-time updates to user balances via cloud-hosted services.

## Benefits

* **User Convenience**: Quick and easy metro card recharges from any location using mobile banking or specific machines.
* **Real-time Updates**: Users can track balances and manage their metro cards through a user-friendly interface. Or, they can also use an interface hosted on web to quickly access.
* **Scalability**: Designed to handle large volumes of users and transactions efficiently. Besides it can be integrated into other systems, as well as handling multiple purposes.

## Backend Server

* **Python FastAPI**
* **SQLAlchemy**
* **SQLite/MySQL** (for database)
* **Python**
* **Uvicorn** (for ASGI server)
* **Pydantic** (for data validation)
* **HTTP/HTTPS**

## Frontend Budget

|  |  |
| --- | --- |
| **Equipments Name** | **Approx. Price** |
| PIR (Passive infrared sensor) | 110 |
| Arduino UNO R3 SMD | 574 |
| Cable | 55 |
| Breadboard | 150 |
| Buzzer | 15 |
| RFID Reader | 195 |
| RFID Cards | 70 |
| Resistor | 30 |
| ESP 32 | 470 |

## **Estimated Timeline**

* **Phase 1**: Hardware integration and system setup (2 weeks)
* **Phase 2**: Backend development and database integration (3 weeks)
* **Phase 3**: Mobile banking integration and testing (3 weeks)
* **Phase 4**: Final testing, deployment, and user feedback (2 weeks)