



BHARAT

INSTITUTE OF ENGINEERING AND TECHNOLOGY

NAAC Accredited, NBA Accredited for UG Programmes: CSE, ECE

Approved by AICTE, New Delhi, Affiliated to JNTUH

Dept of Electronics & Communication Engineering

MAJOR PROJECT REVIEW

BATCH NO-21ECE-MP-B-08

PREPAID AND POSTPAID EV CHARGING STATION

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OBJECTIVES

- Develop a dual-mode (prepaid and postpaid) EV charging system using RFID authentication.
- Monitor and control real-time energy usage with sensors and automated relay switching.
- Ensure a secure, user-friendly, and efficient charging experience for both users and service providers.

INTRODUCTION

- Electric vehicles (EVs) are becoming more common, so smart charging systems are needed.
- Old charging setups don't track energy use well or support user-specific billing.
- This project uses **RFID cards** to identify users and manage charging sessions.
- It supports **prepaid** (stops when balance ends) and **postpaid** (pay after use) options.
- **Sensors** track real-time voltage and current to measure energy used.
- A **relay** automatically turns charging on or off based on the user's status.

LITERATURE REVIEW :

Title	Authors	Publication / Conference	Year	Publisher / Source
SMART RFID IOT ENABLED EV CHARGING SYSTEM	Dr. D. Siva, S. Jameela, P. Lavanya, V. Surendra	International Journal of Scientific Research in Engineering and Management (IJSREM), Vol. 9, Issue 4	2025	IJSREM
RFID-BASED SMART CHARGING STATION FOR ELECTRIC VEHICLES	J. Liu, X. Wang, Y. Zhang	IEEE International Conference on Smart Grid Communications (SmartGridComm)	2022	IEEE
SMART GRID-BASED EV CHARGING STATION USING RFID AUTHENTICATION AND IOT INTEGRATION	A. Sharma, V. Kumar	IEEE Power and Energy Conference	2022	IEEE
RELAY-CONTROLLED ELECTRIC VEHICLE CHARGING STATION WITH RFID-BASED USER AUTHENTICATION	T. Chen, L. He, W. Zhang	IEEE Internet of Things Journal, Vol. 9, Issue 3	2023	IEEE

EQUIPMENT REQUIRED :

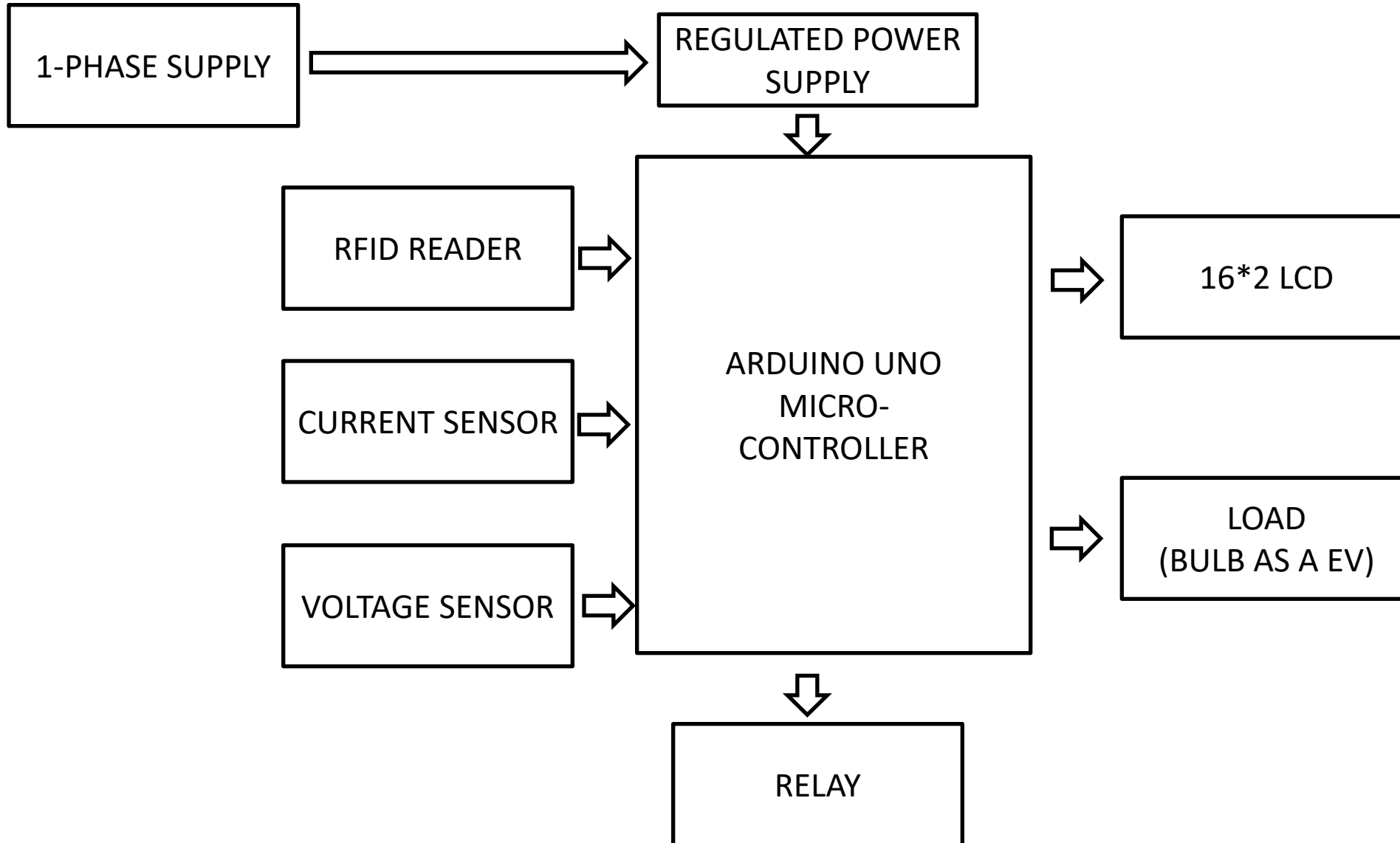
REQUIRED HARDWARE:

- 1) RPS
- 2) Arduino uno micro controller
- 3) Relay
- 4) Current Transformer
- 5) Voltage Regulator LM7805
- 6) 16*2 lcd
- 7) RFID Reader with two tags
- 8)Capacitor
- 9)ADC circuit.

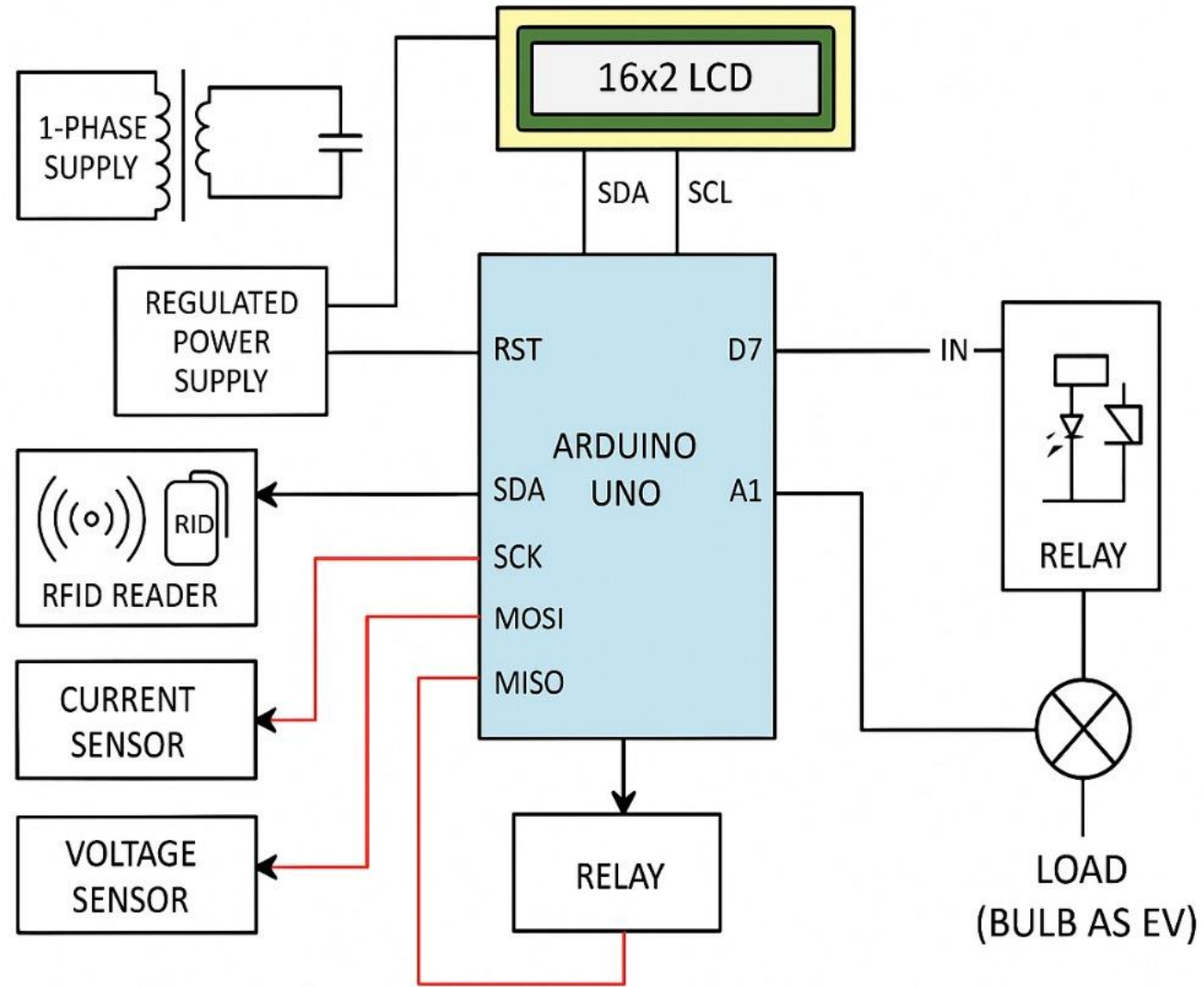
REQUIRED SOFTWARE:

- 1) Arduino IDE

BLOCK DIAGRAM :



CIRCUIT DIAGRAM:



METHODOLOGY:

PREPAID SYSTEM –

➤ System Initialization:

- The system powers on, initializing the microcontroller, sensors, RFID reader, and relay.

➤ RFID Card Detection:

- User taps their RFID card on the RFID reader to check the stored balance.

➤ Balance Check:

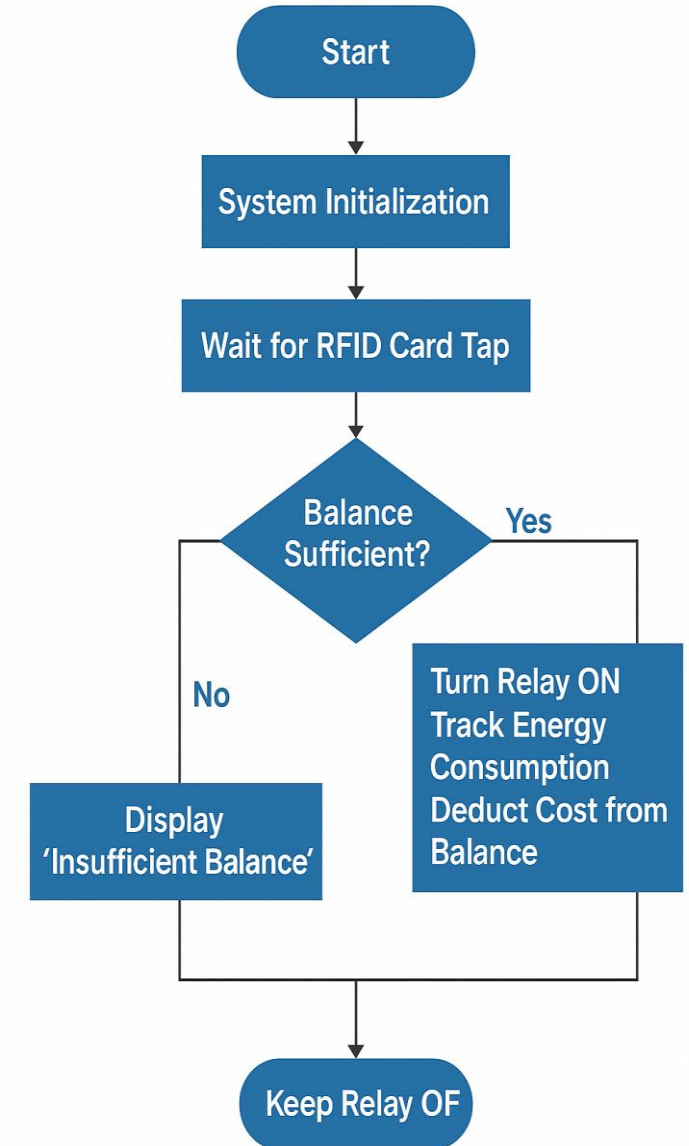
- If the balance is sufficient:
- Relay is activated, and electricity flows to the load.
- Energy consumption is tracked using current and voltage sensors.
- The microcontroller deducts the energy cost from the user's balance.

➤ Insufficient Balance:

- If the balance is insufficient, the relay remains OFF and the system displays an "Insufficient Balance" message.

➤ Automatic Cut-Off:

- Once the balance is exhausted, the relay is automatically turned OFF to stop further consumption.



POSTPAID SYSTEM-

➤ System Initialization:

- The system starts when the RFID card is tapped to activate it.

➤ Energy Consumption Tracking:

- The microcontroller tracks energy usage and converts it into cost based on the rate (e.g., ₹3.5 per unit or per hour).

➤ Usage End Detection:

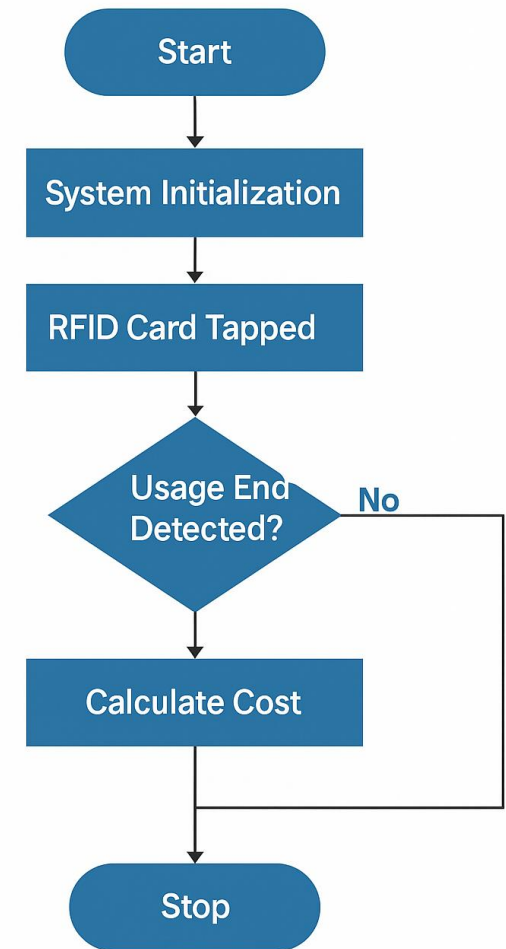
- After use, the user taps the RFID card again to signal the end of consumption.

➤ Cost Calculation:

- The microcontroller calculates the total energy consumed and displays the corresponding cost on the I2C display.

➤ Power Cut-Off:

- Once the session ends, the relay is turned OFF, cutting off the power supply.



APPLICATIONS:

- **Smart Energy Meters** – For automated billing and energy control using RFID cards.
- **Prepaid Electricity Supply in Hostels/PGs** – Students can pay in advance and use electricity based on their balance.
- **Postpaid Billing in Rented Apartments** – Tenants can be billed accurately for electricity consumed during their stay.
- **Industrial Workstations** – To monitor and charge electricity usage by individual workers or machines.
- **Temporary Events or Stalls** – For controlled energy access and billing during exhibitions, fairs, or outdoor events.
- **EV Charging Stations** – To allow RFID-based prepaid/postpaid charging of electric vehicles.

RESULT:

✅ This project presents a smart and secure electric vehicle (EV) charging system using RFID technology. It allows only authorized users to access the charging station by scanning an RFID card. The system includes a voltage sensor and an LCD display to show real-time charging status. A relay module is used to safely control the power supply. This setup makes EV charging more convenient, automated, and efficient.

CONCLUSION & FUTURE SCOPE:

CONCLUSION-

The RFID-based prepaid and postpaid billing system plays a key role in enhancing the efficiency and security of electric vehicle (EV) charging stations. By allowing users to access charging services securely and pay either in advance or after use, the system ensures accurate energy tracking and billing. This reduces human effort, prevents misuse, and makes the charging process more user-friendly and automated.

FUTURE SCOPE-

- Use with mobile apps
- Work with solar charging stations
- Use in buses and public transport
- Add OTP or fingerprint security
- Show energy usage reports

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THANK YOU

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