Electricity Meter Management System Detailed Documentation

# Project Overview

Project Name: Electricity Meter Management System  
Description: This project involves the development of a web application for managing electricity meter data, including user authentication, role-based access control, CRUD (Create, Read, Update, Delete) operations for meter readings, file upload for bulk data import, and real-time data analysis to monitor electricity consumption. The system will allow authorized users to manage electricity meter records, upload data in bulk, and analyze consumption trends through visual reports.

# Roles and Access Control

The system will have the following user roles, each with specific access permissions and responsibilities:

## 1. Admin Role

• Full access to the application  
• Can create, read, update, and delete any meter records  
• Can manage user accounts (create, update, delete users)  
• Can upload and validate bulk data files (CSV format)  
• Can access real-time consumption analysis and generate reports for all users  
• Can manage roles and permissions for other users

## 2. User Role

• Limited access to the application  
• Can only view their own meter readings and consumption data in graphical form (charts)  
• Cannot perform CRUD operations on other users' data  
• Cannot manage users or roles

# Functional Requirements

## 1. Authentication & Authorization

• User Registration: New users should be able to register by providing necessary details like username, email, password, etc.  
• User Login: Registered users can log in to the system with valid credentials (username/email and password).  
• Role-Based Access Control: The system should ensure different users have different access rights based on their roles (Admin, User).

## 2. Meter Management

• CRUD Operations: Admins can perform the following operations on meter records:  
 - Create: Add new meter readings  
 - Read: View meter records  
 - Update: Edit existing meter readings  
 - Delete: Remove meter readings  
• Search & Filter: Users (Admin and User) can search and filter meter records by parameters like meter number, customer ID, date, etc.

## 3. File Upload

• Bulk Data Upload: Admin should be able to upload CSV files containing meter data for multiple customers. The CSV file should include details such as User ID and their corresponding meter readings for the month.  
• Data Validation: The uploaded file should be validated for correct format and data consistency.  
• Error Handling: If the file contains errors (e.g., missing fields or invalid data), the system should notify the admin and reject the file.

## 4. Data Analysis

• Monitoring: The system should provide updates on electricity consumption trends for all users .  
• Data Visualization: Graphs and charts should be generated to represent the consumption data, such as daily, weekly, and monthly consumption trends.  
• User-Specific Reports: Each user can only view consumption data for their own meter in graphical form. Admins can view reports for all meters.

# Conclusion

This document outlines the detailed requirements and features of the Electricity Meter Management System. The application will provide efficient management of electricity meter data, user authentication and role-based access, bulk data upload features, and data visualization. Admins will have full control over the system, while users will be able to view and manage their own data.