HIGH LEVEL DESIGN

Entity-Relationship Diagram (ERD) Document

Project Title: Project X
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1. Introduction

This document outlines the Entity-Relationship Diagram (ERD) for the Attendance Management System. The system supports secure login, role-based access, course scheduling, and QR-based attendance tracking for students and lecturers. This ERD models the data entities and their relationships, which form the foundation of the system's database layer.

2. Entities and Attributes

2.1. User

Represents all users of the system regardless of role.

Field	Type	Key	Description
user_id	UUID/Int	Primary Key (PK)	Unique identifier for the user
first_name	String		First name
last_name	String		Last name
email	String		Email address
username	String		Login username
password	String		Hashed password
role	String		Role type (e.g., student, lecturer)

2.2. Role_Type

Defines specific user roles for normalization.

Field	Type	Key	Description
role_id	Int	Primary Key (PK)	Role identifier
user_id	Int	Foreign Key (FK)	References User.user_id

2.3. Student

Inherits from User and stores student-specific records.

Field	Type	Key	Description
role_id	Int	Primary Key (PK)	Role identifier
user_id	Int	Foreign Key (FK)	References User.user_id

2.4. Lecturer

Inherits from User and stores lecturer-specific records.

Field	Type	Key	Description
role_id	Int	Primary Key (PK)	Role identifier
user_id	Int	Foreign Key (FK)	References User.user_id

2.5. Administrator

Inherits from User and stores admin-specific records.

Field	Type	Key	Description
role_id	Int	Primary Key (PK)	Role identifier
user_id	Int	Foreign Key (FK)	References User.user_id

2.6. Course

Represents a course offered in the system.

Field	Type	Key	Description
course_id	Int	Primary Key (PK)	Unique course ID
course_code	String		Alphanumeric course code
course_name	String		Course title
description	Text		Optional description of the course
lecturer_id	Int	Foreign Key (FK)	References Lecturer.lecturer_id
schedule_id	Int	Foreign Key (FK)	References Schedule.schedule_id
student_list	Text/JSON		List of student IDs enrolled

2.7. Schedule

Details when a course occurs.

Field	Type	Key	Description
course_id	Int	Primary Key (PK)	Unique course ID
course_code	String		Alphanumeric course code
course_name	String		Course title
description	Text		Optional description of the course
lecturer_id	Int	Foreign Key (FK)	References Lecturer.lecturer_id
schedule_id	Int	Foreign Key (FK)	References Schedule.schedule_id
student_list	Text/JSON		List of student IDs enrolled

2.8. Attendance

Records attendance via QR code for each course.

Field	Type	Key	Description
course_id	Int	Primary Key (PK)	Unique course ID
course_code	String		Alphanumeric course code
course_name	String		Course title
description	Text		Optional description of the course
lecturer_id	Int	Foreign Key (FK)	References Lecturer.lecturer_id
schedule_id	Int	Foreign Key (FK)	References Schedule.schedule_id
student_list	Text/JSON		List of student IDs enrolled

2.9. Login_Audit

Tracks user login activity.

Field	Type	Key	Description
login_id	Int	Primary Key (PK)	Unique login record
user_id	Int	Foreign Key (FK)	References User.user_id
time	Time		Login time
day	String		Day of login
username	String		Redundant for logging purposes

3. Relationships Overview

A **User** has one **Role_Type**.

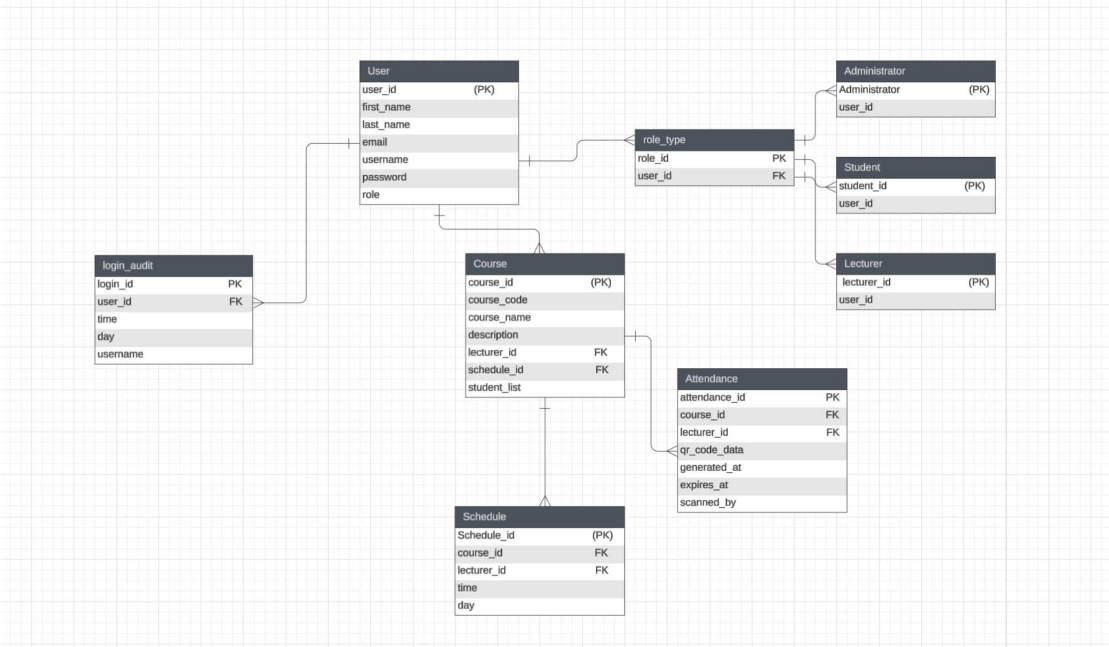
A **Role_Type** can be a **Student**, **Lecturer**, or **Administrator**.

A **Course** is taught by one **Lecturer** and has one **Schedule**.

A **Schedule** is linked to a **Course** and a **Lecturer**.

Attendance is tied to both **Course** and **Lecturer**, and stores QR metadata.

Login_Audit logs each login event with reference to a **User**.



4. Conclusion

This ERD document outlines a normalized and role-based data structure for the Attendance Management System. It ensures efficient data retrieval, extensibility for new features (e.g., reporting), and compliance with common software architecture principles.