



UNIVERSITY OF BUEA  
FACULTY OF ENGINEERING &  
TECHNOLOGY

CEF440: INTERNET PROGRAMMING AND MOBILE PROGRAMMING

# **DESIGN AND IMPLEMENTATION OF A BIOMETRIC STUDENT'S ATTENDANCE SYSTEM**

Presented by

**GROUP 12**

Course Instructor

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# Group 12 Members

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**i-tend** is a mobile application designed for educational institutions to streamline, modernize and facilitate the process of attendance recording using biometric technology.

Case Study: Faculty of Engineering and Technology, University of Buea



# Project Overview

1

## Requirement Gathering / User Research

Conduct interviews, and surveys to understand user/stakeholder pain points and specific needs

2

## Requirement Analysis

Define functional and non-functional requirements based on user findings.

3

## System Modelling & Design

Conceptual design of the system by means of UML diagrams.

4

## UI Design & Implementation

Design user interface and user experience following requirements and design principles, and implement.

5

## Database Design & Implementation

Design database schema, E-R Diagram, and implement.



# Problem Statement

1

Unreliable  
Tracking

2

Susceptibility  
to Fraud

3

Report  
Generation



# General Objectives

1

**Improved accuracy and reliability of attendance records.**

2

**Enhanced administrative efficiency.**

3

**Gain user acceptance**



# Specific Objectives

1

**Efficiency**

2

**Transparency**

3

**Compliance**



# Key Terms

**Biometric Systems, Fingerprint Recognition,  
Attendance Tracking, Educational Institutions,  
Administrative Efficiency, User Acceptance**



# LITERATURE REVIEW

## Related Works

### International Journal of Engineering Research & Technology (IJERT)

The system consists of microcontroller interface with finger print sensor, and GSM Module.

#### Advantages

- Automated Attendance

#### Disadvantages

- Privacy and Security Concerns



“

*cutting-edge biometric technology ensures accurate, secure, and efficient attendance management*

# LITERATURE REVIEW

## Related Works

### International Conference on Information Technology\_(InCIT)

QR code is the fastest way to authenticate digital data. Implementing this in an attendance system would allow the students to scan QR code on their mobile to mark attendance.

#### **Advantages**

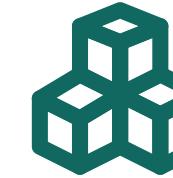
- User-Friendly

#### **Disadvantages**

- Network Requirement

# METHODOLOGY

## Requirement Gathering



Capturing stakeholder needs.

## Requirement Analysis



Prioritising stakeholder needs

## Design and Implementation



Creating a user-friendly interface and backend

## Testing and Maintenance



Ensuring functionality and ongoing improvements

# Requirement Gathering

Requirement gathering techniques

01



Brainstorming

02



Reverse  
Engineering

03



Surveys/  
Questionnaires

04



Interviews

# Requirement Analysis

## Identify key Stakeholders

- Administrator
- Teachers
- Students

## Functional Requirements

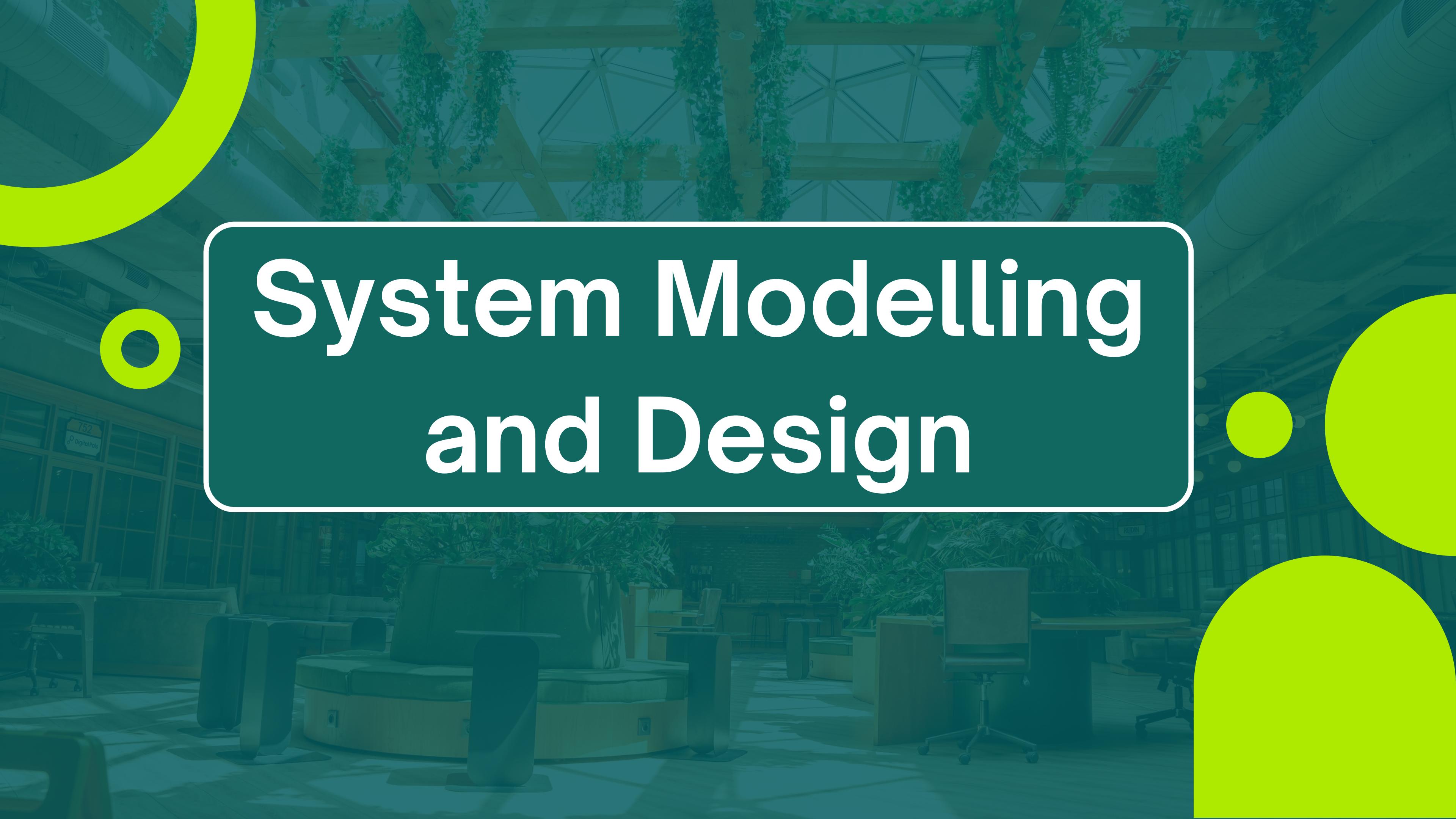
- Registration
- Biometric Data Capture
- Report Generate
- Attendance Activation
- Register student in spacial case

## System Requirements

- Robust Security Measure
- Compatible with various device.
- Biometric Authentication
- Reliable and scalable database

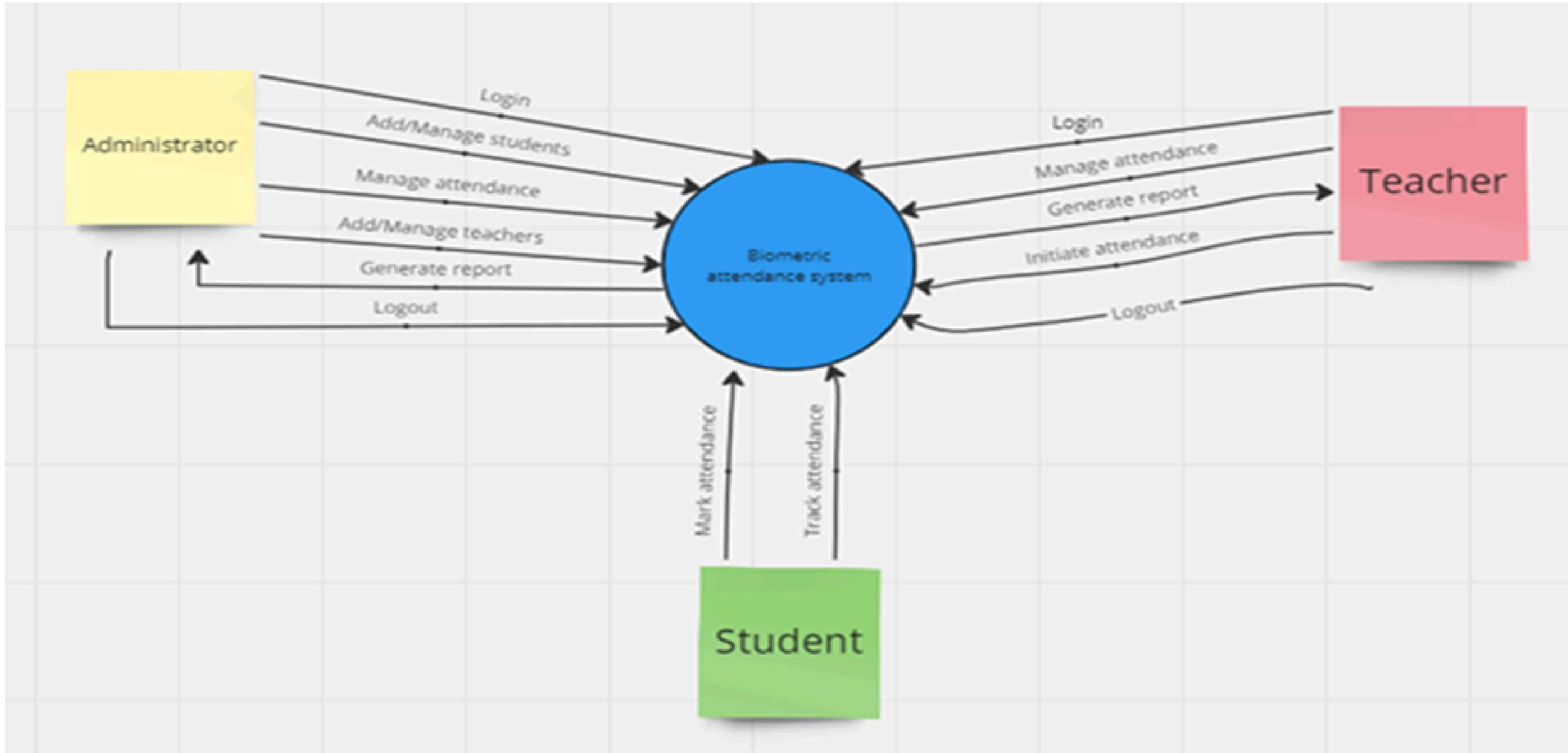
## Non-Functional Requirements

- Security
- Performance
- Usability
- Scalability
- Transparency

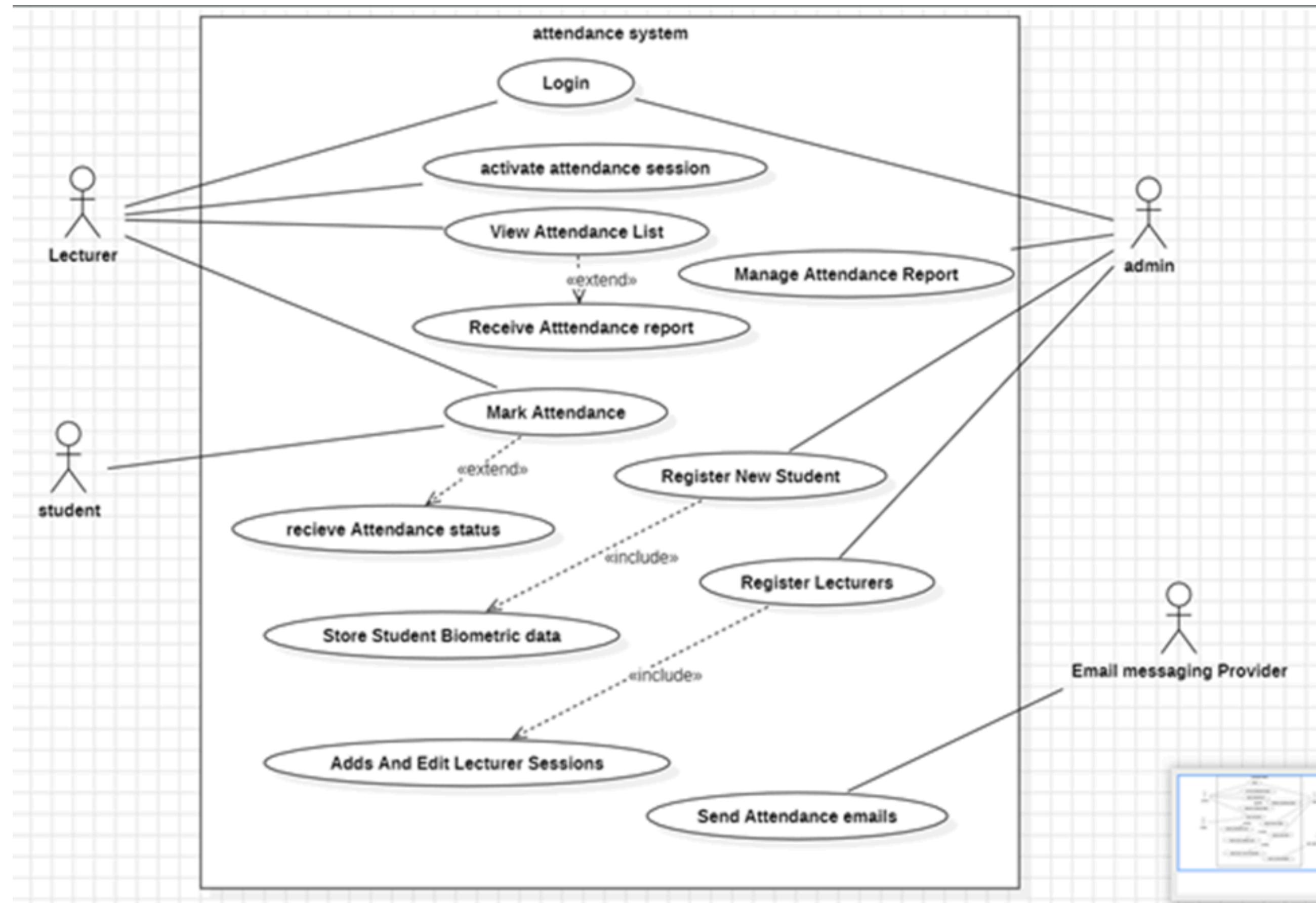


# System Modelling and Design

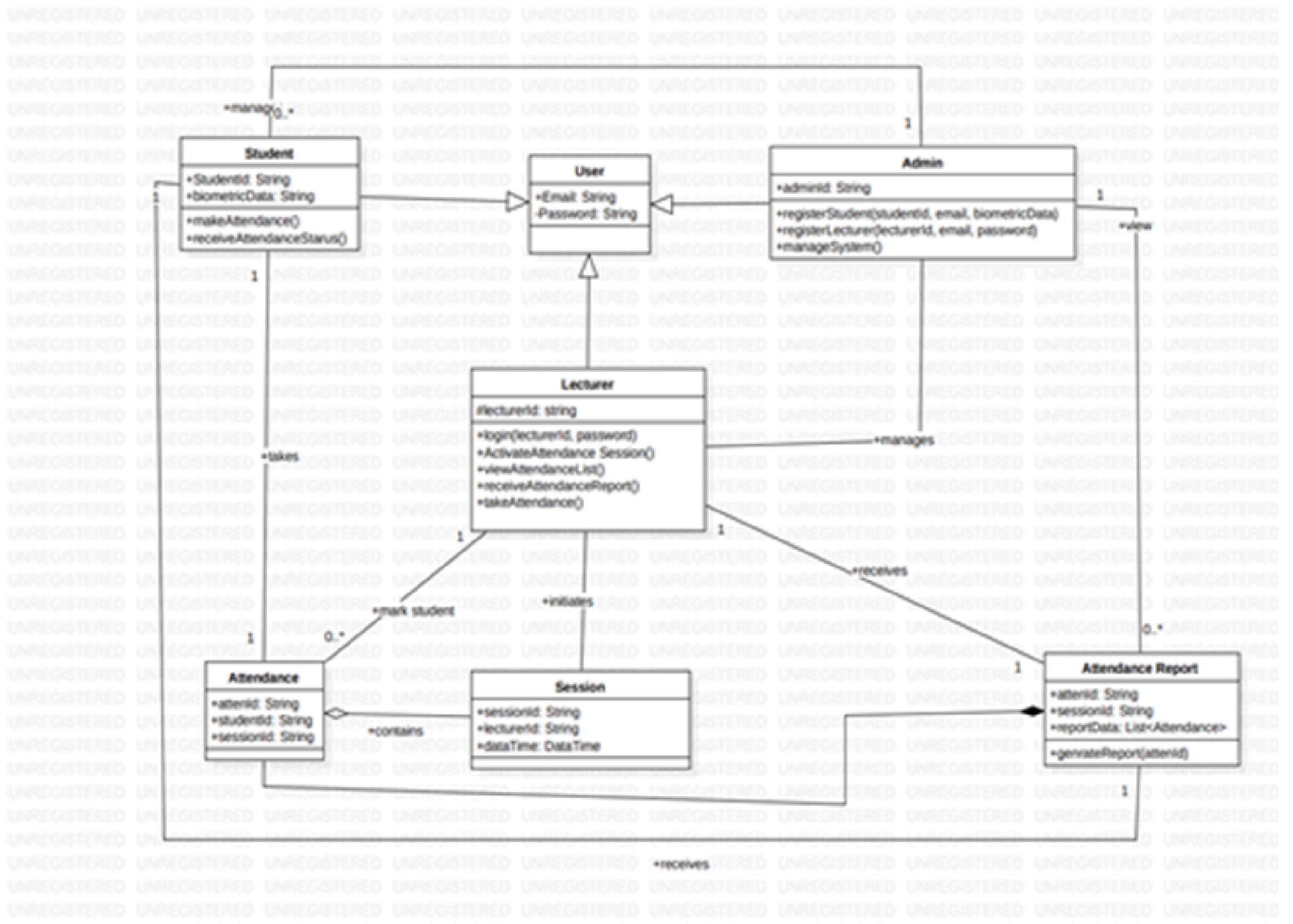
# Context Diagram



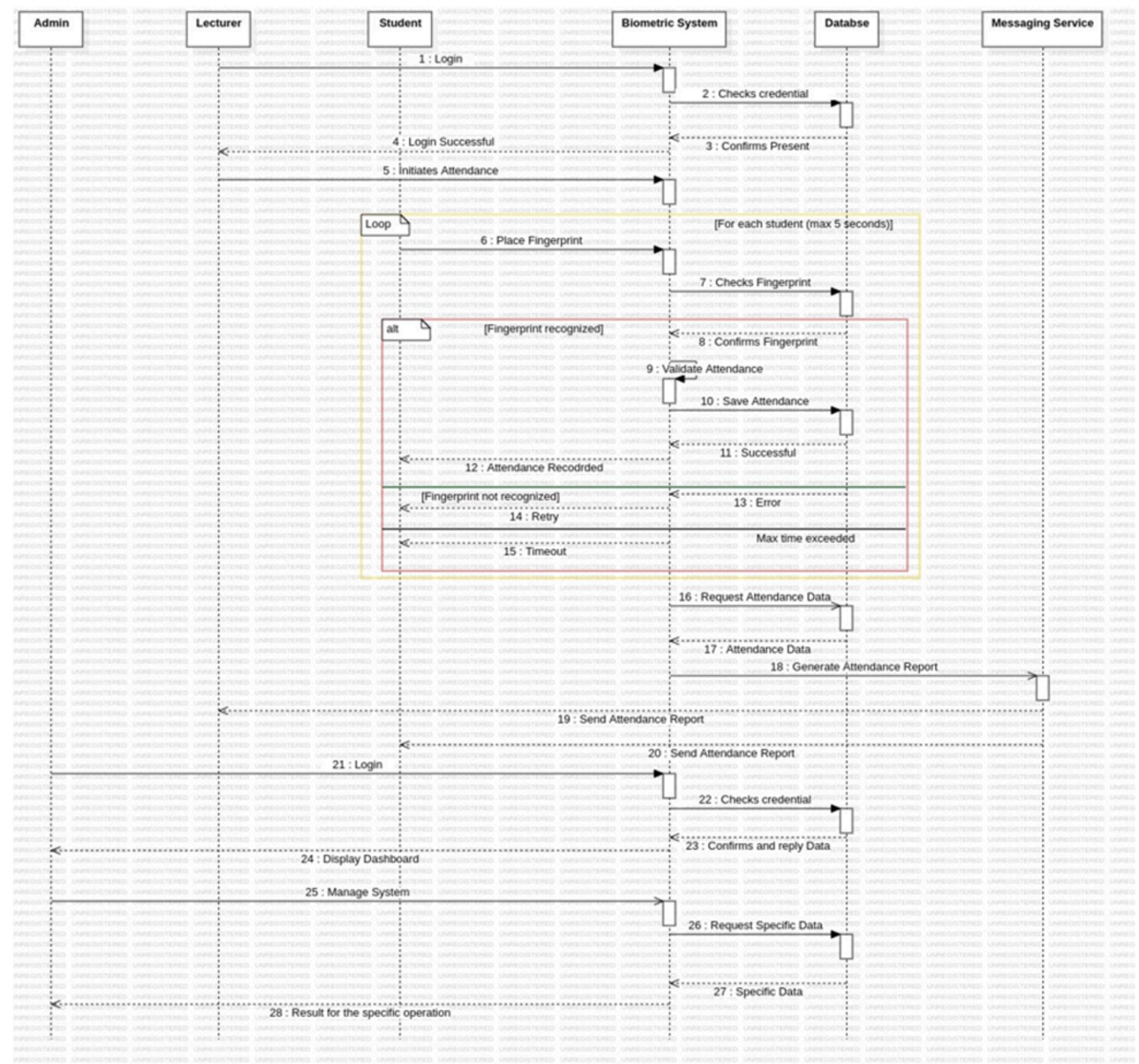
# Use Case Diagram



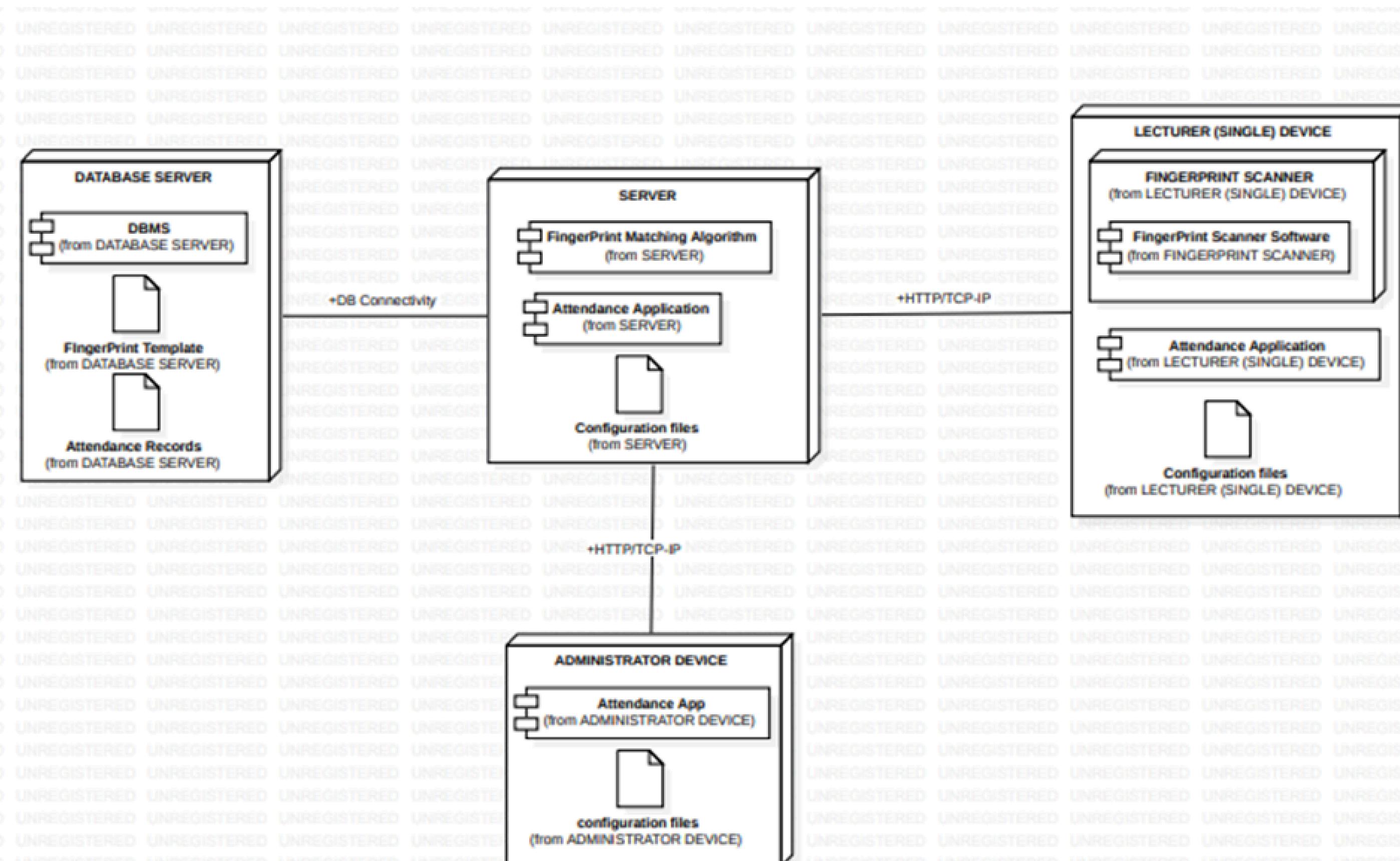
# Class Diagram



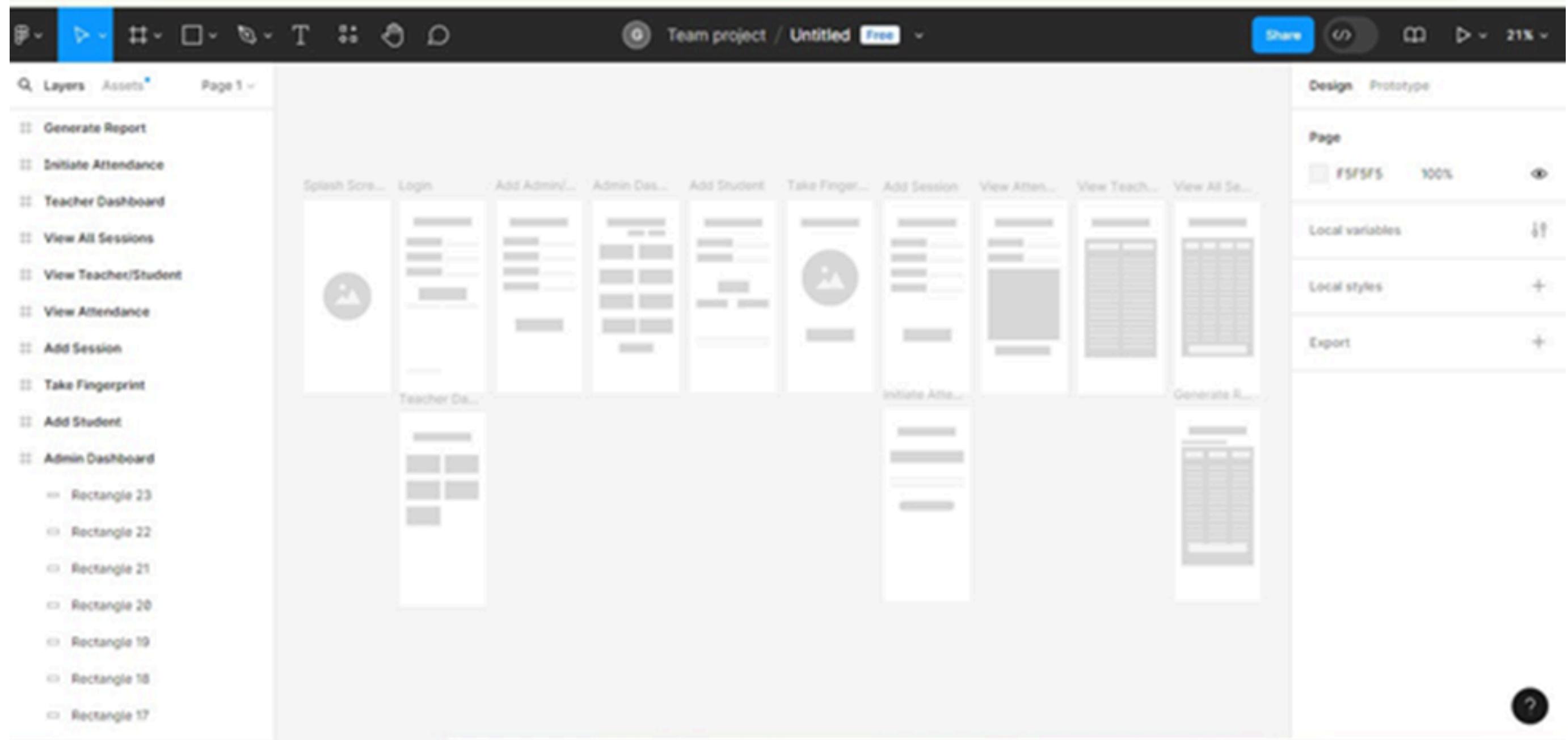
# Sequence Diagram

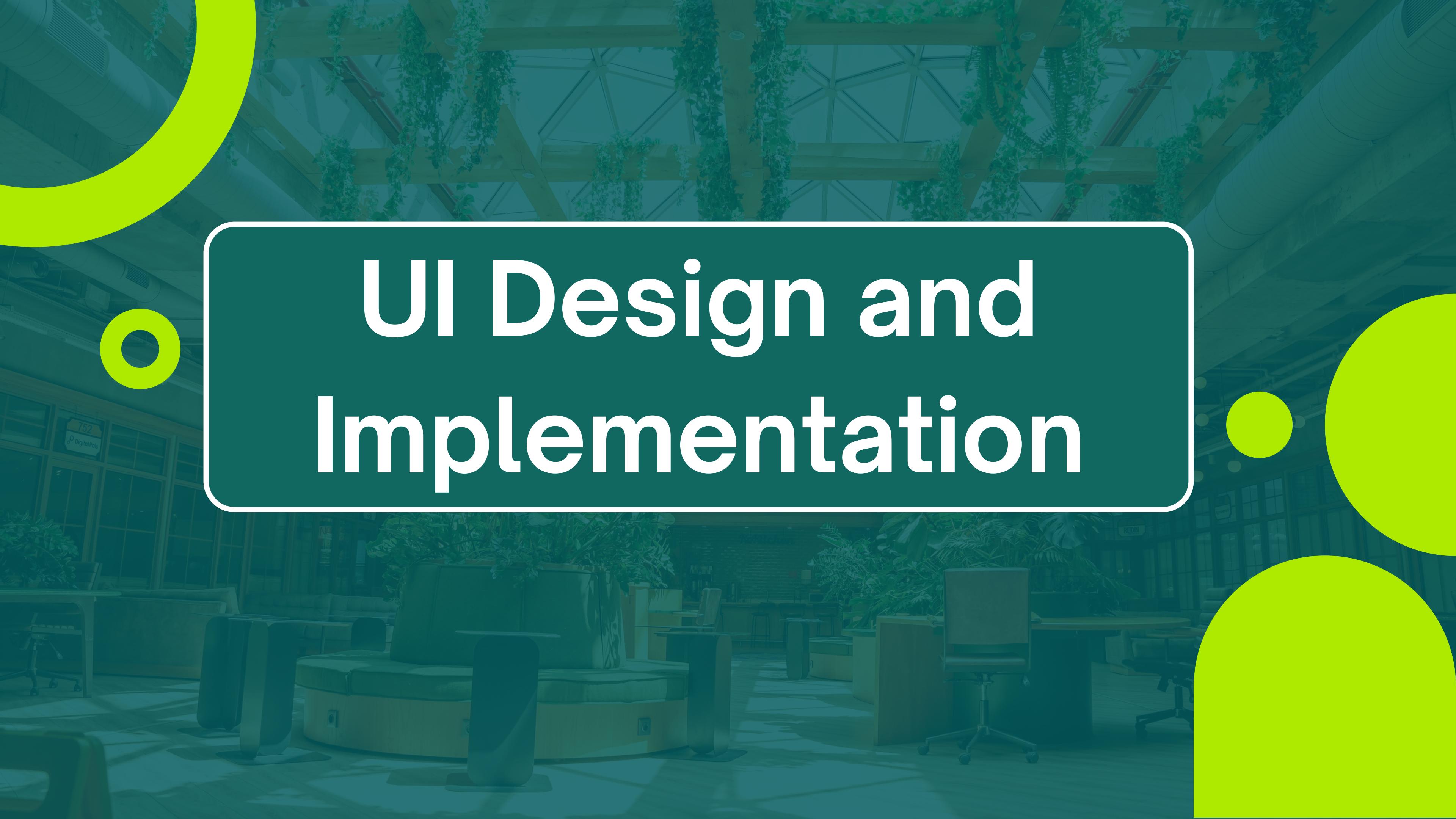


# Deployment Diagram



# Wireframe

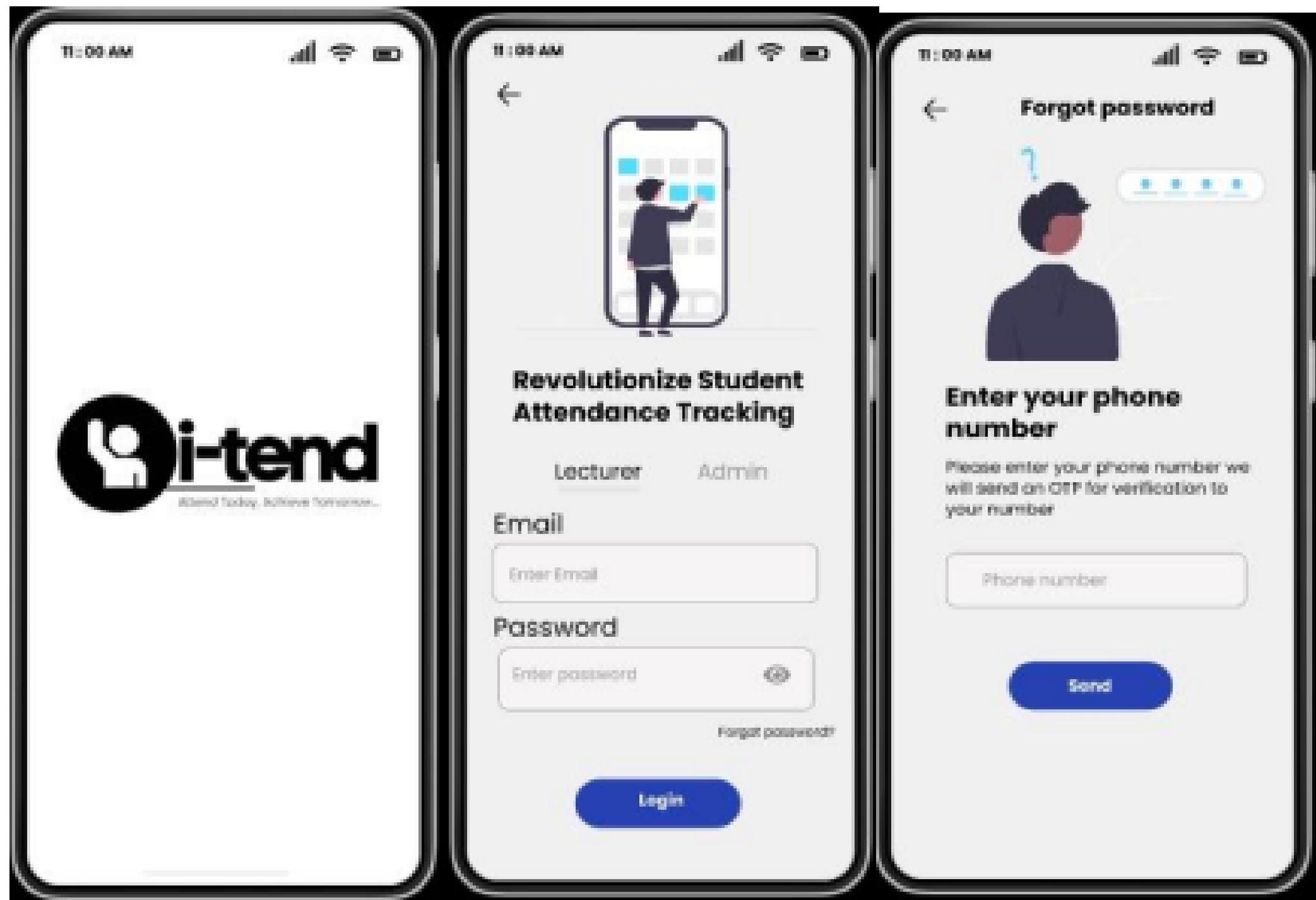




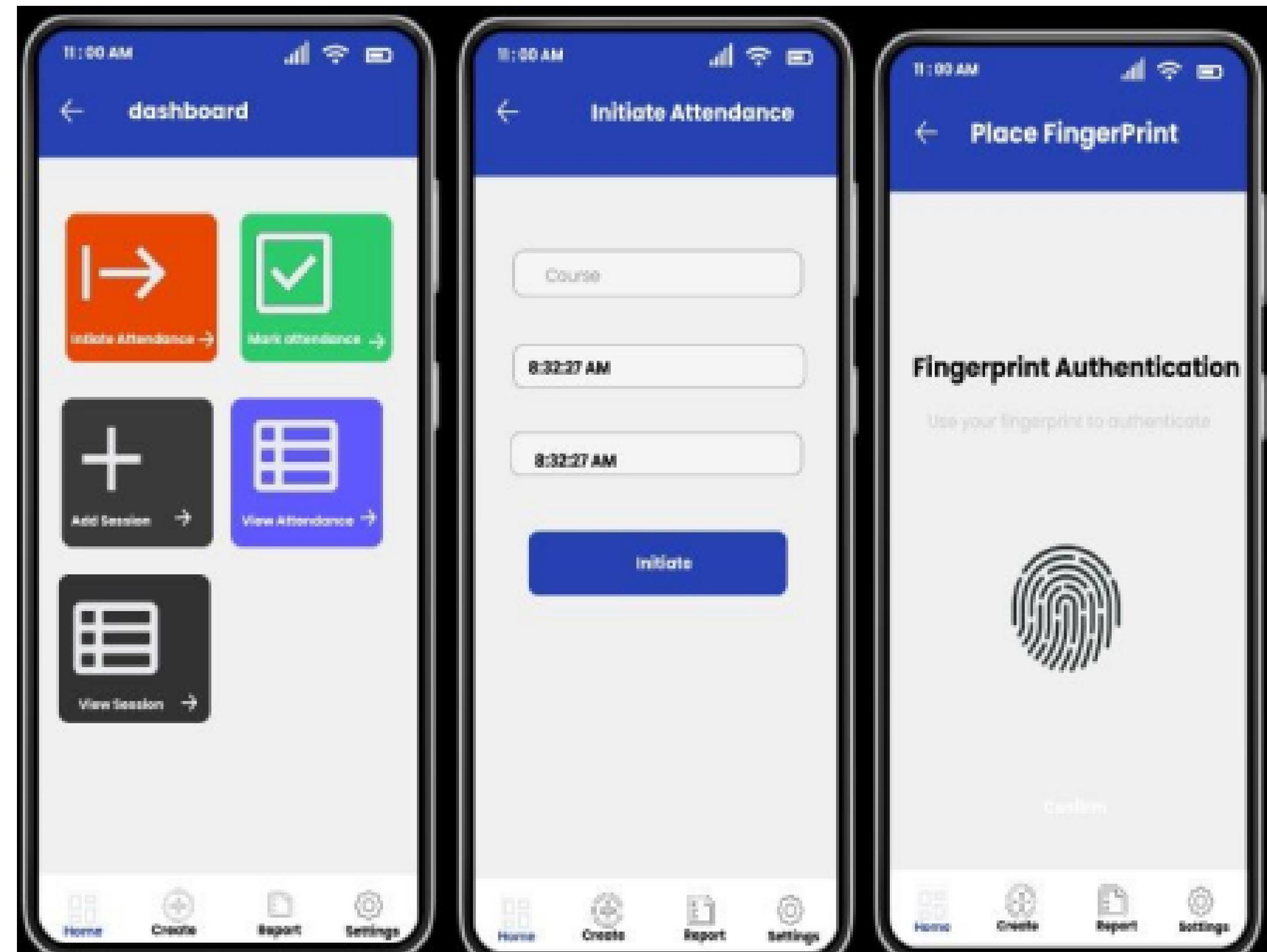
# UI Design and Implementation

# UI Design and Implementation

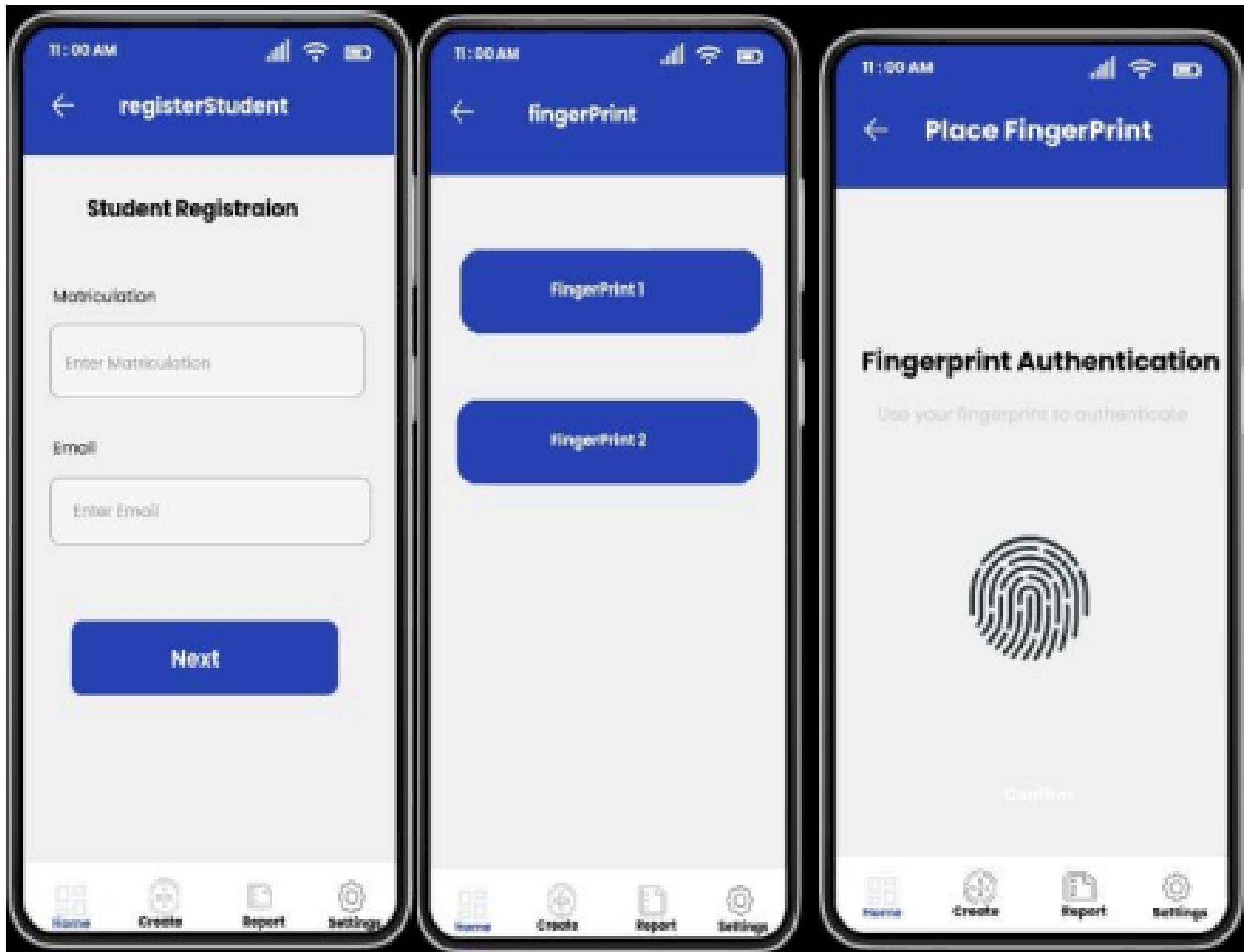
Welcome pages:



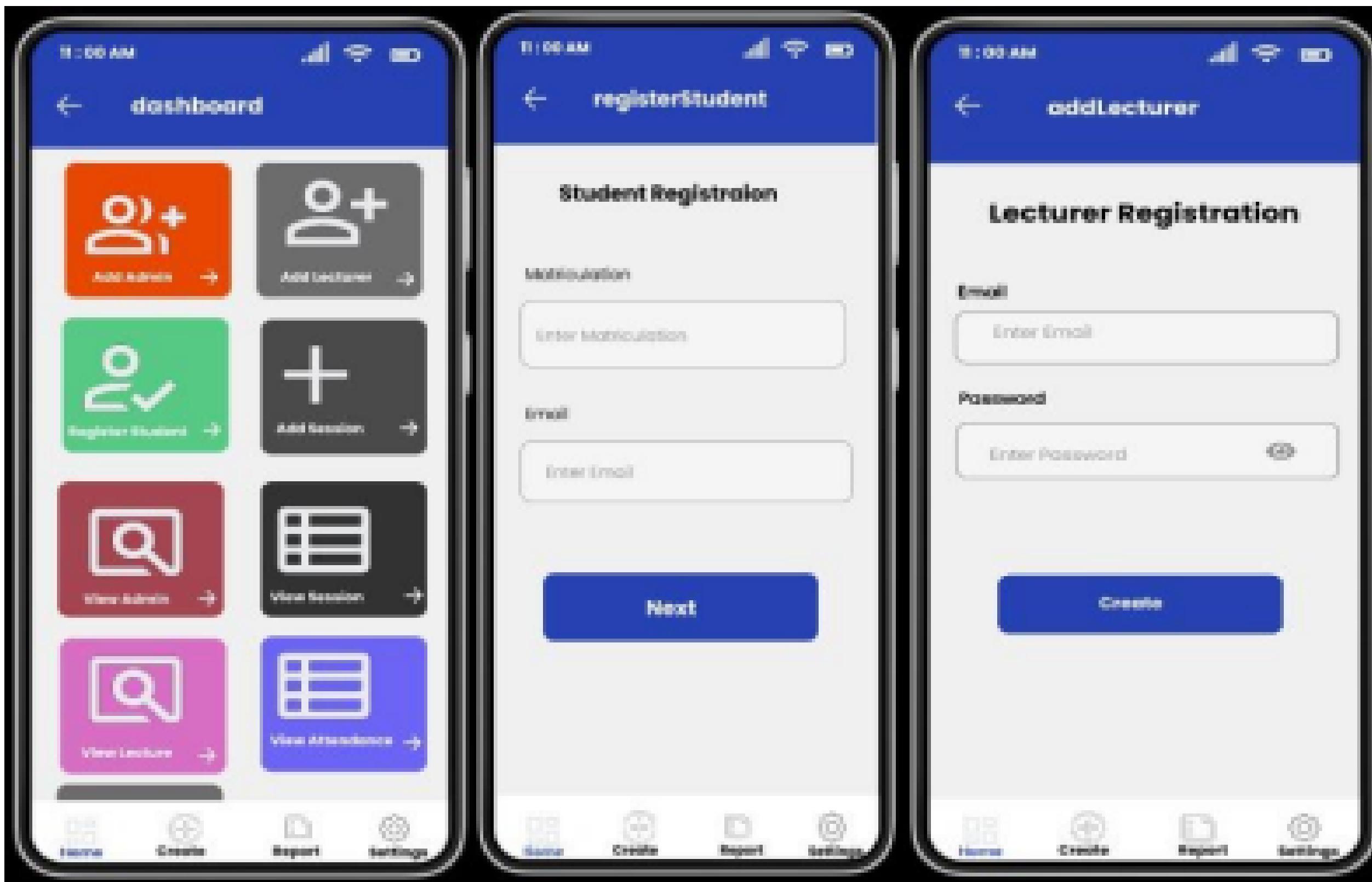
# Teacher Dashboard



# Register fingerprints

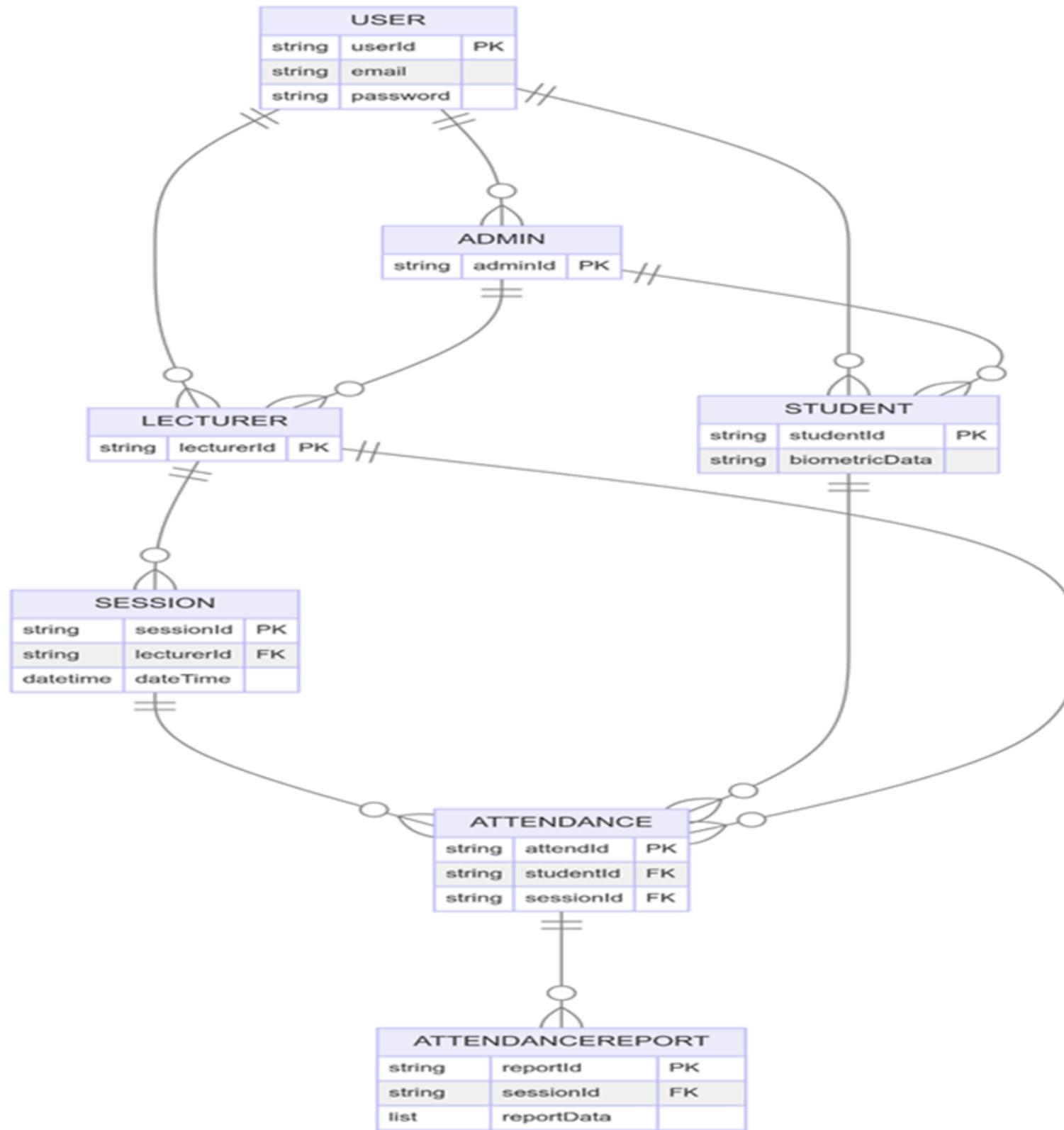


# Admin Dashboard



# Database Design and Implementation

## E-R Diagram



# Database Design and Implementation

## Firebase Database

The screenshot shows the Firebase Authentication console for a project named "Attendanc App". The left sidebar includes links for Project Overview, Generative AI, Build with Gemini, Project shortcuts, Authentication (which is selected and highlighted in blue), Firestore Database, Data Connect, What's new, App Hosting, Product categories, Build, Run, Analytics, All products, Spark (No-cost \$0/month), and Upgrade.

The main page title is "Authentication" under the "Users" tab. A prominent warning message at the top states: "Cross origin redirect sign-in on Google Chrome M115+ is no longer supported, and will stop working on June 24, 2024." Below this, there is a search bar labeled "Search by email address, phone number, or user UID" and a "Add user" button. A table lists five users with the following details:

Identifier	Providers	Created	Signed In	User UID
kemenivalery@gmail.co...	✉️	Jul 8, 2024	Jul 8, 2024	aMyOTCDerUSmrjq58cF9N8p...
lecturer2@example.com	✉️	Jul 7, 2024	Jul 7, 2024	3xVSnG111wMLkeAkJ7yZE2Z...
lecture1@example.com	✉️	Jul 6, 2024	Jul 6, 2024	80pcDHDjHLPobGkDEU9H9sG...
admin@example.com	✉️	Jul 5, 2024	Jul 8, 2024	AqRKIJF9cAPwzVHGroL9WY2...
lecturer@example.com	✉️	Jul 4, 2024	Jul 8, 2024	eDWDqmPuf8S7stZFdYZAzOz...

At the bottom of the table, there are buttons for "Rows per page" (set to 50), "1 – 5 of 5", and navigation arrows.

# Database Design and Implementation

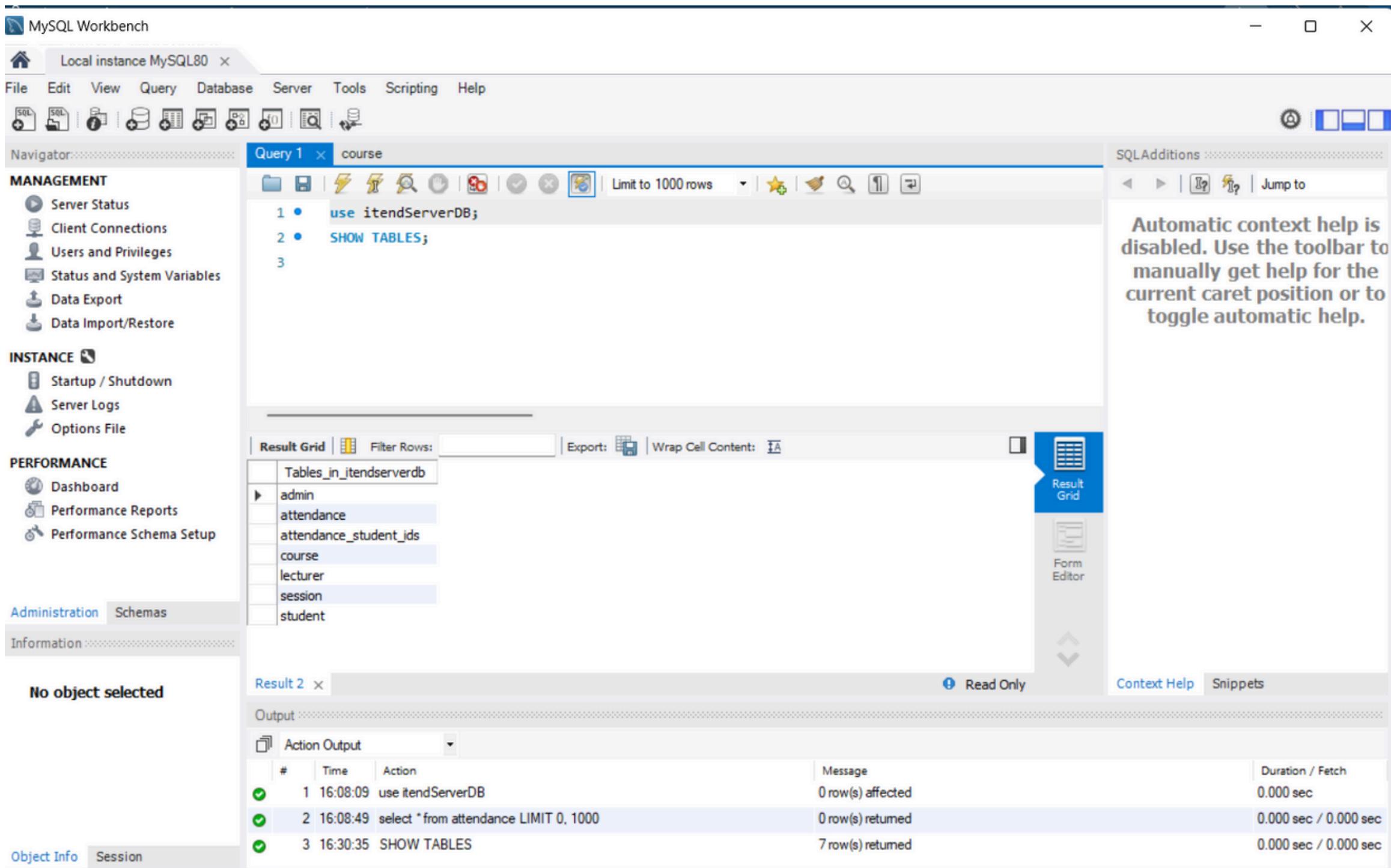
## Firebase Database

The screenshot shows the Firebase Firestore database interface. The left sidebar contains project navigation links such as Project Overview, Authentication, Firestore Database (which is selected and highlighted in blue), Data Connect, App Hosting, Product categories, Build, Run, Analytics, All products, Spark (No-cost \$0/month), and Upgrade. The main area displays the Cloud Firestore interface with tabs for Data, Rules, Indexes, Usage, and Extensions. A banner at the top right encourages protecting resources from abuse. The current view is under the 'lecturers' collection, which has two documents: 'aMyOTCDerUSmrjq58cF9N8pylVh2' and '8opcDHDjHLPobGkDEU9H9sGGU5q1'. The document 'aMyOTCDerUSmrjq58cF9N8pylVh2' is expanded, showing fields: createdBy: "AqRKIJF9cAPwzVHGroL9WY26mmH2", email: "kemenivalery@gmail.com", role: "lecturers", and uid: "aMyOTCDerUSmrjq58cF9N8pylVh2".

Path	Value	
(default)	lecturers	
+ Start collection	+ Add document	
administrators	3xVSnG111wMLkeAkJ7yZEZZDkj01	
lecturers	8opcDHDjHLPobGkDEU9H9sGGU5q1	
students	+ Start collection	
	+ Add field	
	aMyOTCDerUSmrjq58cF9N8pylVh2	createdBy: "AqRKIJF9cAPwzVHGroL9WY26mmH2"
		email: "kemenivalery@gmail.com"
		role: "lecturers"
		uid: "aMyOTCDerUSmrjq58cF9N8pylVh2"

# Database Design and Implementation

## MySQL Database



# CONCLUSION

The project aimed to design and implement a fingerprint-based biometric attendance system for the Faculty of Engineering and Technology at the University of Buea. The key findings from this project are:

- High Enrollment Success
- Accurate Verification
- User Satisfaction
- Enhanced Efficiency
- Robust Security

# DIFFICULTIES ENCOUNTERED

- User Resistance
- Data Quality
- Cost Constraint

# FURTHER WORKS

- Improved Biometric Sensors
- Multi-Biometric System
- Longitudinal Studies
- Data Analytics



THANKS FOR  
YOUR ATTENTION