FAIZ BAQIR KHAN
01-134171-023

MOHAMMAD OSAMA NASIR
01-134181-034

UNIVERSITY COMMUNICATION & NOTIFICATIONS MOBILE BASED APPLICATION

Bachelor of Science in Computer Science

Supervisor: Syed Hassan Tanvir

Department of Computer Science

Bahria University, Islamabad

Certificate

We accept the work contained in the report titled "UNIVERSITY COMMUNICATION & NOTIFICATIONS MOBILE BASED APPLICATION", written by Mohammad Osama Nasir and Faiz Baqir Khan as a confirmation to the required standard for the partial fulfilment of the degree Bachelor of Science in Computer Science.

Approved by…:

____

Supervisor – Syed Hassan Tanvir

____

Internal Examiner

____

External Examiner

____

Project Coordinator – Ms. Zubaria Inayat

____

Head of the Department – Dr. Muhammad Muzammal

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MOHAMMAD OSAMA NASIR

FAIZ BAQIR KHAN

Dated: May 24, 2021

Abstract

The rapid advancement in technology in today's world has enhanced the need of staying informed. Information has become one of the most expedient and essential matters. The matter becomes of more importance when it comes to education. Keeping in mind, the recent and ongoing pandemic situation, it is undeniable that staying digitally informed is the need of time.

We have observed that students have to put in a lot of manual effort to stay up to date in regard to their day-to-day educational tasks. To assist fellow students across Pakistan and beyond, we present this mobile application which would bring together, all the vital pieces in a student's university education path, which otherwise, are scattered across numerous platforms.

The goal also is to make the usability and interactional capabilities of this application up to the mark and in competition with today's advanced software. To achieve this goal, we have spent days in research and gathered all the necessary data to make this project a success. We have also adopted the latest techniques to design and implement this application for maximum performance and optimization.

Abbreviations

- CMS – Content Management System
- LMS – Learning Management System
- UI – User Interface
- UX – User Experience
- SA – Student Advisor

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1. Introduction

1.1. Introduction:

Modern technology plays a vital role in providing useful information which is easy to access. With the unexpected evolutionary growth of internet, numerous educational applications supported by many digital technologies have caused an explosion of interactivity among students, teachers, and the institute management.

Applications like Google Classroom, Piazza, Edmodo and Remind have changed the mode of classroom communication in today's world and it has now become a need that students and teachers have all the important information with them on the go.

Mobile phones are the most frequently used devices and to keep up with today's technology, each institute and business is coming up with well-designed, user-friendly mobile applications for their software.

To analyze the student response to having a mobile app for university notifications and communication, a survey was conducted within the Computer Science (CS) department of Bahria University, where more than 90% of the results were in favor and demanded an institutional based mobile application of its own. This application will provide a platform for both, students, and instructors, where they can interact and stay up to date regarding the important semester tasks along with other services like communication and analytics which the previous applications were lacking.

1.2. Problem Statement:

One of the most major issues is that communication among students, teachers, and the university management is not possible in the existing system. The law-and-order situation in our country in unpredictable and it gets hard to keep students notified regarding change in the academic calendar. Moreover, there is no defined mode for communication which students can use to communicate with their instructors or even among themselves. Using applications like WhatsApp or Facebook is not a suitable alternative because that breaches the privacy of teachers and students.

The SARS-CoV-2 Pandemic hit the globe in the end of 2019 halting the daily lives of people all over the globe. Strict lockdowns have been imposed by almost every country. The Education sector has evolved accordingly with the situation. Many universities and schools have adopted digital ways to provide education, but the use of multiple platforms is a major issue.

In the existing system, important student information is scattered across various platforms. Students need the CMS to keep a check on their attendance summary, exam schedule, semester fee records and quality assurance surveys. They need the LMS to stay up to date regarding quizzes, assignments, and lecture notes. Piazza, Turnitin and Google Classrooms are also used for assignment/lab journal submissions and course notifications. Most notifications regarding holidays or semester fee reminders are sent via email or SMS and some notifications are published on the university website. It becomes harder for students to keep track of all the important notifications with an increasing number of platforms being used.

The lack of the ability to stay notified regarding quizzes, assignments, and class tasks, is also a huge problem for students. Many students miss their quizzes and assignments because there is no system to notify them about it. It affects their grades and overall CGPA. Similarly, students do not complete their CSP hours in many cases, due to lack of notification. In some cases, students even lose their chance of getting gold medals just because of this issue.

Mobile phones are the most widely used devices in today’s world. According to a study in August 2020 by Pakistan Telecommunication Authority (PTA), the number of cellular subscribers is 169 million, basic telephony subscribers is 3 million, 3G and 4G subscribers is 85 million[1]. With increased number of mobile users, many institutes have developed user-friendly mobile applications. In Pakistan, however, the number of user-friendly mobile applications for institutions is lacking and we need more mobile applications which focus on the need of the students and teachers as well as the design and quality of the mobile application.

1.3. Objective:

To create a multi-platform mobile application which serves the needs of students and instructors by providing CMS, LMS, communication and notifications features in a user-friendly manner by utilizing the best UI/UX practices in the industry.

- Provide a unified platform which should cater all problems stated in the problem statement:
    - Unified platform for all activities
    - Notification system so that students do not miss any quiz or assignment, and they stay informed regarding any upcoming event
    - Attendance management so that faculty can mark, and students can view their attendance on their mobile phones
    - Messaging system so that faculty and students can have an official communication platform
    - CSP hours and internship management so that students can complete their pending CSP hours and internship tasks on time
- Platform where students and teachers can interact with each other
- Provide a user-friendly mobile application which focuses on UI and UX to maintain quality

1.4. Project Scope:

1. Scope Description:

The project is to provide universities with a platform where communication will be made possible without sharing any personal information like phone number, in form of a mobile application. The theme of this application is to allow communication among:

- Students
- Teachers
- Student Advisor

The project aims to deliver a Multi-platform mobile app with a single code-base able to run on both iOS and Android machines. University Communication and Notification

Mobile based application is a Multiplatform CMS and LMS build on sound UI/UX principals.

1.5. Solution Application Areas:

This project is a hands-on mobile application which will benefit students and faculty alike. The application can be used to keep track of the academic calendar, to get notified of the due tasks and assignments, analysis of student progress and grades, communication between faculty and students. With reference to the above-mentioned scope and benefits, this project can be deployed in all the educational sectors and can be used effectively by the students to benefit themselves.

The revolution in digital technology in today's world is at its peak and it is very important for our educational institutions to keep up with this rapid change. Every student and teacher uses a smartphone in today's world, so having a mobile application for communication and information is quite essential. It is hard to keep track of information scattered across numerous platforms which is why a single application should be available for keeping track of all important updates.

Therefore, the proposed system includes the all-in-one mobile app for assisting teachers and students for sharing all important information on the go, using one mobile app. Teachers and students will stay up to date regarding university events and students will have the ability to submit their assignments as well as quizzes on the application.

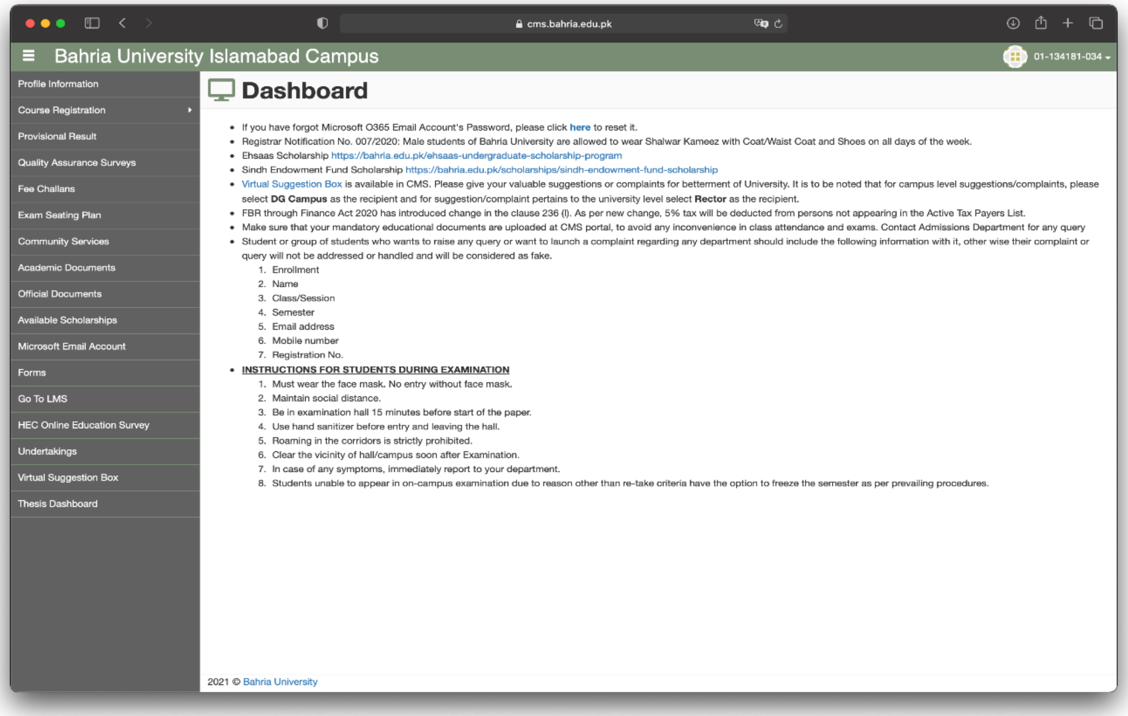
2. Literature Review

2.1. Existing Research

It is significant to understand and recognize the information about existing systems to provide a better system compared to already available systems. This is quite helpful to trace a gap between already available systems and the proposed system. For this project, we have thoroughly analyzed multiple existing solutions and have concluded that there is no application on the market that successfully satisfies the scope of the proposed system.

2.2. Existing Systems

1. BU CMS & LMS



Dashboard

- If you have forgot Microsoft O365 Email Account's Password, please click **here** to reset it.
- Registrar Notification No. 007/2020: Male students of Bahria University are allowed to wear Shalwar Kameez with Coat/Waist Coat and Shoes on all days of the week.
- Ehsaas Scholarship https://bahria.edu.pk/ehsaas-undergraduate-scholarship-program
- Sindh Endowment Fund Scholarship https://bahria.edu.pk/scholarships/sindh-endowment-fund-scholarship
- Virtual Suggestion Box is available in CMS. Please give your valuable suggestions or complaints for betterment of University. It is to be noted that for campus level suggestions/complaints, please select **DG Campus** as the recipient and for suggestion/complaint pertains to the university level select **Rector** as the recipient.
- FBR through Finance Act 2020 has introduced change in the clause 236 (I). As per new change, 5% tax will be deducted from persons not appearing in the Active Tax Payers List.
- Make sure that your mandatory educational documents are uploaded at CMS portal, to avoid any inconvenience in class attendance and exams. Contact Admissions Department for any query
- Student or group of students who wants to raise any query or want to launch a complaint regarding any department should include the following information with it, other wise their complaint or query will not be addressed or handled and will be considered as fake.
  1. Enrollment
  2. Name
  3. Class/Session
  4. Semester
  5. Email address
  6. Mobile number
  7. Registration No.
- **INSTRUCTIONS FOR STUDENTS DURING EXAMINATION**
  1. Must wear the face mask. No entry without face mask.
  2. Maintain social distance.
  3. Be in examination hall 15 minutes before start of the paper.
  4. Use hand sanitizer before entry and leaving the hall.
  5. Roaming in the corridors is strictly prohibited.
  6. Clear the vicinity of hall/campus soon after Examination.
  7. In case of any symptoms, immediately report to your department.
  8. Students unable to appear in on-campus examination due to reason other than re-take criteria have the option to freeze the semester as per prevailing procedures.

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Figure 2.1 BU CMS Desktop

The current CMS in use at Bahria University is a web-based application which provides the following features:

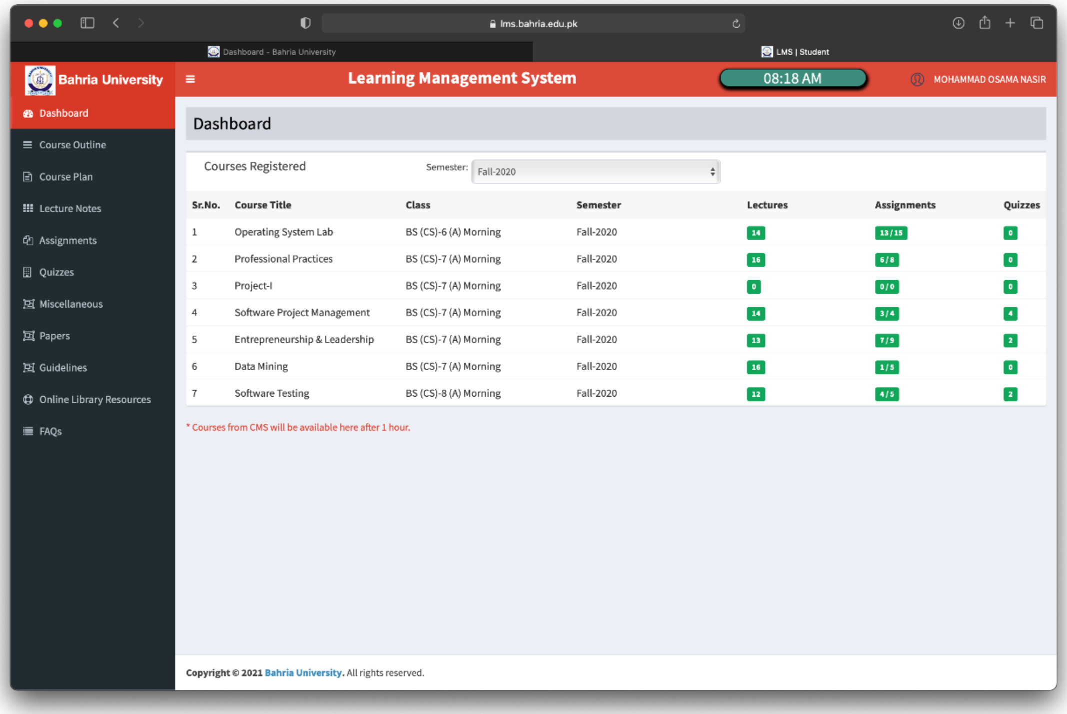
- Attendance system
- Course registration system
- Examination slip system
- QA survey system

The application can be accessed on browsers only, and it further links to the LMS web-based application.

The LMS is a recently launched application which provides a platform where teachers and students can work on assignments, quizzes, and lecture notes. LMS comes with the following features:

- Assignment management system
- Quiz management system
- Lecture notes sharing system

The CMS is built on ASP.net and the LMS is built on PHP.



Dashboard

Courses Registered

Semester: Fall-2020

Sr.No.	Course Title	Class	Semester	Lectures	Assignments	Quizzes
1	Operating System Lab	BS (CS)-6 (A) Morning	Fall-2020	14	13 / 15	0
2	Professional Practices	BS (CS)-7 (A) Morning	Fall-2020	16	6 / 8	0
3	Project-I	BS (CS)-7 (A) Morning	Fall-2020	0	0 / 0	0
4	Software Project Management	BS (CS)-7 (A) Morning	Fall-2020	14	3 / 4	4
5	Entrepreneurship & Leadership	BS (CS)-7 (A) Morning	Fall-2020	13	7 / 9	2
6	Data Mining	BS (CS)-7 (A) Morning	Fall-2020	16	1 / 5	0
7	Software Testing	BS (CS)-8 (A) Morning	Fall-2020	12	4 / 5	2

* Courses from CMS will be available here after 1 hour.

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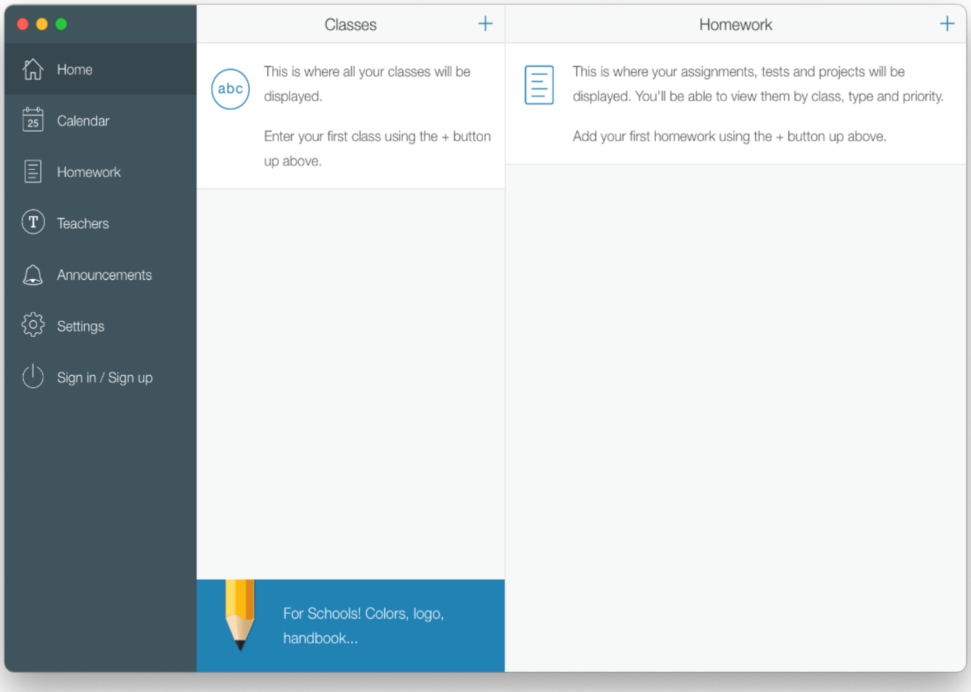
Figure 2.2 LMS Dashboard

Both the LMS and CMS are only accessible on browsers and do not have a desktop or mobile application. The system is not designed for mobile and has UI/UX issues when accessed from a phone. The systems do not offer communication methods between students and teachers. The feature to notify students or teachers is also not a part of the offered features yet. Teachers cannot inform students about upcoming quizzes and assignments.

2. myHomework App

myHomework is a third party app that allows its users to keep up with their academic calendar, get notified for upcoming assignments/homework, receive announcements. It does not allow for any sort of communication nor can student view attendance or see their course and semester statistics.



This is where all your classes will be displayed.

Enter your first class using the + button up above.

This is where your assignments, tests and projects will be displayed. You'll be able to view them by class, type and priority.

Add your first homework using the + button up above.

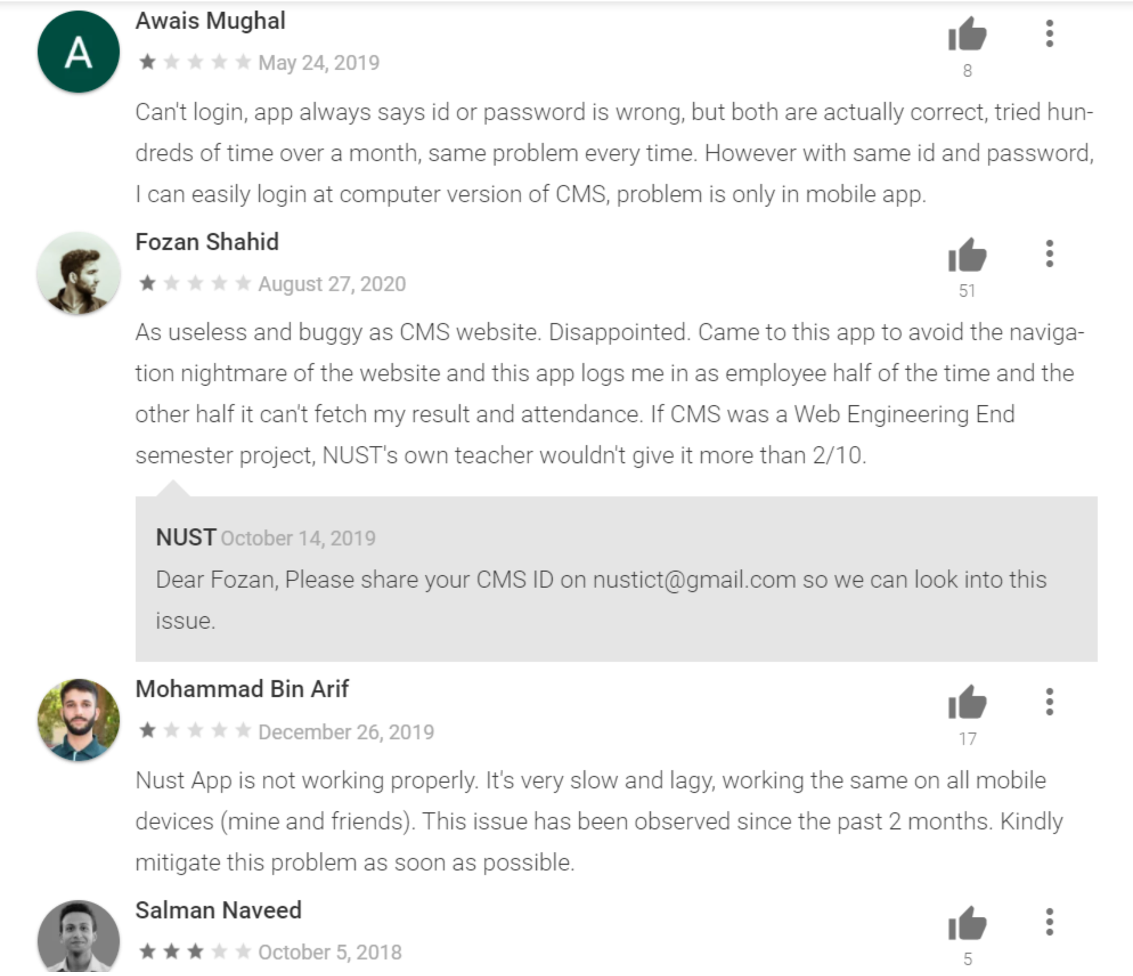
For Schools! Colors, logo, handbook...

Figure 2.3 myHomework App Home

3. NUST (Official)

NUST (Official) mobile app is specifically made for students of NUST University. It allows student to view their stats, attendance and get notified of university activities. It does not allow for any communication via the app, nor does it notify students of their upcoming assignments and tasks.

"As useless and buggy as CMS website. Disappointed. Came to this app to avoid the navigation nightmare of the website and this app logs me in as employee half of the time and the other half it can't fetch my result and attendance. If CMS was a Web Engineering End semester project, NUST's own teacher wouldn't give it more than 2/10." - Fouzan Shahid, Google Playstore.[2]



Awais Mughal

★☆☆☆☆ May 24, 2019

8

Can't login, app always says id or password is wrong, but both are actually correct, tried hundreds of time over a month, same problem every time. However with same id and password, I can easily login at computer version of CMS, problem is only in mobile app.

Fozan Shahid

★☆☆☆☆ August 27, 2020

51

As useless and buggy as CMS website. Disappointed. Came to this app to avoid the navigation nightmare of the website and this app logs me in as employee half of the time and the other half it can't fetch my result and attendance. If CMS was a Web Engineering End semester project, NUST's own teacher wouldn't give it more than 2/10.

> **NUST** October 14, 2019
>
> Dear Fozan, Please share your CMS ID on nustict@gmail.com so we can look into this issue.

Mohammad Bin Arif

★☆☆☆☆ December 26, 2019

17

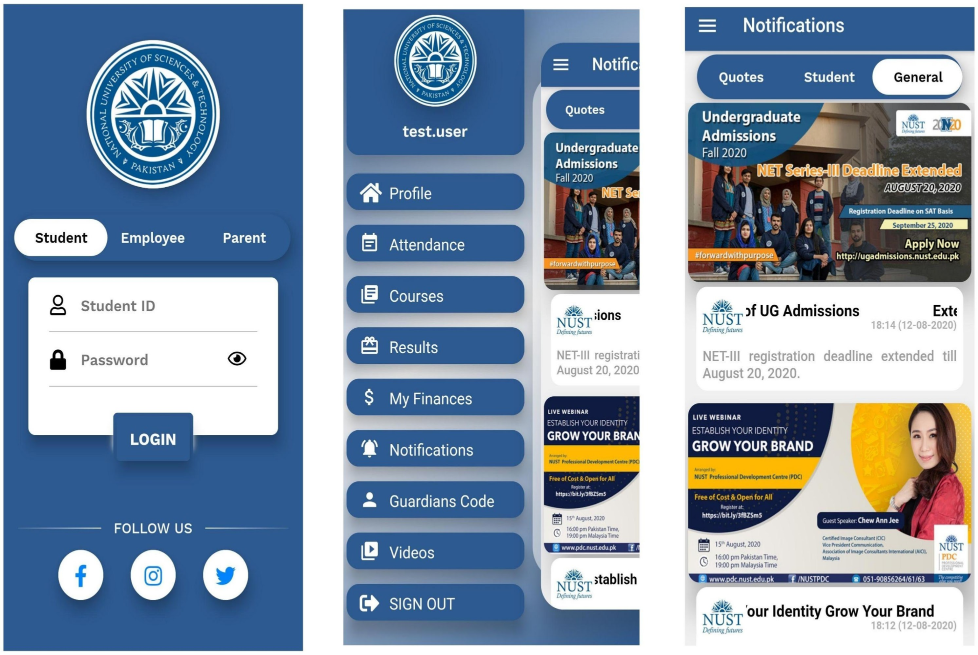
Nust App is not working properly. It's very slow and lagy, working the same on all mobile devices (mine and friends). This issue has been observed since the past 2 months. Kindly mitigate this problem as soon as possible.

Salman Naveed

★★★☆☆ October 5, 2018

5

Figure 2.4 Nust Official App Reviews on Playstore



of UG Admissions Exte
18:14 (12-08-2020)
NET-III registration deadline extended till August 20, 2020.

our Identity Grow Your Brand
18:12 (12-08-2020)

Figure 2.5 NUST Official

Feature	BU CMS	BU LMS	myHomework	NUST Official	Proposed Application
Mobile Based Application	✗	✗	✓	✓	✓
Attendance Management	✓	✗	✗	✓	✓
Course Management	✓	✓	✓	✓	✓
Notification System	✗	✗	✓	✓	✓

Messaging	✗	✗	✗	✗	✓
File Sharing	✗	✓	✓	✗	✓
Assignment Management	✗	✓	✓	✗	✓
Quiz Management	✗	✓	✓	✗	✓
CSP Hours Management	✗	✗	✗	✗	✓

Table 2.1 Comparison of existing systems

2.3. Importance of Mobile-First Design

During the last decade, mobile phones have become an integral part of our lives. More people browse the web on mobile phones than on desktop devices and this trend will keep on increasing therefore it is crucial that apps and websites are designed for the mobile user. Providing good mobile experience will result in more user engagement, more traffic and in the end more profit. Web Apps that are not designed with the mobile user in mind tend to fail often.

One of the major elements in mobile first design is simplicity. Keeping the application as simple as possible gives the best user experience. This does not mean the extra functionality isn't necessary, but it is where we must consider how the user is searching and what their purpose may be. For example, a desktop user may be looking for more in-depth information and expecting full-size imagery and more whitespace whereas the mobile user just wants to be able to find the answer quickly.

2.4. Value of UI / UX in Mobile Applications

Mobile users prefer quick and easy to navigate applications that can solve their problems with fewer interactions and touch instead of tacky applications that provide a lot of useless features therefore it is crucial that the UI is designed in such a way that it considers the users' needs first and foremost. This will enhance the UX of the application as all the users' needs are being met with minimal lag or disturbance. Applications that fail to keep UI/UX principles in mind fail to attract users and keep them long-term.

3. Requirements Specifications

3.1. Existing System:

For requirements specification, we used the existing system in Bahria University for research purpose only. The existing system being used in Bahria university, uses different applications for different tasks. CMS is primarily focused on course view and attendance while LMS is focused on assignment/quiz submission. Communication is done using MS Teams or WhatsApp groups. Important Notifications are only available on the university website or sent via email and SMS messages. To get any information regarding CSP hours and internship, the students need to physically visit the Student Advisor or the SRC office.

Existing system has information divided in numerous platforms and it does not provide an efficient way to handle communication and information sharing. Hence, it is necessary to have a mobile application which can cater this issue and provide a unified platform to students and faculty of universities.

3.2. Proposed System:

The proposed system comes with all the features within one application while keeping privacy intact. The mobile application is proposed to be designed with the latest technologies and focuses on the UI/UX aspect which will improve the user experience and provide a user-friendly interface for its users. The system will keep the teachers, students, and student advisors in communication, and it will focus on features like attendance, quiz/assignment submission and notification handling.

3.3.Functional Requirements:

1. Registration & Login

FRR01	Super admin should be allowed to register Student Advisor
FRR02	Student Advisor should be able to register Student and Teacher
FRL01	User should be able to log in using a valid ID and Password
FRL02	User should be able to see an error message alert when wrong ID or password is entered
FRL03	User should see a forget password button on the login screen to reset password by entering their ID

Table 3.1 Registration & Login Functional Requirements

2. Attendance

FRA01	Student Advisor should be able to create Attendance Schedule
FRA02	Teacher should be able to mark attendance scheduled by Student Advisor
FRA03	Teacher and Student should be able to view marked attendance

Table 3.2 Attendance Functional Requirements

3. Courses

FRC01	Student Advisor should be able to create course, assign a teacher and register students to it
FRC02	Teacher should be able to view assigned courses
FRC03	Student should be able to view registered courses

Table 3.3 Course Functional Requirements

4. Assignments & Quizzes

FRAS01	Teacher should be able to upload assignment file, set a deadline for assignment submission and select the course for the assignment
FRAS02	Student in that course should be able to view the assignment file and submission deadline. Student should be able to submit the assignment before the deadline is passed
FRAS03	Teacher should be able to extend the deadline for an assignment
FRAS04	Teacher should be able to view the file submitted by student for the assignment
FRQ01	Teacher should be able to upload a quiz file, set the deadline for quiz submission and select the course for the quiz
FRQ02	Student in that course should be able to view the quiz file and submission deadline. Student should be able to submit the quiz before deadline is passed
FRQ03	Teacher should be able to extend the deadline for a quiz
FRQ04	Teacher should be able to view the file submitted for the quiz by the student

Table 3.4 Assignment & Quiz Functional Requirements

5. Messaging

FRM01	All users should be able to send message to other users
FRM02	User should be able to receive and view a message sent to them

Table 3.5 Messaging Functional Requirements

6. File Sharing

FRF01	User should be able to send and receive files using the messages option
FRF02	Teacher should be able to upload lecture to the course
FRF03	Student should be able to download lecture uploaded for the course by teacher

Table 3.6 File Sharing Functional Requirements

7. Notifications

FRN01	Student Advisor and Teacher should be able to create and send notification to all other users
FRN02	All users should be able to receive and view notifications sent to them

Table 3.7 Notification Functional Requirements

8. CSP Hours

FRCSP01	Student Advisor should be able to view and update a Student’s CSP Hours
FRCSP02	Student should be able to view their CSP Hours in the application when they are logged in

Table 3.8 CSP Hours Functional Requirements

3.4.Non-Functional Requirements:

1. Performance:

The performance of the application will be evaluated by its response time for the given task. For example, whenever a user launches the application, it should show the initial screen within 3 seconds.

2. Responsiveness:

Application should be responsive to any activity by user or other external interruption, and it should return to the same state after the interruption. For example, if a user gets a phone call while using the application, the application should save state and resume from there once the call ends.

3. Security:

All the application data should be encrypted and secure. The data should be protected from internals and external attacks. For example, the authentication token should be stored on local device for comparison purpose, and it should be accessible with user’s permission.

4. Usability:

The system’s user interface should be user-friendly, and the system should be easy-to-use. The user should be able to understand the flow of the application without any help or guideline.

5. Scalability:

The system should be able to handle increased amount of usage and should be able to handle large data as the time progresses. For example, when the user data is increased (cache, stored data, etc.), the application should handle it without any delay and the storage of the data should be optimized.

3.5. Use Cases:

Use case can be defined as a set of activities and operations which is created to define the interaction between any actor in the system and the system itself, to achieve a specific goal. In our system, we have written the use cases to cover all aspects and functionalities of the system.

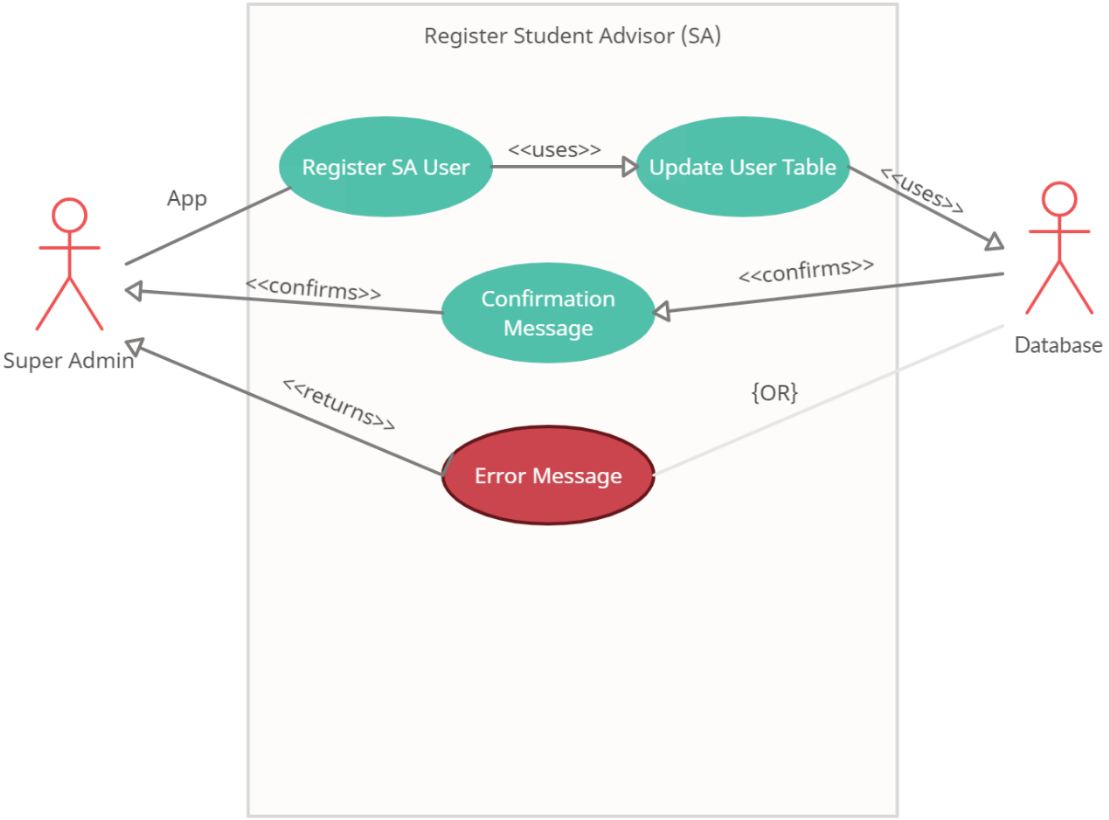


Figure 3.1 Student Advisor Registration Use Case Diagram

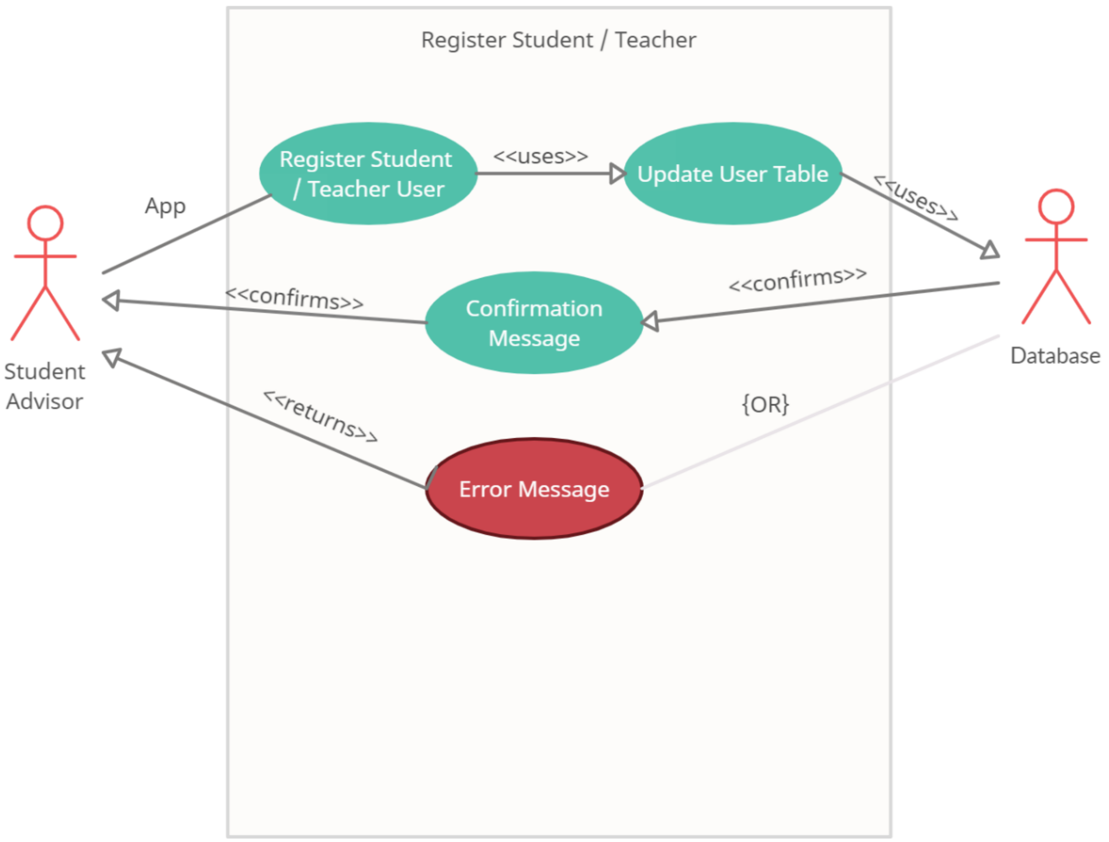


Figure 3.2 Student / Teacher Registration Use Case Diagram

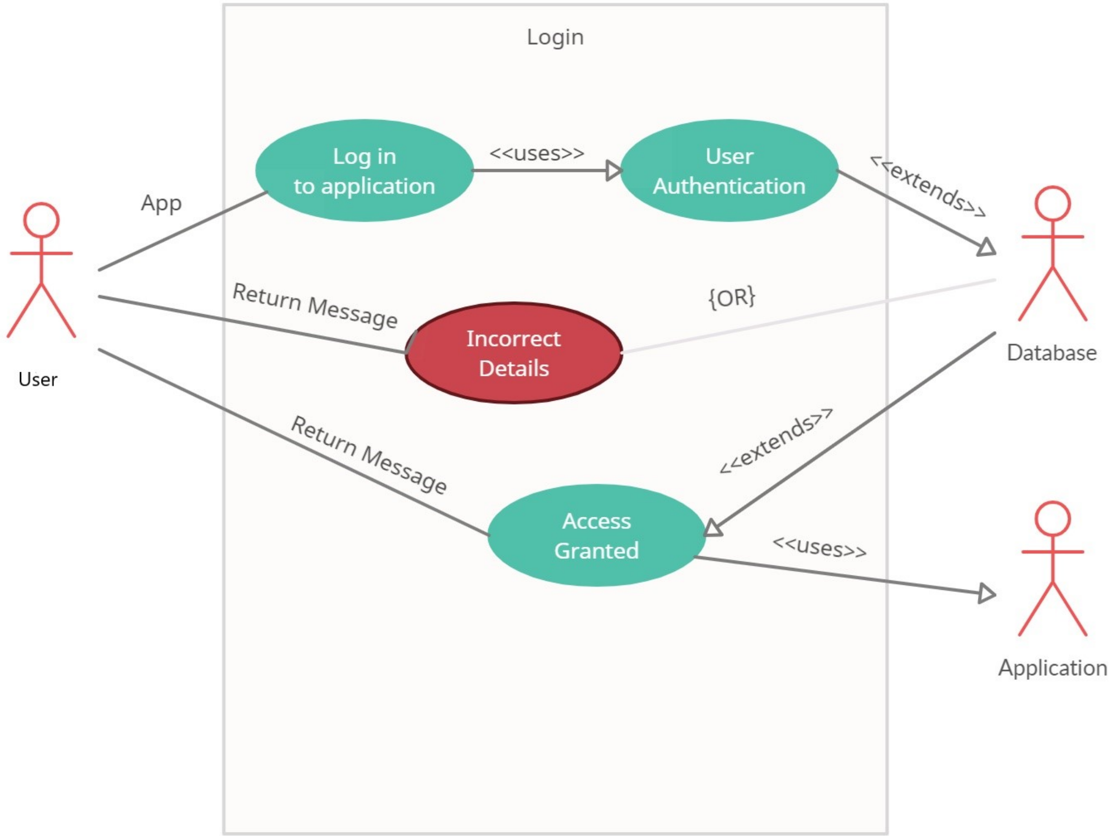


Figure 3.3 Login Use Case Diagram

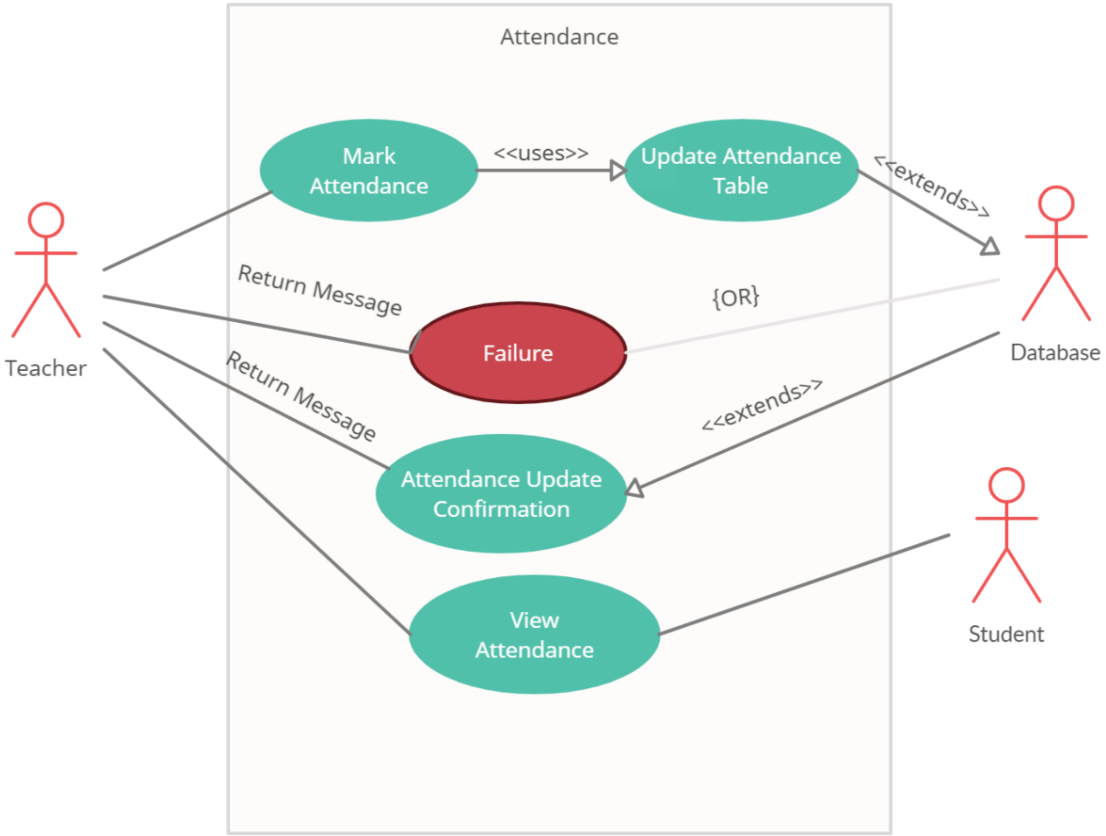


Figure 3.4 Attendance Use Case Diagram

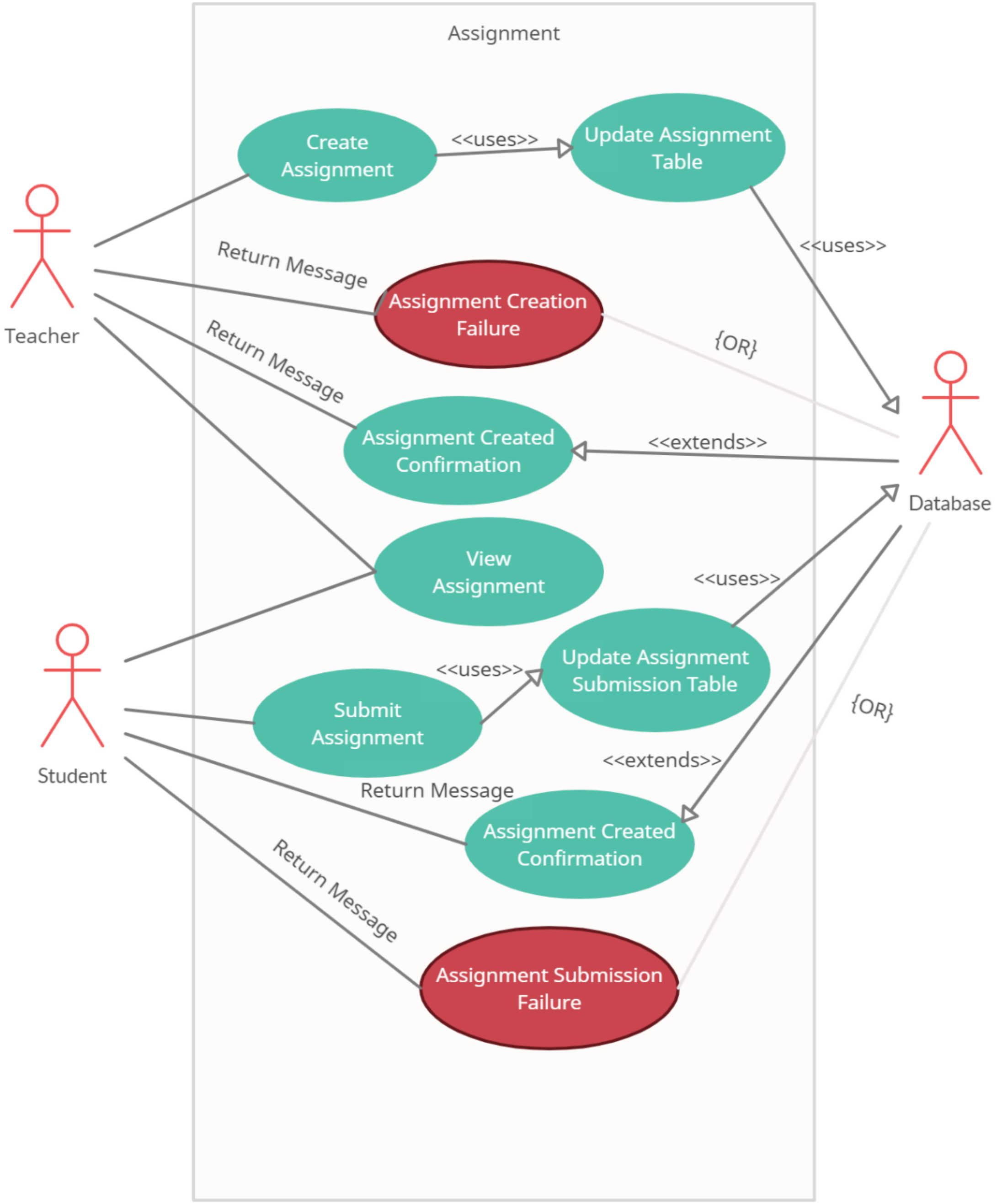


Figure 3.5 Assignment Use Case Diagram

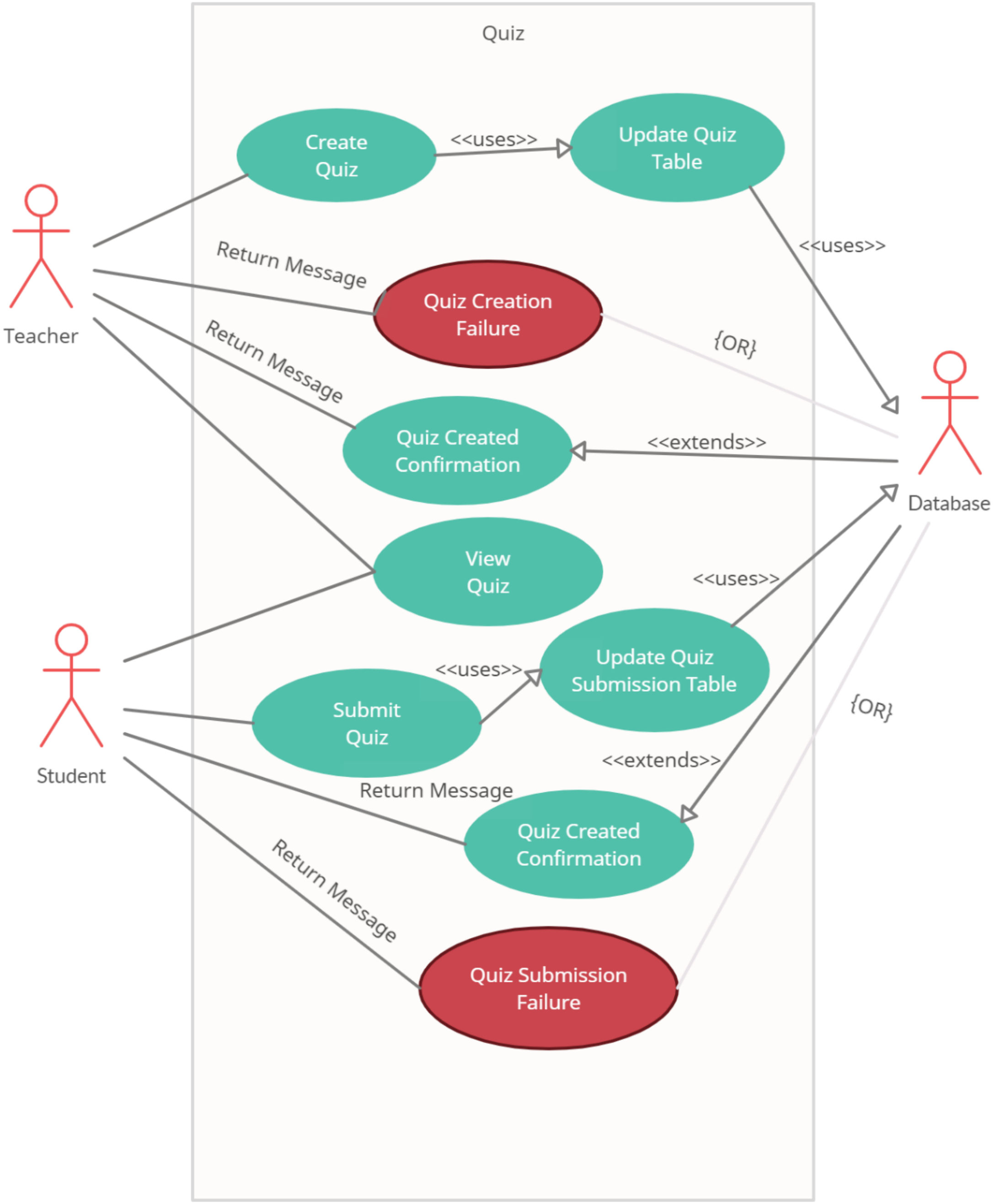


Figure 3.6 Quiz Use Case Diagram

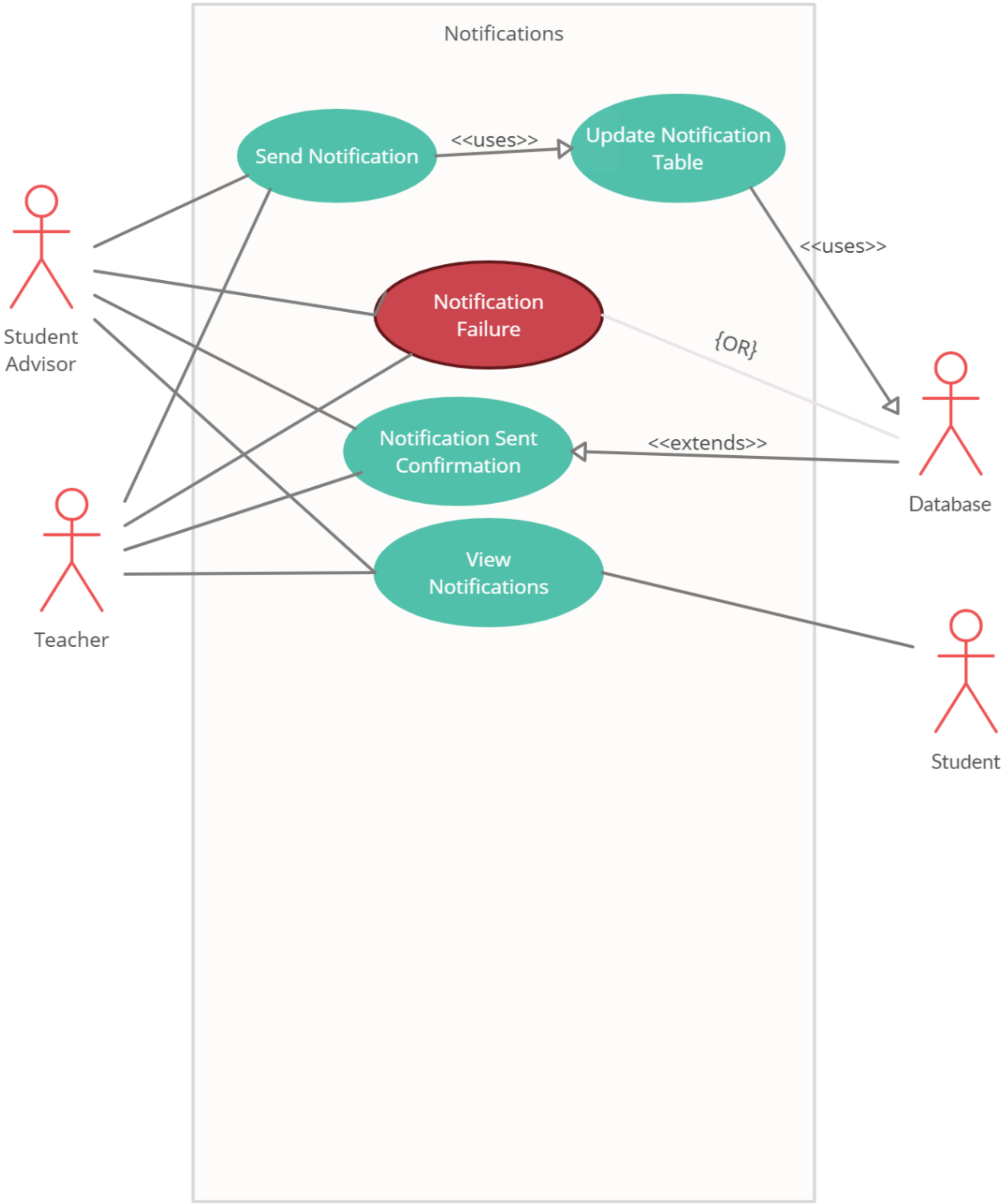


Figure 3.7 Notification Use Case Diagram

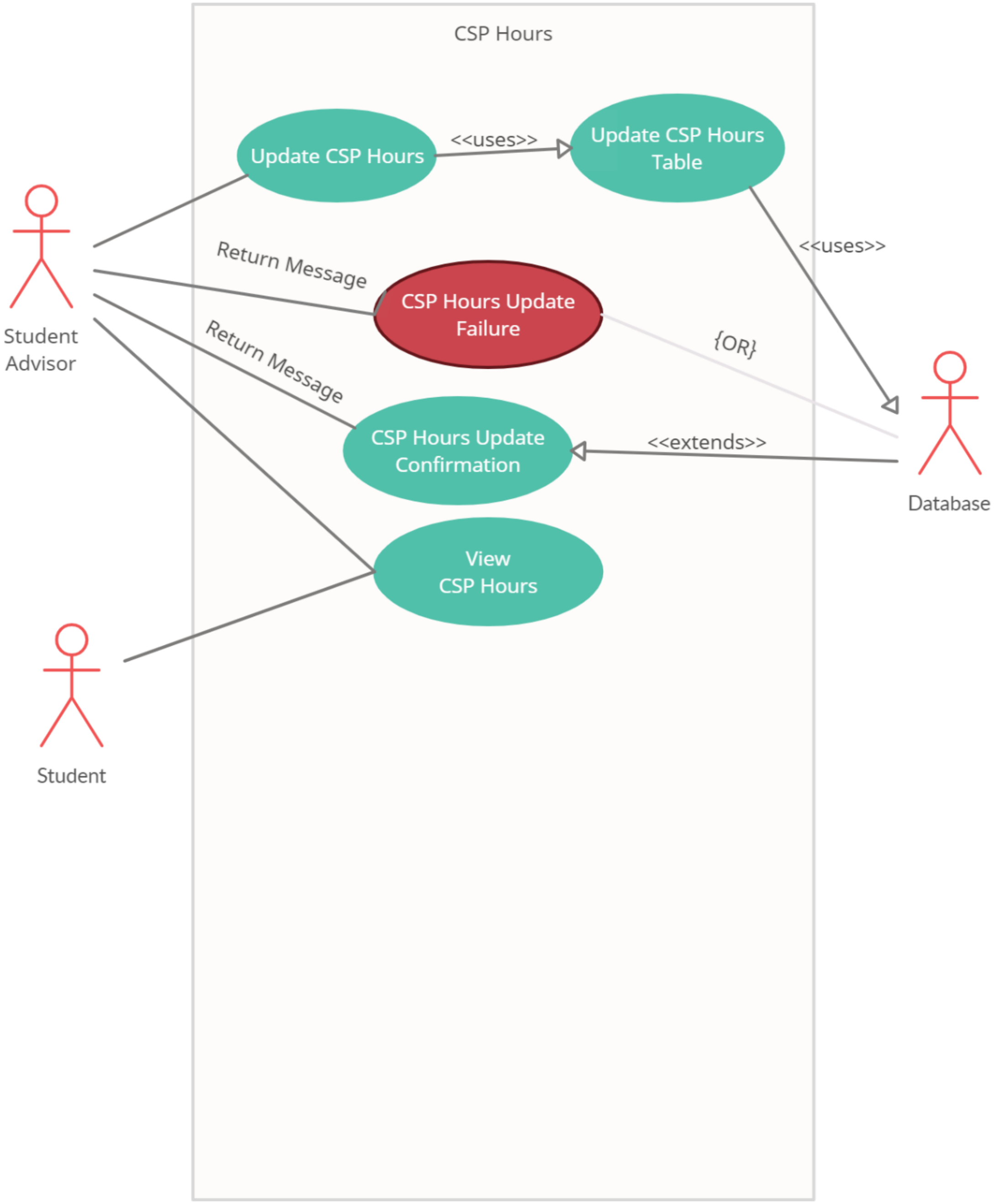


Figure 3.8 CSP Hours Use Case Diagram

1. Use Case Prioritization

The use cases for the project have been prioritized keeping in mind the following metrics:

- Functional Requirements
- Risk
- Development Effort
- Application Stability

Priority	Description
High	• Part of the functional requirements • Affects the entire application flow • Flow for other functional requirement(s) will break if use case fails
Medium	• Part of the functional requirements • Flow for any other functional requirement will not break if use case fails
Low	• Not part of the functional requirements • Flow for any functional requirement will not break if use case fails

2. Use Case Description Tables

Name	Login
ID	UCL01
Priority	High
Primary Actor	Student / Teacher / Student Advisor
Description	This use case describes the login flow. Every user should be able to log in to the system with valid credentials.
Basic Flow	User will go to the login screen User will enter credentials User will be logged in
Alternate Flow	Invalid credentials entered User will be prompted with error message
Pre-condition	Login screen should be open Internet should be connected
Steps	**Actor Actions:** Step 1: User will enter email Step 2: User will enter password Step 3: User will tap on the Log in button **System Response:** Step 4: System will check if the credentials are valid Step 5: User will be directed to home screen
Post-condition	Home screen will be displayed

Table 3.9 Login Use Case Description

Name	Log out
ID	UCL02
Priority	Low
Primary Actor	Student / Teacher / Student Advisor
Description	This use case describes the logout flow. Every user should be able to log out from the system.
Basic Flow	User will open the profile menu User will select the log out option User will be logged out
Pre-condition	User should be logged in
Steps	**Actor Actions:** Step 1: User will open the profile menu Step 2: User will tap on the log out button Step 4: User will tap on confirm button **System Response:** Step 3: System will Prompt user with a confirmation popup Step 5: User will be directed to login screen
Post-condition	User will be logged out from the system

Table 3.10 Logout Use Case Description

Name	Change Password
ID	UCP01
Priority	Low
Primary Actor	Student / Teacher / Student Advisor
Description	This use case describes the change password flow. Every user should be able to change password from profile settings.
Basic Flow	User will go to the profile settings screen User will select change password option User will enter old password User will enter new password User will confirm new password Password will be changed successfully
Alternate Flow 2	Old Password is incorrect OR New passwords do not match System will show error message and password will not be changed
Pre-condition	User should be logged in Internet should be connected

Steps	**Actor Actions:** Step 1: User will open the profile menu Step 2: User will tap on the profile settings button Step 3: User will tap on the change password button Step 4: User will enter old password Step 5: User will enter new password Step 6: User will confirm new password Step 7: User will tap on the confirmation button **System Response:** Step 8: System will check if the credentials are valid Step 9: System will update the password in the system Step 10: System will prompt the user with a confirmation message
Post-condition	Password will be changed successfully

Table 3.11 Change Password Use Case Description

Name	User Registration
ID	UCR01
Priority	High
Primary Actor	Super Admin / Student Advisor
Description	This use case describes the user registration flow. Super Admin should be able to register a new SA. SA should be able to register new Student or Teacher user in the system.
Basic Flow	Actor will go to the user registration Actor will enter the required information New user will be registered successfully
Alternate Flow	User already exists System will prompt the Actor with error message New user will not be created
Pre-condition	Student Advisor should be logged in Internet should be connected
Steps	**Actor Actions:** Step 1: User will choose the Create User option Step 2: User will enter the required information Step 3: User will choose the confirmation option **System Response:** Step 4: System will check if the credentials are valid Step 5: New user will be registered successfully into the system Step 6: System will prompt the user with a confirmation message
Post-condition	New user is registered successfully

Table 3.12 User Registration Use Case Description

Name	Update User Profile
ID	UCUP01
Priority	Medium
Primary Actor	Student / Teacher / Student Advisor
Description	This use case describes the update profile flow. Users should be able to update their own profile password and picture.
Basic Flow	User will go to the update profile screen User will update the information System will update information successfully
Alternate Flow	Profile picture is too large OR Password does not match the required format System will show error message
Pre-condition	User should be logged in Internet should be connected
Steps	**Actor Actions:** Step 1: User will select the update profile option Step 2: User will enter updated profile information Step 3: User will choose the confirmation option **System Response:** Step 4: System will check if the information is valid Step 5: User information will be updated in the system
Post-condition	Information will be updated successfully

Table 3.13 Update Profile Use Case Description

Name	Update User Profile – SA
ID	UCUP02
Priority	Low
Primary Actor	Student Advisor
Description	This use case describes the update profile by student advisor flow. Student Advisor should be able to update any user's profile information
Basic Flow	User will go to the update profile screen User will update the information System will update information successfully
Alternate Flow	User does not exist OR Invalid credentials entered System will prompt with error message
Pre-condition	Student Advisor user should be logged in Internet should be connected
Steps	**Actor Actions:** Step 1: Actor will view the user Step 2: Actor will choose the edit user option Step 3: Actor will enter updated information Step 4: Actor will choose the confirmation option **System Response:** Step 5: System will check if the information is valid Step 6: User information will be updated in the system
Post-condition	Information will be updated successfully

Table 3.14 Update Profile SA Use Case Description

Name	Messaging
ID	UCM01
Priority	Medium
Primary Actor	Student / Teacher / Student Advisor
Description	This use case describes the messaging flow. Users should be able to send and receive messages through the system.
Basic Flow	User1 will go to the messaging option User1 will send message to User2 Message will be sent and received successfully
Pre-condition	User1 should be logged in Internet should be connected
Steps	**Actor Actions:** Step 1: User1 will select the message option Step 2: User1 will select User2 Step 3: User1 will type message Step 4: User1 will send message Step 6: User2 will log in Step 7: User2 will select the message option Step 8: User2 will view the received message **System Response:** Step 5: System will send message to User2
Post-condition	Message will be sent and received successfully

Table 3.15 Messaging Use Case Description

Name	Send Notification
ID	UCN01
Priority	Medium
Primary Actor	Teacher / Student Advisor
Description	This use case describes the send notification flow. Teacher and student advisor users should be able to create and send a notification to all users in the system.
Basic Flow	User will go to the create notification screen User will create and send notification Notification will be sent successfully
Pre-condition	Teacher or Student Advisor user should be logged in Internet should be connected
Steps	**Actor Actions:** Step 1: User will select the create notification option Step 2: User will create a notification and select Send option **System Response:** Step 3: Notification will be sent to the specified users Step 4: User will be prompted with a confirmation message
Post-condition	Notification will be sent successfully

Table 3.16 Send Notification Use Case Description

Name	Receive Notification
ID	UCN02
Priority	Medium
Primary Actor	Student / Teacher / Student Advisor
Description	This use case describes the receive notification flow. All users should be able to receive a notification.
Basic Flow	User1 will send a notification User2 will log in Notification will be received successfully
Pre-condition	Teacher or Student Advisor user should be logged in as User1 Internet should be connected
Steps	**Actor Actions:** Step 1: User1 will send notification Step 3: User2 will log in Step 4: User2 will choose the notification option Step 5: User2 will view notification **System Response:** Step 2: Notification will be sent to the specified users Step 6: Notification will be shown to the user
Post-condition	Notification will be received successfully

Table 3.17 Receive Notification Use Case Description

Name	Update CSP Hours
ID	UCCSP01
Priority	Medium
Primary Actor	Student Advisor
Description	This use case describes the update CSP hours flow. Student Advisor user should be able to view and update a Student user's CSP hours.
Basic Flow	User will go to the Student's profile User will Edit the profile User will update the CSP hours
Alternate Flow	Teacher or Student user is logged in Update CSP Hours options will not be available
Pre-condition	Student Advisor user should be logged in Internet should be connected
Steps	**Actor Actions:** Step 1: User will go to View Student Profile Step 2: User will edit student profile Step 3: User will enter updated CSP hours Step 4: User will choose the Save option **System Response:** Step 5: CSP hours will be updated, and user will be prompted with a confirmation message
Post-condition	CSP Hours will be updated in the system successfully

Table 3.18 Update CSP Hours Use Case Description

Name	View CSP Hours
ID	UCCSP02
Priority	Medium
Primary Actor	Student
Description	This use case describes the view CSP hours flow. Student should be able to view CSP hours in their profile.
Basic Flow	User will go to the CSP hours option User will view CSP hours
Pre-condition	Student user should be logged in Internet should be connected
Steps	**Actor Actions:** Step 1: User will go to View CSP hours screen **System Response:** Step 2: CSP hours will be displayed
Post-condition	CSP Hours will be displayed successfully

Table 3.19 View CSP Hours Use Case Description

Name	Create Course
ID	UCC01
Priority	High
Primary Actor	Student Advisor
Description	This use case describes the create course flow. Student Advisor user should be able to create a new course.
Basic Flow	User will go to the Create Course screen User will enter the required information Course will be created
Alternate Flow	Teacher or Student user is logged in Create Course option will not be available
Pre-condition	Student Advisor user should be logged in Internet should be connected
Steps	**Actor Actions:** Step 1: User will go to Create Course screen Step 2: User will enter the required information Step 3: User will choose the Save option **System Response:** Step 4: Course will be created, and user will be prompted with a confirmation message
Post-condition	Course will be created successfully

Table 3.20 Create Course Use Case Description

Name	Enroll Student to Course
ID	UCC02
Priority	Medium
Primary Actor	Student Advisor
Description	This use case describes the view course flow. Student advisor should be able to enroll students to a course
Basic Flow	User will go to the View Course User will enroll student Student will be enrolled
Pre-condition	Student Advisor user should be logged in Internet should be connected
Steps	**Actor Actions:** Step 1: User will go to View Course screen Step 3: User will select the Enroll Student option Step 4: User will enter the required information Step 5: User will choose the Save option **System Response:** Step 2: List of courses will be shown Step 6: Student will be enrolled to the course and user will be prompted with confirmation message
Post-condition	Student will be enrolled to the course successfully

Table 3.21 Enroll Student Use Case Description

Name	Create Attendance Schedule
ID	UCA01
Priority	Medium
Primary Actor	Student Advisor
Description	This use case describes the create attendance schedule flow. Student Advisor user should be able to create a new attendance schedule.
Basic Flow	User will go to the Create Attendance screen User will enter the required information Attendance schedule will be created
Pre-condition	Student Advisor user should be logged in Course should be created Internet should be connected
Steps	**Actor Actions:** Step 1: User will go to Create Attendance screen Step 2: User will enter the required information Step 3: User will choose the Save option **System Response:** Step 4: Attendance schedule will be created, and user will be prompted with a confirmation message
Post-condition	Attendance schedule will be created successfully

Table 3.22 Create Attendance Use Case Description

Name	Mark Attendance
ID	UCA02
Priority	Medium
Primary Actor	Teacher
Description	This use case describes the mark attendance schedule flow. Teacher user should be able to mark attendance from the system and save it.
Basic Flow	User will go to the mark attendance screen User will mark and post the attendance Attendance schedule will be marked and saved
Pre-condition	Teacher user should be logged in Attendance schedule should be created Internet should be connected
Steps	**Actor Actions:** Step 1: User will go to Mark Attendance screen Step 2: User will mark attendance Step 3: User will choose the Save option **System Response:** Step 4: Attendance will be saved, and user will be prompted with a confirmation message
Post-condition	Attendance will be marked and saved in the system successfully

Table 3.23 Mark Attendance Use Case Description

Name	Upload Assignment
ID	UCAS01
Priority	Medium
Primary Actor	Teacher
Description	This use case describes the upload assignment flow. User should be able to upload an assignment file to the system and set deadline for submission.
Basic Flow	User will go to the Create Assignment screen User will upload the file Assignment will be uploaded successfully
Pre-condition	Teacher user should be logged in Teacher should be registered to the course Internet should be connected
Steps	**Actor Actions:** Step 1: User will go to Create Assignment screen Step 2: User will upload the assignment file Step 3: User will fill the required information Step 4: User will choose the Save option **System Response:** Step 5: Assignment will be created, and user will be prompted with a confirmation message
Post-condition	Assignment will be created successfully

Table 3.24 Upload Assignment Use Case Description

Name	Upload Quiz
ID	UCQ01
Priority	Medium
Primary Actor	Teacher
Description	This use case describes the upload quiz flow. User should be able to upload a quiz file to the system and set deadline for submission.
Basic Flow	User will go to the Create Quiz screen User will upload file Quiz will be uploaded successfully
Pre-condition	Teacher user should be logged in Teacher should be registered to the course Internet should be connected
Steps	**Actor Actions:** Step 1: User will go to Create Quiz screen Step 2: User will upload the quiz file Step 3: User will fill the required information Step 4: User will choose the Save option **System Response:** Step 5: Quiz will be created, and user will be prompted with a confirmation message
Post-condition	Quiz will be created successfully

Table 3.25 Upload Quiz Use Case Description

Name	Submit Quiz
ID	UCQ02
Priority	Medium
Primary Actor	Student
Description	This use case describes the submit quiz flow. User should be able to view the uploaded quiz file and submit the quiz within the given deadline.
Basic Flow	User will go to the View Quiz screen User will view quiz file User will upload submission file Quiz will be submitted successfully
Alternate Flow	Deadline is exceeded Quiz submission will not be enabled User will not be able to submit the quiz
Pre-condition	Student user should be logged in Quiz should be uploaded by Teacher user Internet should be connected
Steps	**Actor Actions:** Step 1: User will go to View Quiz screen Step 2: User will download the quiz file (optional) Step 4: User will upload the submission file **System Response:** Step 3: Quiz file will be downloaded Step 5: Quiz will be submitted, and user will be prompted with confirmation
Post-condition	Quiz will be created successfully

Table 3.26 Submit Quiz Use Case Description

Name	Submit Assignment
ID	UCAS02
Priority	Medium
Primary Actor	Student
Description	This use case describes the submit assignment flow. User should be able to view the uploaded assignment file and submit the assignment within the given deadline.
Basic Flow	User will go to the View Assignment screen User will view assignment file User will upload submission file Assignment will be submitted successfully
Alternate Flow	Deadline is exceeded Assignment submission option will be disabled User will not be able to submit assignment
Pre-condition	Student user should be logged in Assignment should be uploaded by Teacher user Internet should be connected

Steps	**Actor Actions:** Step 1: User will go to View Assignment screen Step 2: User will download the assignment file (optional) Step 4: User will upload the submission file **System Response:** Step 3: Assignment file will be downloaded Step 5: Assignment will be submitted, and user will be prompted with confirmation
Post-condition	Assignment will be created successfully

Table 3.27 Submit Assignment Use Case Description

4. System Design

4.1. Introduction

A mobile app for university students or students in general where they can stay informed regarding their semester-wise and overall stats including attendance, internals, grading, important notifications, CSP hours and all other information which is generally scattered across various platforms and makes it very inconvenient to be tracked. We will be using React Native to develop the app.

4.2. System Architecture

The provided environment communicates the proposes system architecture as shown below in Fig. 4.1.

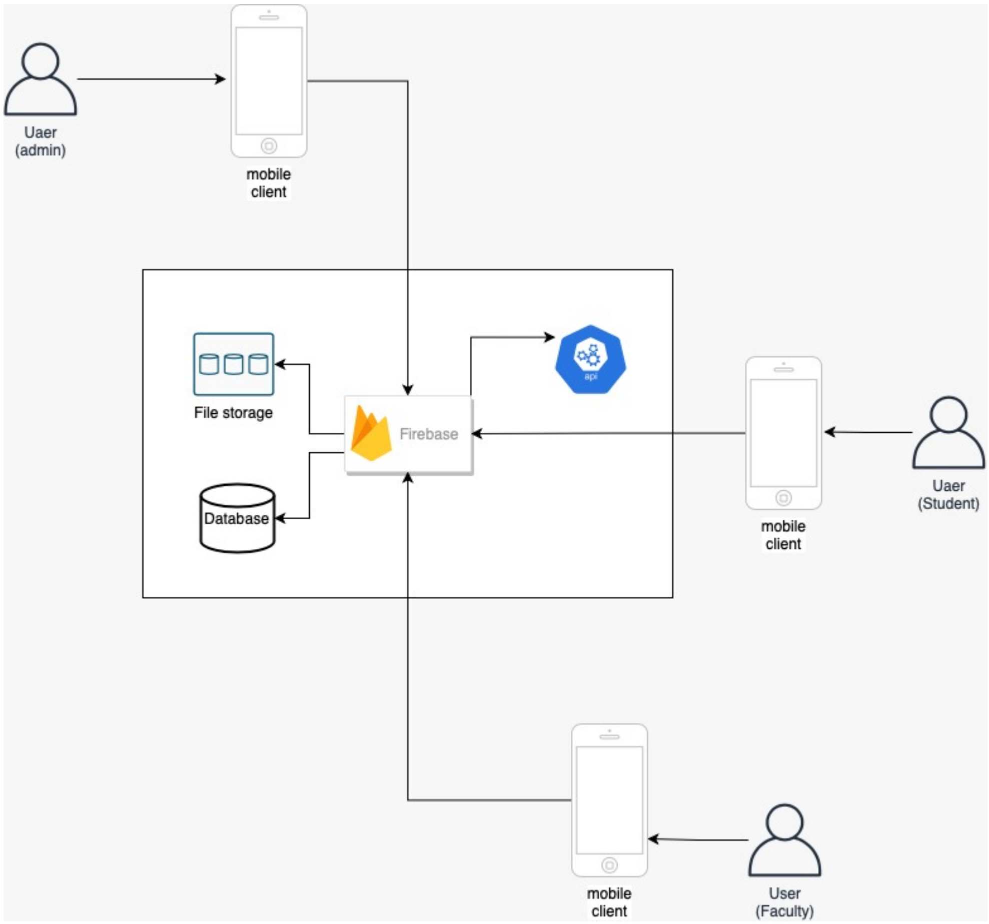


Figure 4.1 System Architecture

4.3. Sequence Diagrams

1. Login Sequence

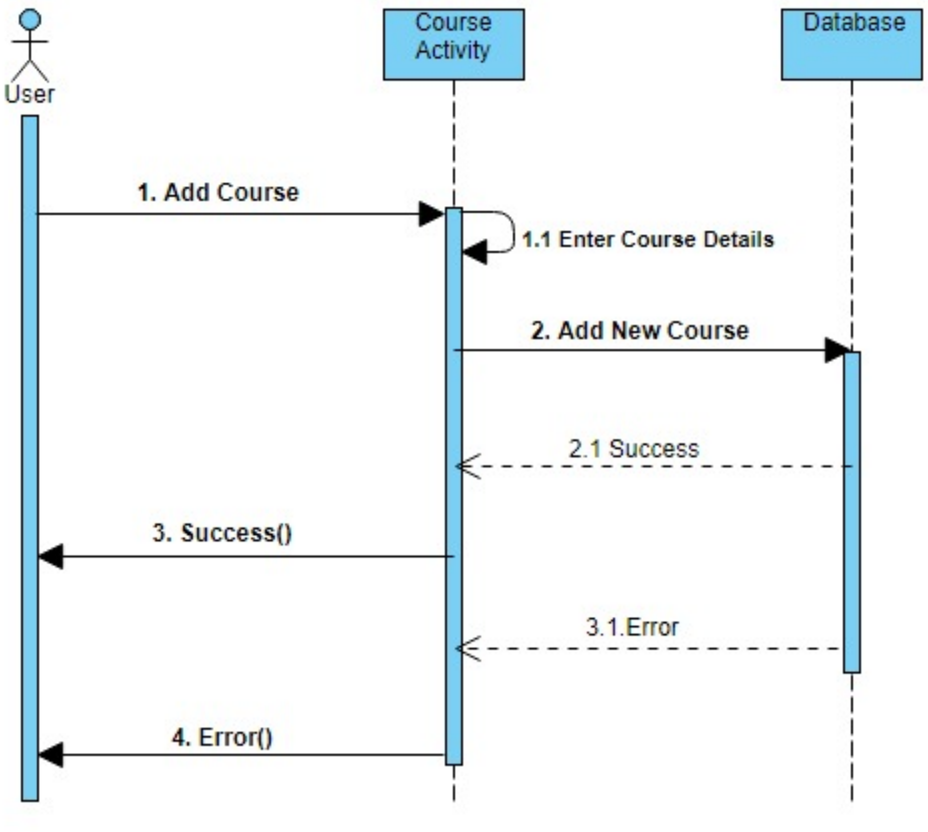


Figure 4.2 Login Sequence Diagram

If the entered credentials are correct, the login will be successful, and the user will proceed to the home screen. Otherwise, error message will be shown, and login will be unsuccessful.

2. Register Sequence

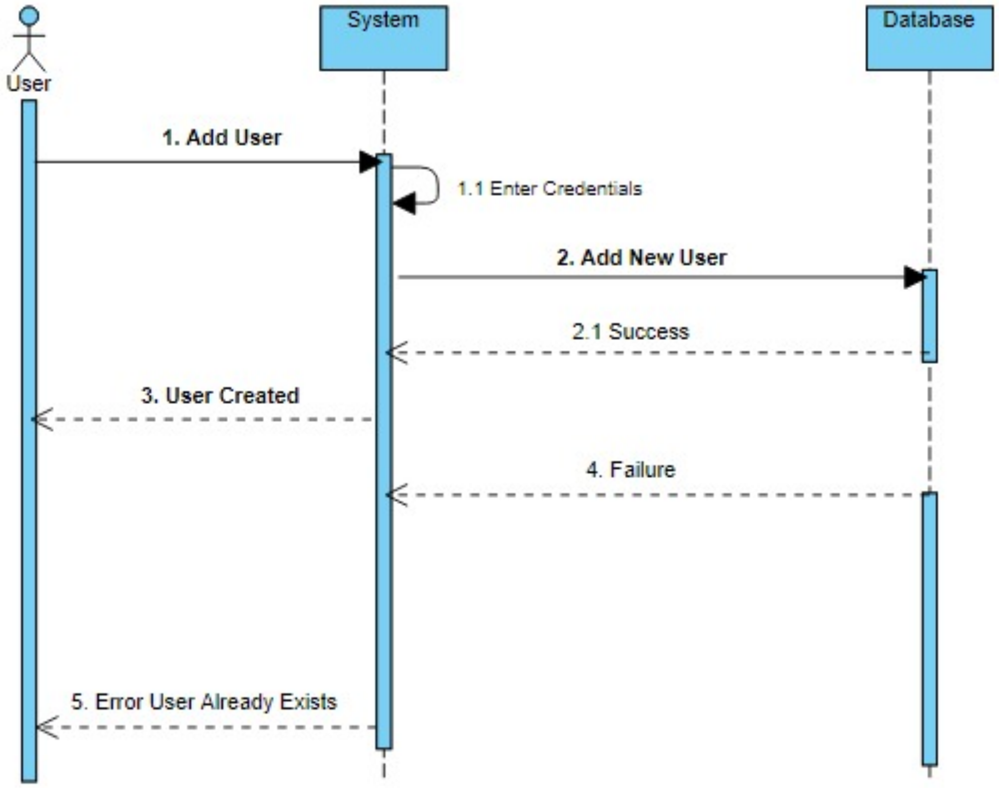


Figure 4.3 Register Sequence Diagram

Student Advisor registers users by adding unique email and a password. System checks if the user does not exist and email is unique, user is registered successfully, and confirmation message is shown. Otherwise, error message is shown.

3. Message Sequence

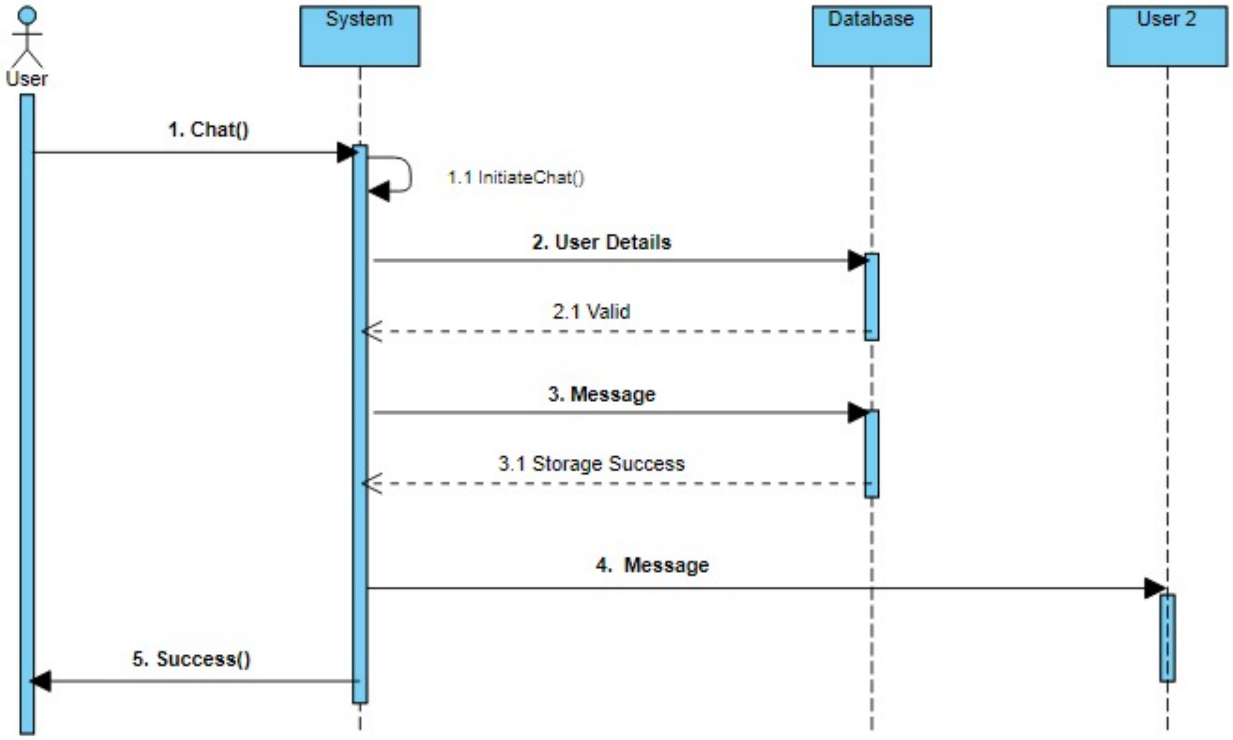


Figure 4.4 Message Sequence Diagram

Users can share messages with each other. If the User2 is found in the system, message is sent to the User2 and success message is shown to User. Message is also stored in the database.

4. Notification Sequence

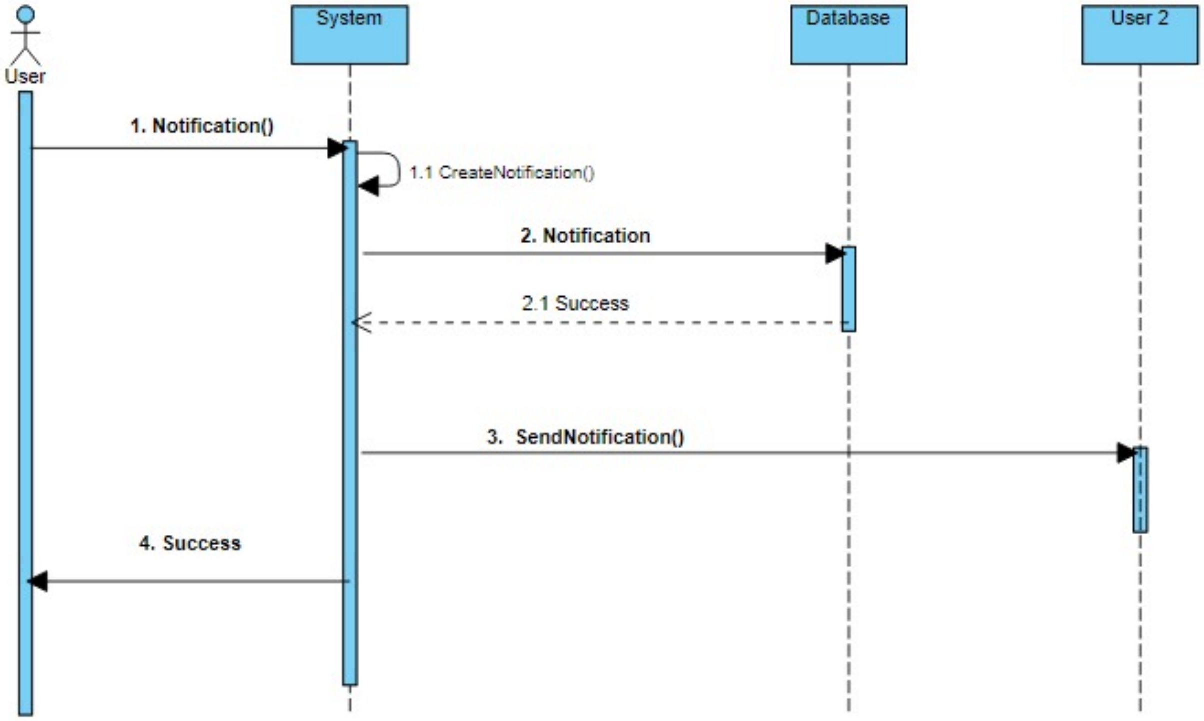


Figure 4.5 Notification Sequence Diagram

Student Advisor and Teacher users can create and send notifications to all users in the system. Notification is stored in database and then sent to all relevant users. Then a confirmation message is shown to the sender user.

5. Mark Attendance Sequence

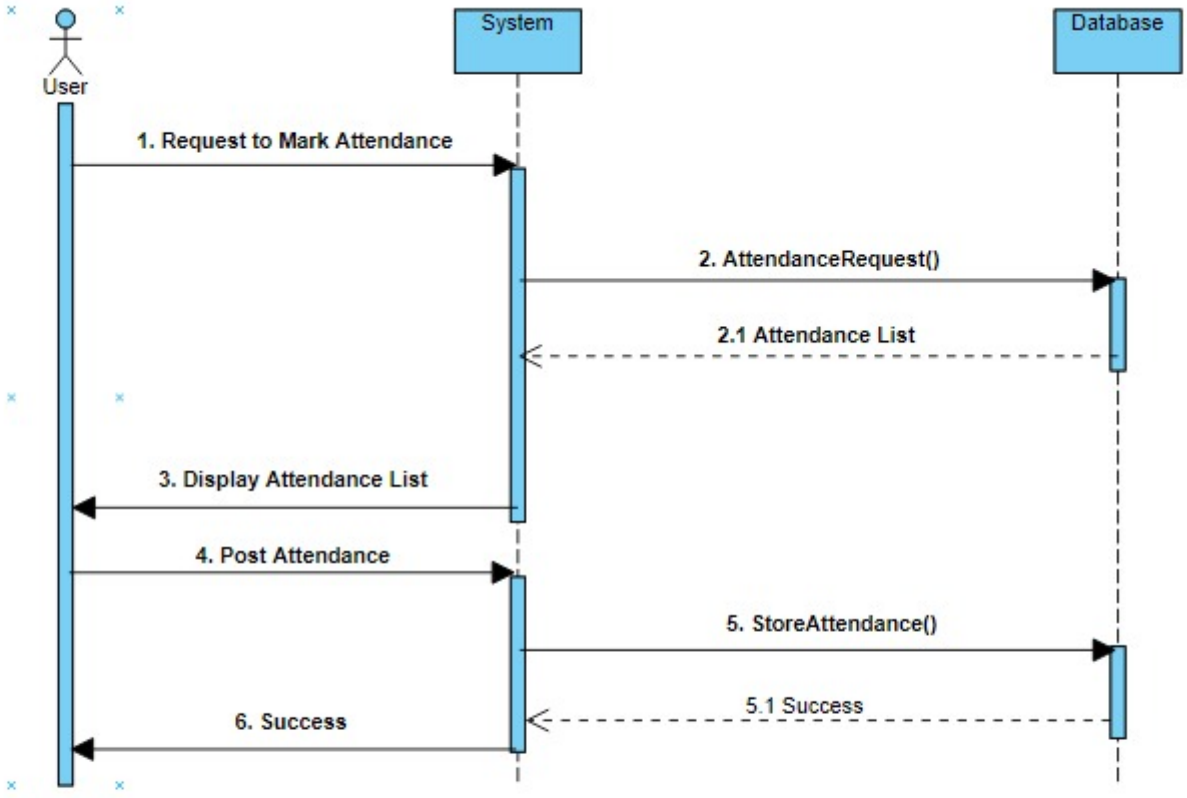


Figure 4.6 Mark Attendance Sequence Diagram

Teacher users can mark attendance in the system. The attendance request is sent to the system and list is fetched from database and shown to teacher. Teacher then marks attendance and sends post request. Attendance is stored in database and success message is shown.

6. View Attendance Sequence

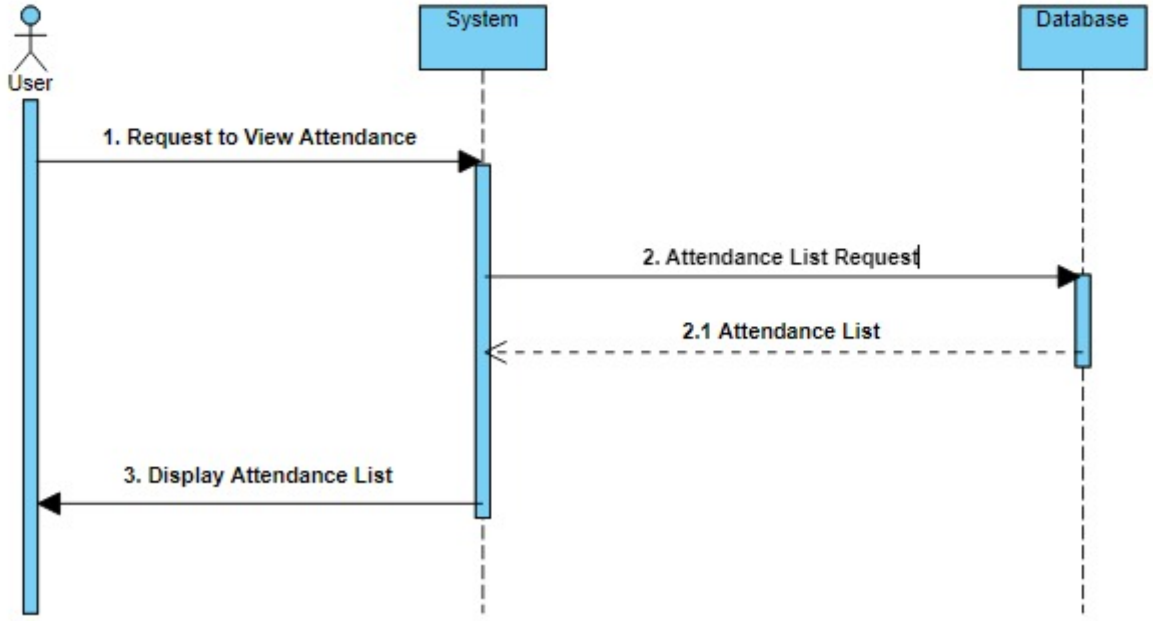

User
System
Database
1. Request to View Attendance
2. Attendance List Request
2.1 Attendance List
3. Display Attendance List

Figure 4.7 View Attendance Sequence Diagram

Students and Teachers can view marked attendance. Marked attendance list is fetched from database and shown to user.

7. Upload Assignment Sequence

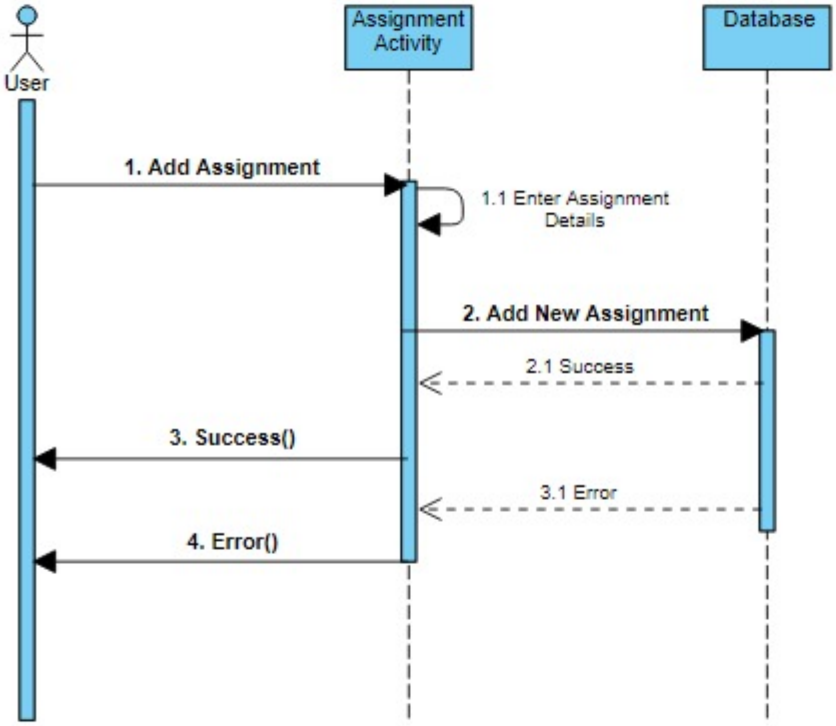


Figure 4.8 Upload Assignment Sequence Diagram

Teacher users can create assignments for their assigned courses in the system. When a new assignment is created and stored in database successfully, success message is shown. In case of error, the relevant error message is shown.

8. Submit Assignment Sequence

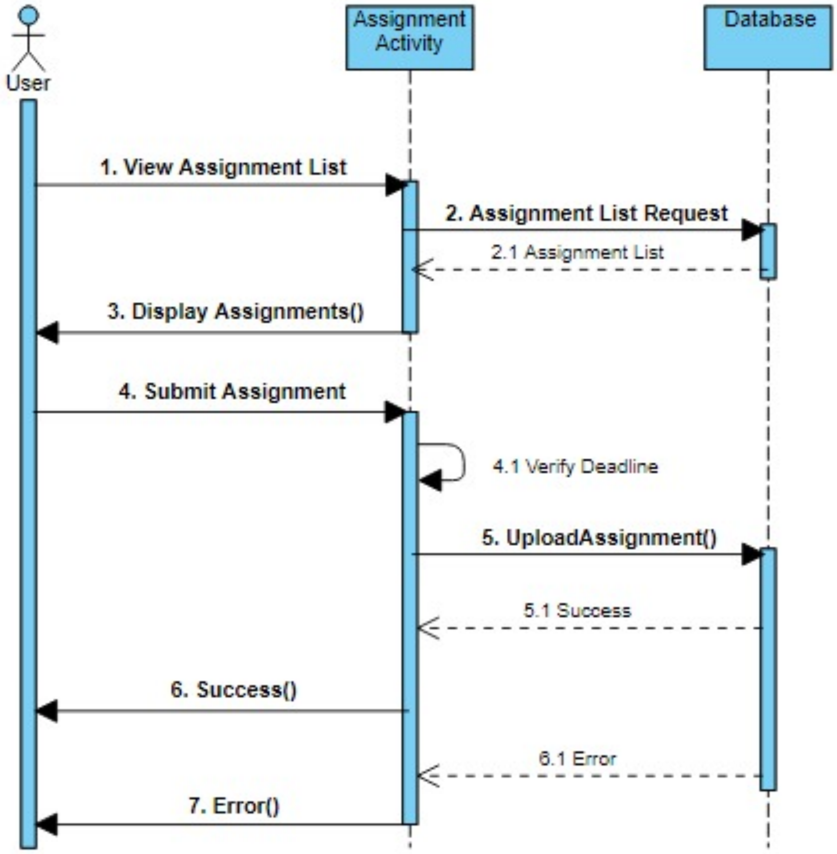


Figure 4.9 Submit Assignment Sequence Diagram

Student users can submit their assignments before the deadline is over. Assignment list is shown to the user and user submits the assignment file. Deadline is verified by the system and then assignment is stored in database. Success message is shown if the process is completed otherwise error message is shown.

9. Update Profile Sequence

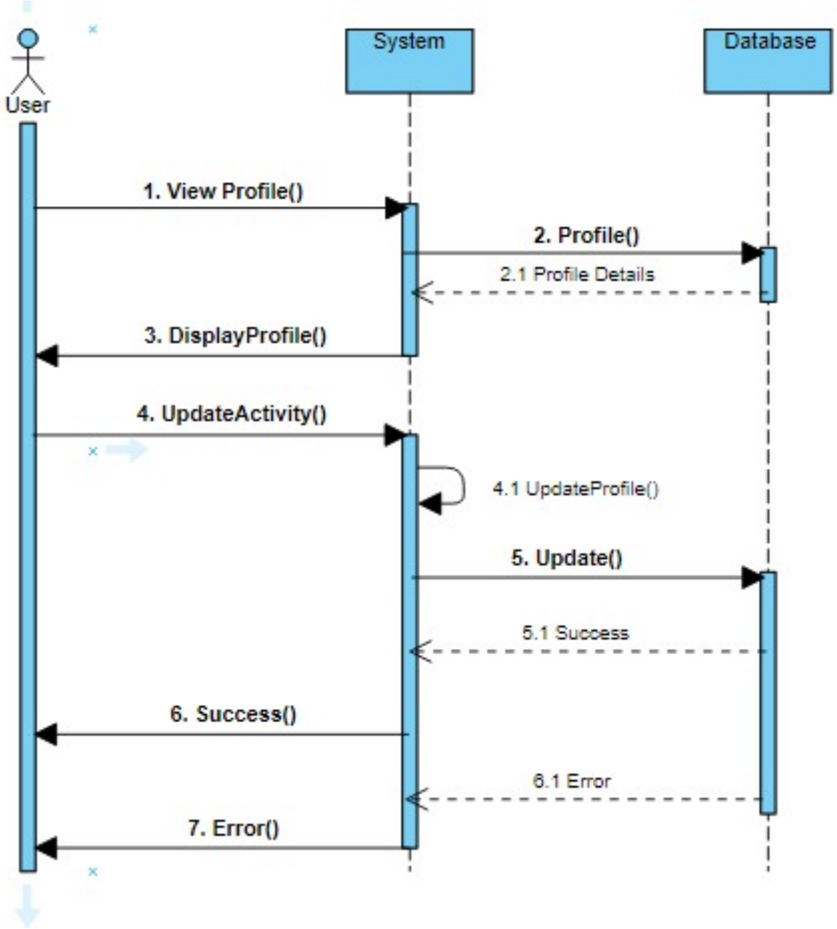


Figure 4.10 Update Profile Sequence Diagram

All users can update their profile in system. Profile is displayed and then the user updates profile. After update is done, success message is shown to user.

10. Update CSP Hours Sequence

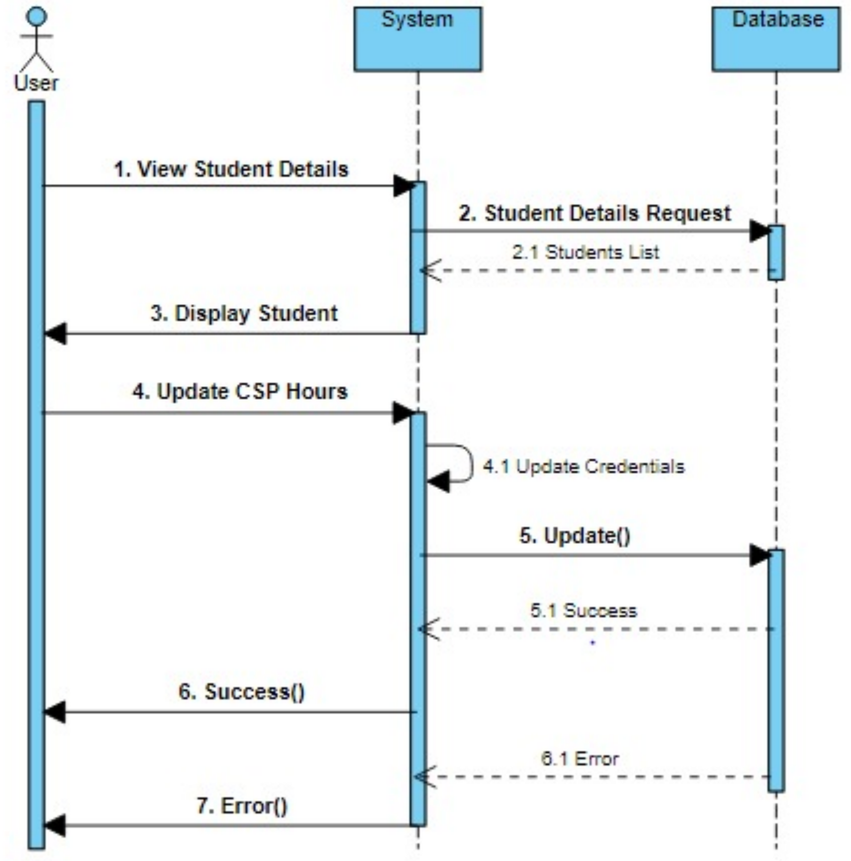


Figure 4.11 Update CSP Hours Sequence Diagram

Student Advisor users can update CSP hours for all student users in the system. User is displayed the student's details and from there the user can update CSP hours and save. After the updated hours are stored in database, success message is shown, else, error message is displayed.

11. Submit Quiz Sequence

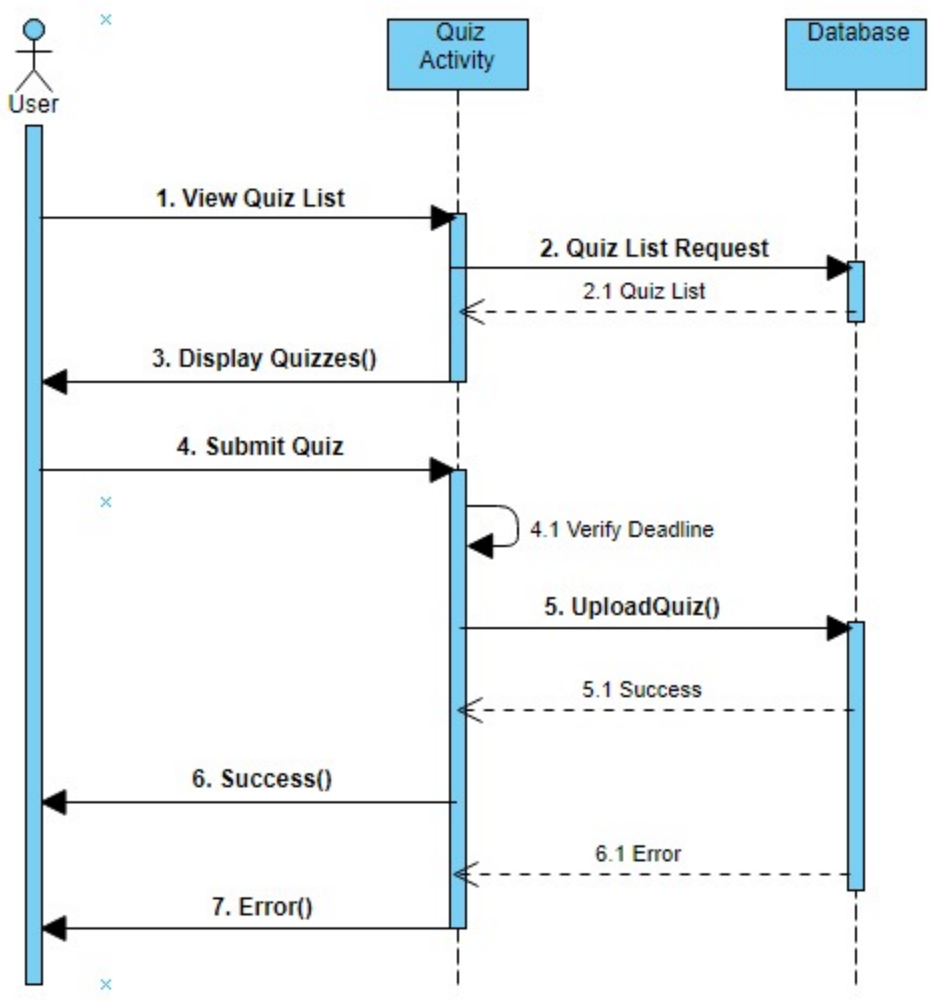


Figure 4.12 Submit Quiz Sequence Diagram

Student users can submit their quizzes before the deadline is over. Quiz list is shown to the user and user submits the quiz file. Deadline is verified by the system and then quiz is stored in database. Success message is shown if the process is completed otherwise error message is shown.

12. Add Course Sequence

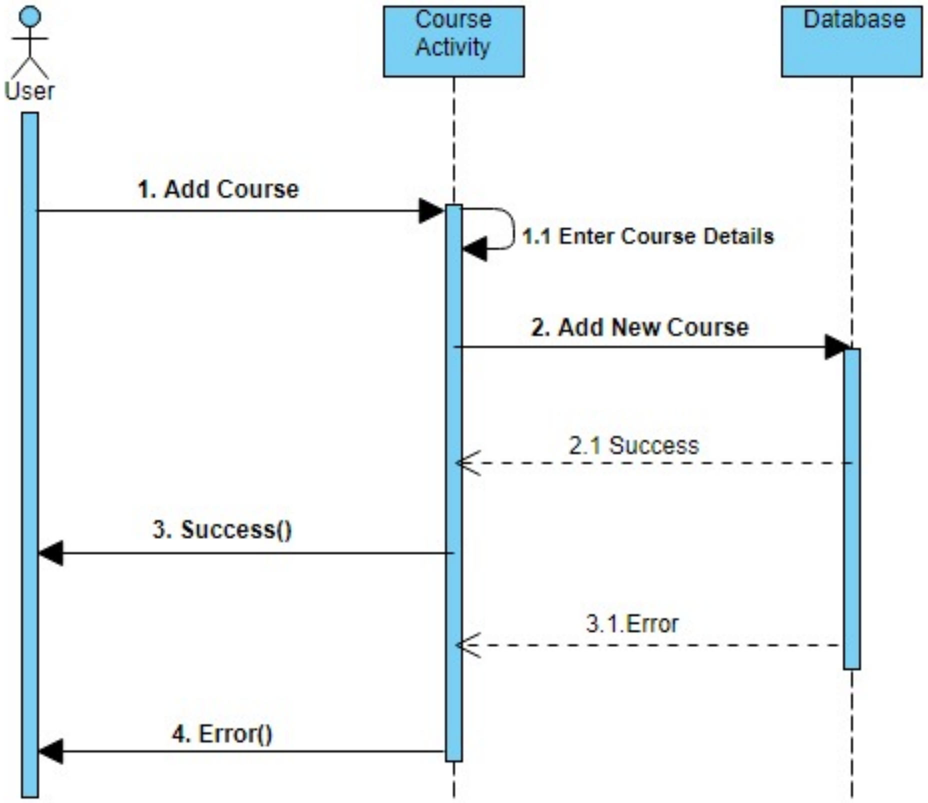


Figure 4.13 Create Course Sequence Diagram

Student Advisor can add a course in the system. User enters the required information, and the system adds the new course to the database. If the course is added, success message is shown. Otherwise, relevant error message is displayed.

4.4. Activity Diagram

Activity diagram is another important diagram in UML to describe the dynamic aspects of the system. Activity diagram is basically a flowchart to represent the flow from one activity to another activity. The activity diagram of our project is given below:

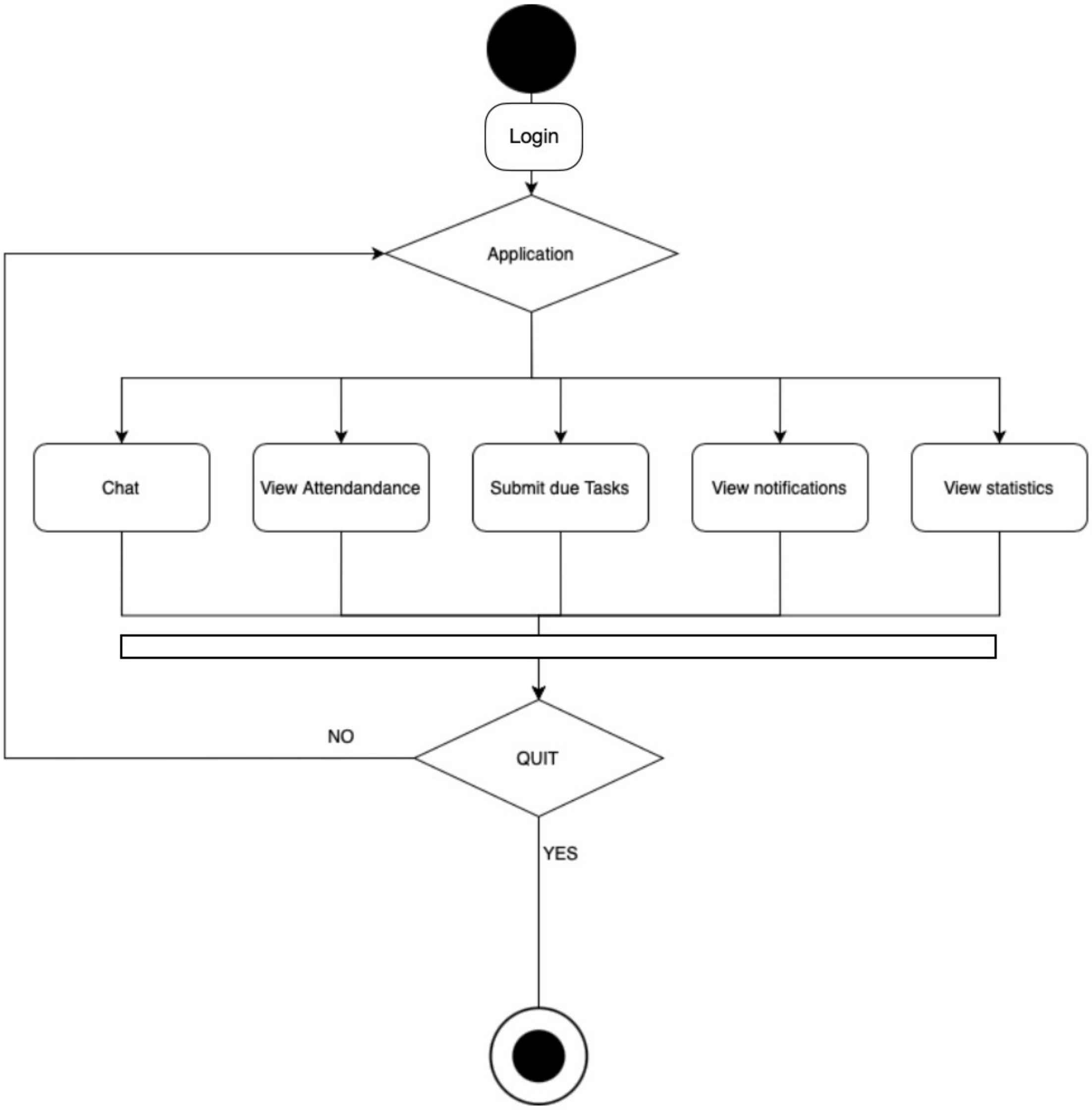


Figure 4.14 Activity Diagram

5. System Implementation

This is the process which defines how the system should be built, making sure that the system is fully functional and meets the quality standards.

5.1. System Architecture

The system based on the 3-tier architecture.

- Data Layer
- Business Layer
- Presentation Layer

1. Advantages of the 3-tier Architecture

- System layers can be updated and modified independently
- Different teams can work on different aspects of the application
- More secure in nature, as the end user is interacting with presentation layer, which then interacts with the business layer, keeping the data layer secure

5.2. Mobile Application Modules

The application has been divided into three modules, one for each user:

1. Student Advisor Module
2. Teacher Module
3. Student Module

5.3. System Internal Components

1. Register

Student Advisor will register each users' accounts and the registered user will be granted a unique login ID and password.

2. Login

Users will be able to log in after their accounts are registered. System will authenticate the login ID and password to grant access.

5.4. Student Advisor Module

1. Home Screen

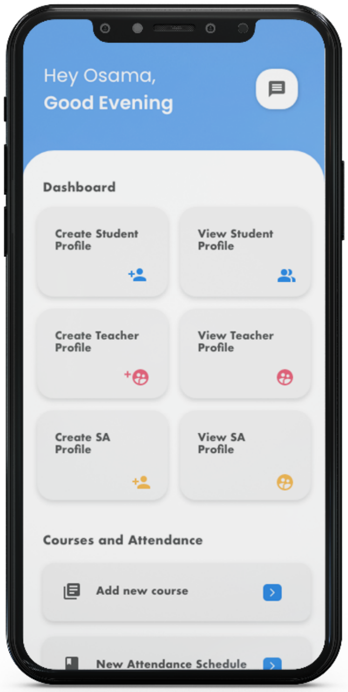


Figure 5.1 SA - Home Screen

This is the Student Advisor’s home screen.

2. Signup Screens

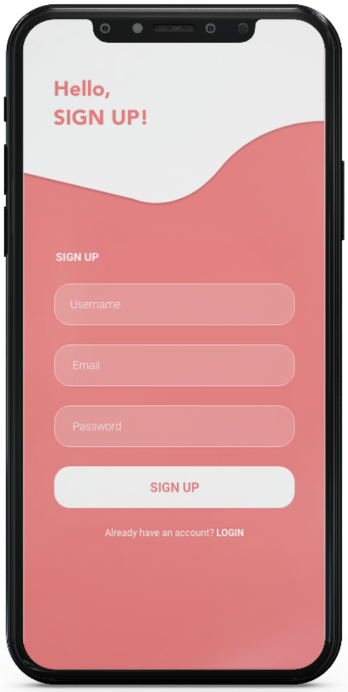
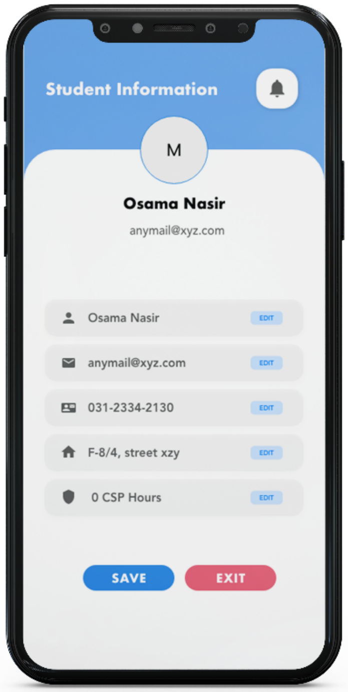


Figure 5.2 Signup 1

This is where a student advisor (super admin) can sign up.

3. Student Profile Screens


Student Information

M

Osama Nasir

anymail@xyz.com

Osama Nasir

anymail@xyz.com

031-2334-2130

F-8/4, street xzy

0 CSP Hours

Figure 5.3 View Student Profiles

Student advisor can view the student’s profile on this screen.

4. Send Notifications Screen

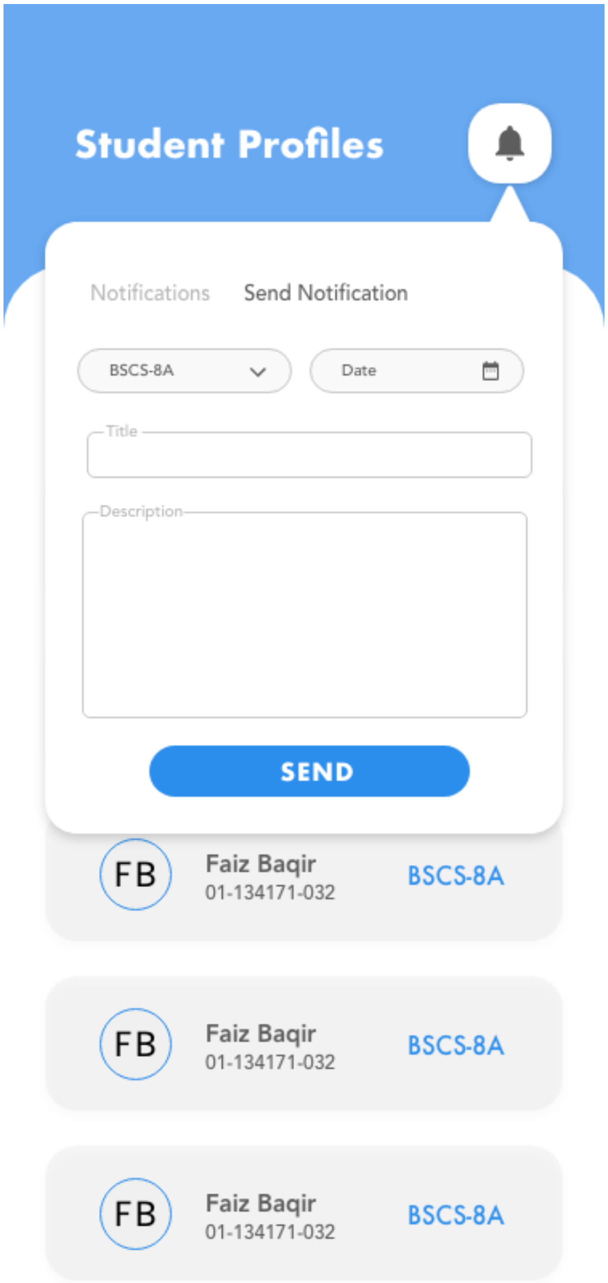


Figure 5.4 Send Notifications

Teacher and Student Advisor users will have this option to send a notification to users.

5. Create Teacher Screens

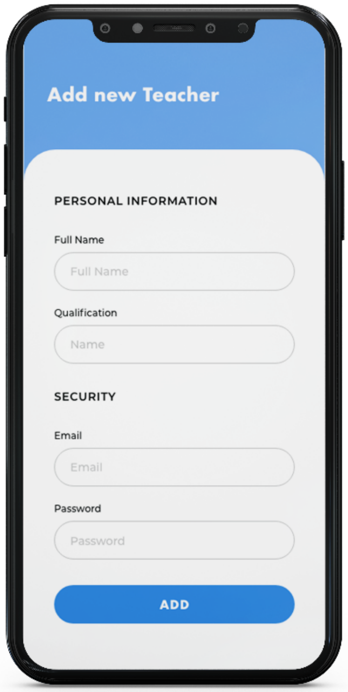
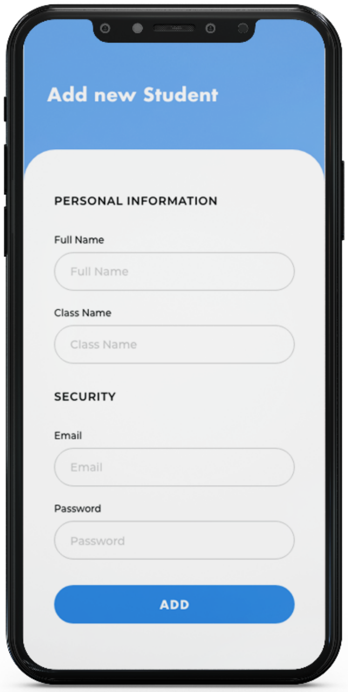


Figure 5.5 Create Teacher 1

Student Advisor can add a new teacher by providing the required information.

6. Create Student Screen



Add new Student

PERSONAL INFORMATION

Full Name

Full Name

Class Name

Class Name

SECURITY

Email

Email

Password

Password

Figure 5.6 Create Student

Student advisor can create a new student by entering a unique email ID.

5.5. Teacher Module

1. Login Screen

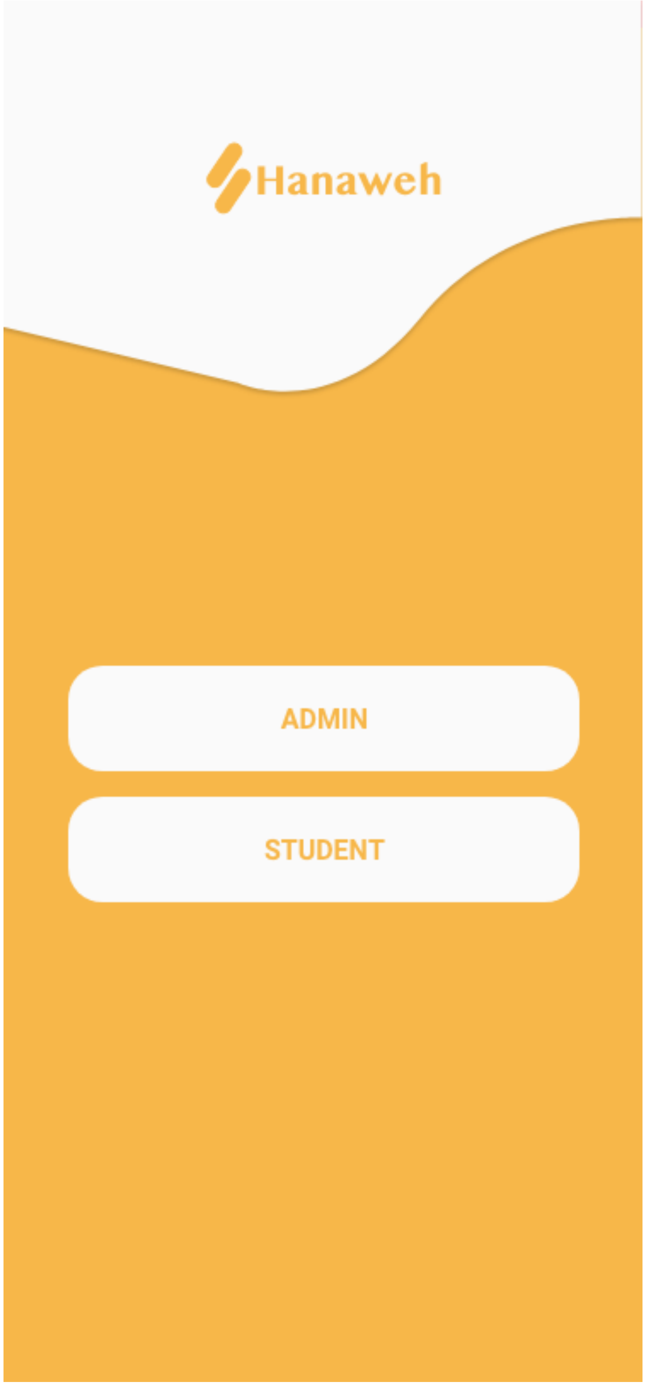


Figure 5.7 Login

This is the pre-login screen for all users. Student Advisor and Teacher will select Admin here whereas Students will select the student option.

2. Home Screen

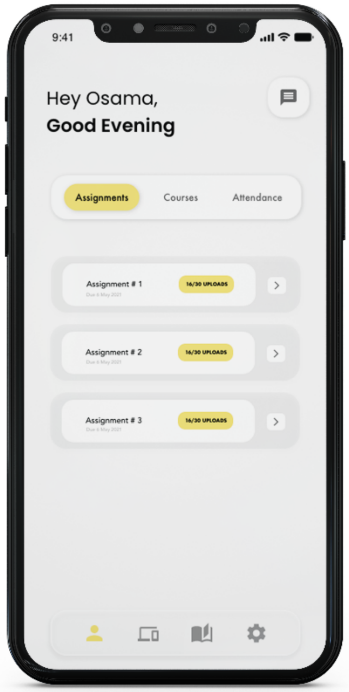
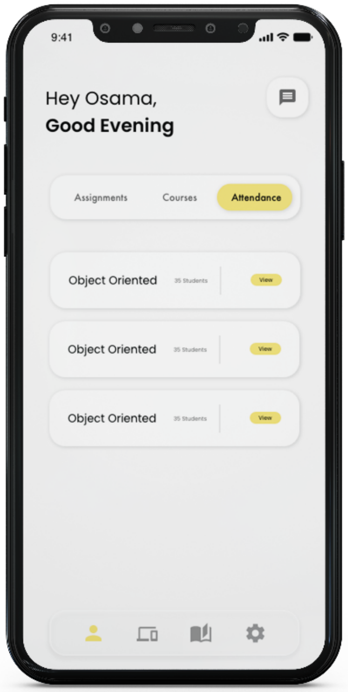


Figure 5.8 Teacher Home

This is the Teacher’s home screen.

3. Attendance Home Screen



Hey Osama,
Good Evening

Object Oriented 35 Students View

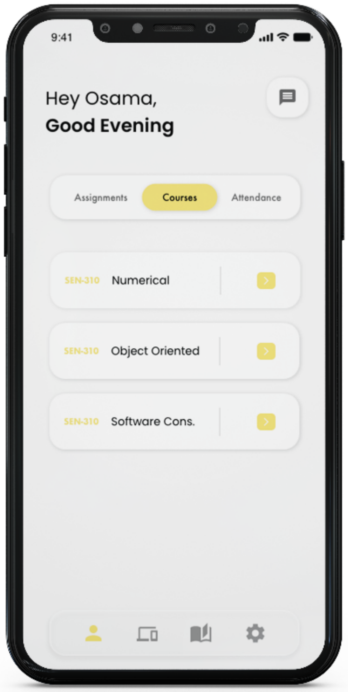
Object Oriented 35 Students View

Object Oriented 35 Students View

Figure 5.9 Attendance Home

This is the Teacher’s attendance screen. It will display all the attendance schedules created for the teacher by the student advisor.

4. Courses Home Screen



Hey Osama,
Good Evening

SEN-310 Numerical

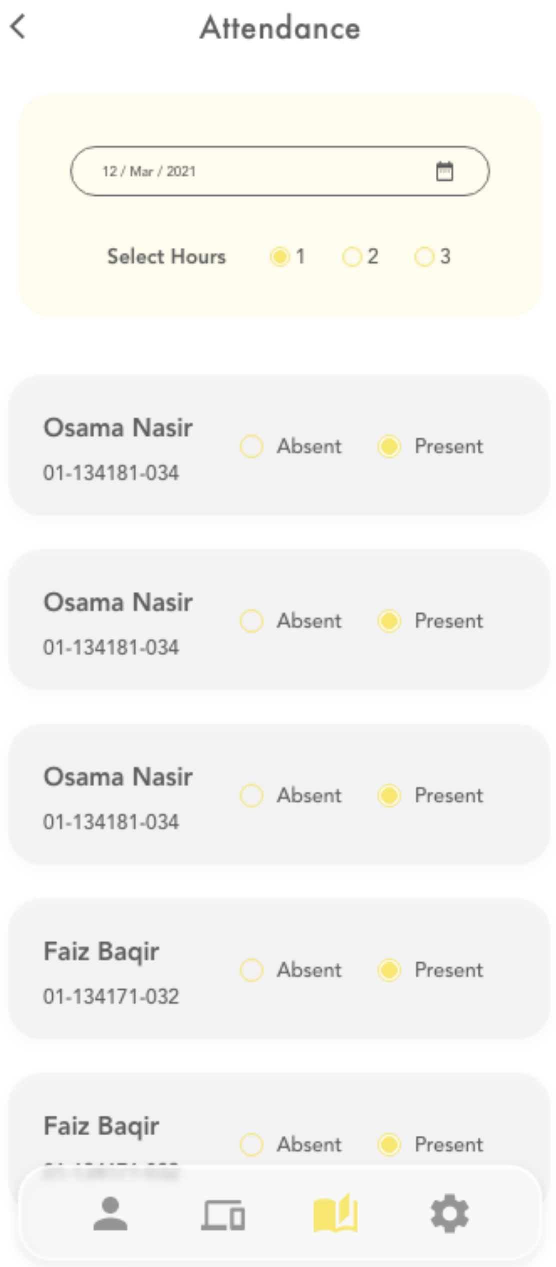
SEN-310 Object Oriented

SEN-310 Software Cons.

Figure 5.10 Courses Home

Teacher can view all assigned courses here.

5. Mark Attendance Screen



12 / Mar / 2021

Select Hours ● 1 ○ 2 ○ 3

Osama Nasir
01-134181-034 ○ Absent ● Present

Osama Nasir
01-134181-034 ○ Absent ● Present

Osama Nasir
01-134181-034 ○ Absent ● Present

Faiz Baqir
01-134171-032 ○ Absent ● Present

Faiz Baqir ○ Absent ● Present

Figure 5.11 Mark Attendance

Teacher can mark attendance here.

6. Messages Screen

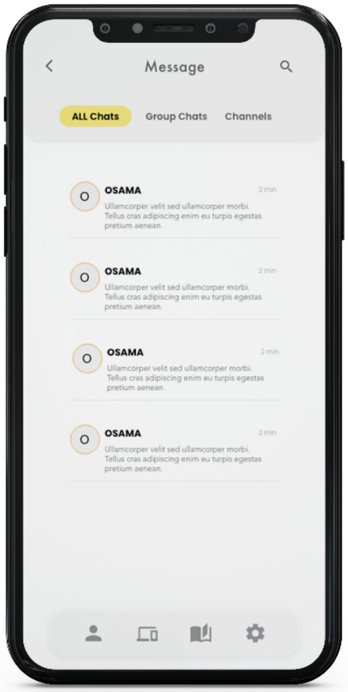


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Figure 5.12 Message - Teacher

This is where all messages will be shown.

7. Settings Screen

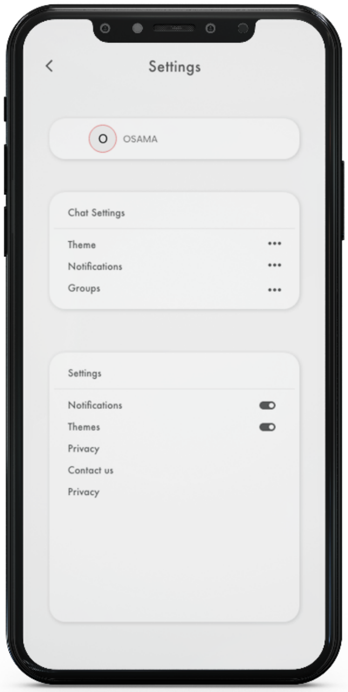
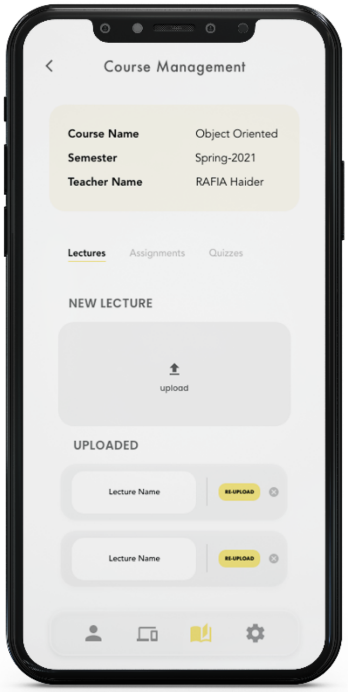


Figure 5.13 Settings

This is the settings screen with various options.

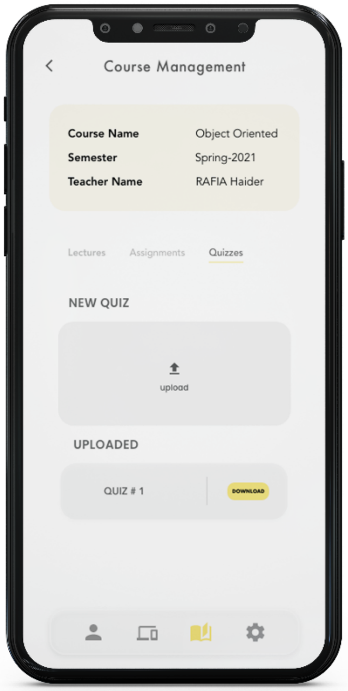
8. Course Management Screens



Course Management

Course Name	Object Oriented
Semester	Spring-2021
Teacher Name	RAFIA Haider

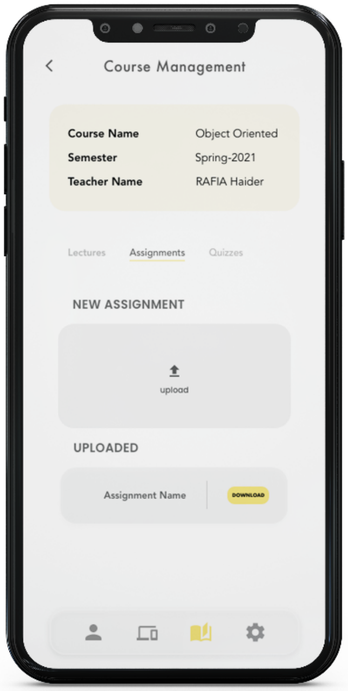
Figure 5.14 Course Management 1



Course Name	Object Oriented
Semester	Spring-2021
Teacher Name	RAFIA Haider

Figure 5.15 Course Management 2

On this screen, the teacher can upload a quiz for the course



Course Name	Object Oriented
Semester	Spring-2021
Teacher Name	RAFIA Haider

Figure 5.16 Course Management 3

On this screen, teacher can upload assignment for the course

5.6. Student Module

1. Login Screen

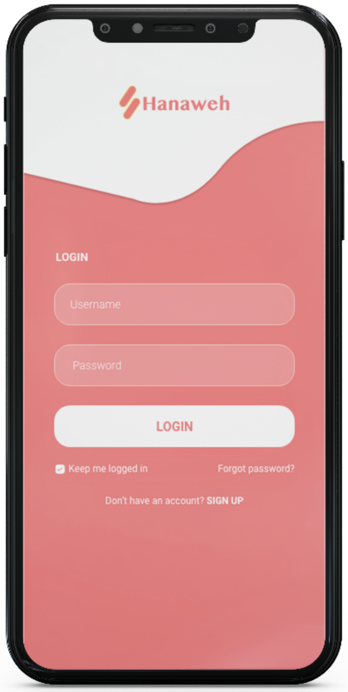


Figure 5.17 Login - Student

This is the main login screen for users.

2. Messages Screen

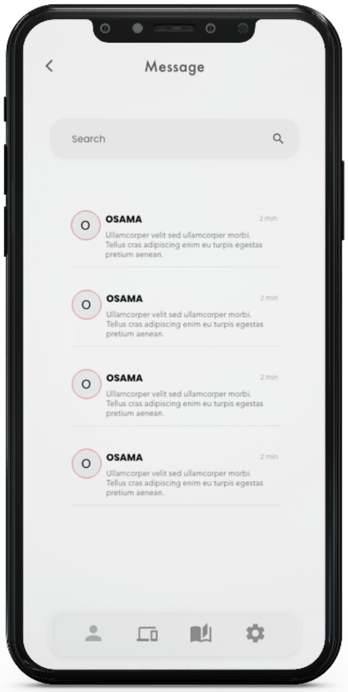


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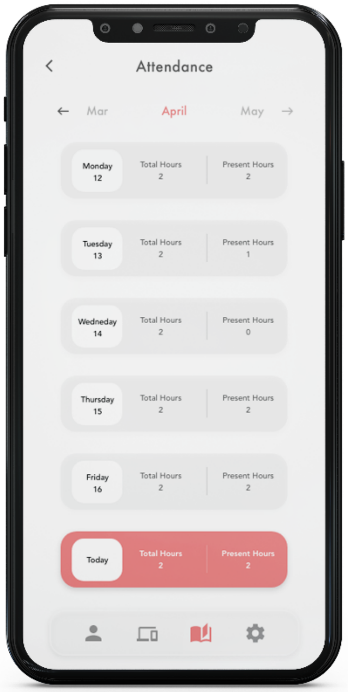
Figure 5.18 Messages – Student

3. Attendance Screens

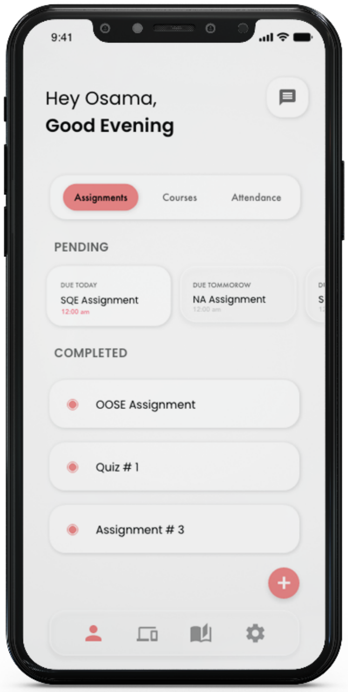


Monday 12	Total Hours 2	Present Hours 2
Tuesday 13	Total Hours 2	Present Hours 1
Wedneday 14	Total Hours 2	Present Hours 0
Thursday 15	Total Hours 2	Present Hours 2
Friday 16	Total Hours 2	Present Hours 2
Today	Total Hours 2	Present Hours 2

Figure 5.19 Attendance 1

Students can view the attendance hours here.

4. Assignment Screen



Hey Osama,
Good Evening

PENDING

DUE TODAY
SQE Assignment
12:00 am

DUE TOMMOROW
NA Assignment
12:00 am

COMPLETED

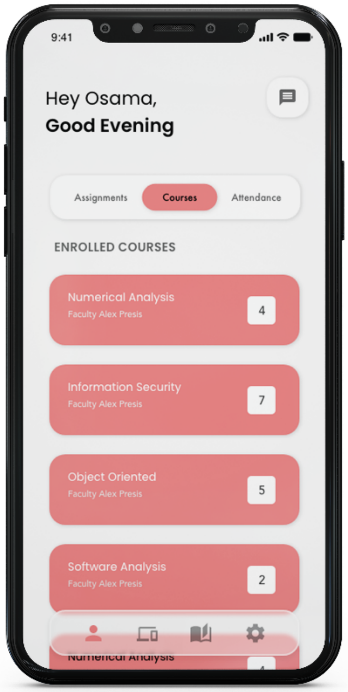
OOSE Assignment

Quiz # 1

Assignment # 3

Figure 5.20 Assignments

5. Course Screens



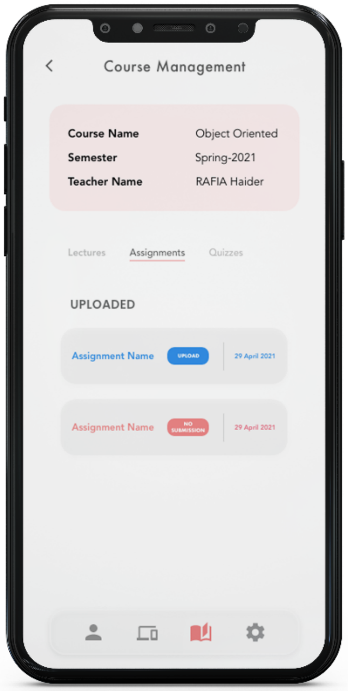
Hey Osama,
Good Evening

ENROLLED COURSES

Numerical Analysis Faculty Alex Presis	4
Information Security Faculty Alex Presis	7
Object Oriented Faculty Alex Presis	5
Software Analysis Faculty Alex Presis	2
Numerical Analysis	4

Figure 5.21 Courses 1

This screen shows all enrolled courses to the student.



Course Name	Object Oriented
Semester	Spring-2021
Teacher Name	RAFIA Haider

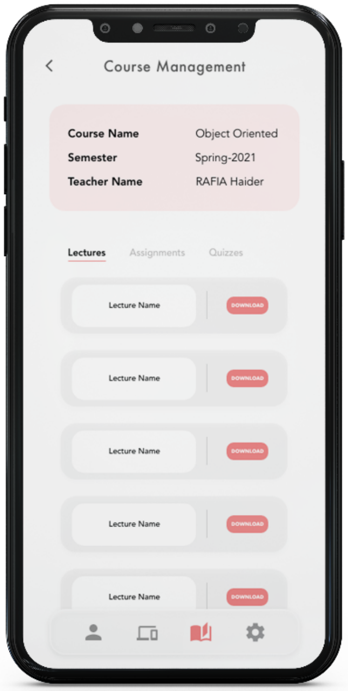
UPLOADED

Assignment Name UPLOAD 29 April 2021

Assignment Name NO SUBMISSION 29 April 2021

Figure 5.22 Courses 2

Student can view and upload assignment for the course here



Course Management

Course Name	Object Oriented
Semester	Spring-2021
Teacher Name	RAFIA Haider

Figure 5.23 Courses 3

Student can find lecture notes for the course here

6. Settings Screen

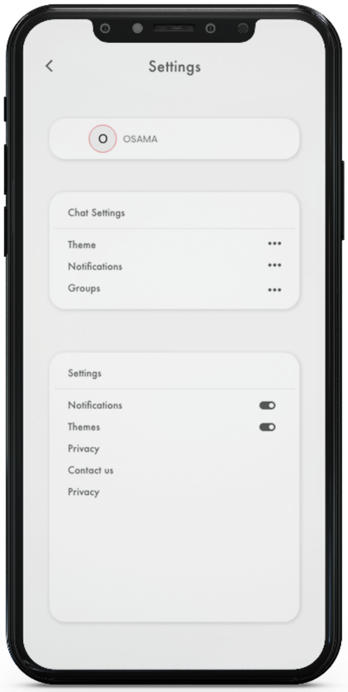


Figure 5.24 Student Settings

This is the student’s settings screen with multiple options.

6. System Testing and Evaluation

6.1. Introduction

The security aspects for applications are quite exiting to find out and need thorough testing cycles to be conducted. The best way to avoid any system vulnerabilities is to adopt the testing methodology in the early development cycle of the application. Testing can be defined as the running and evaluation of system with the purpose of finding vulnerabilities and errors.

Testing ensures the quality of any software and enhances its integrity by pointing out the flaws and errors in the system.

6.2. Testing Approaches

To test the application, different approaches were followed, and the test cases were designed accordingly. The following approaches will be described further in this chapter:

- Black box Testing
- GUI Testing
- Performance Testing
- Usability Testing
- Acceptance Testing

6.3. Black box testing

In this approach, the software is treated as a black box and it is not kept in consideration as to how the internals of the application behave.

We tested the application and validated inputs as per system requirements. The system's output was compared to the expected output to make sure that the requirements are met.

6.4. GUI Testing

Graphical User Interface (GUI) testing is done to check if the application is working fine or not. This is done by checking if the number of tasks performed meet the expected outcome or not.

We tested the system and interacted with all buttons, input fields and dialogs. We tested the application's interface components and passed the use cases by running multiple test cycles.

6.5. Performance Testing

The overall response time of the system is noted in this step.

We checked that the system response time was not slow, and the application's performance was meeting the quality standards.

6.6. Usability Testing

This approach helps in identifying the UI / UX related issues and design and user interface drawbacks in the system.

In this approach we performed the following:

- Checked if users were able to complete all tasks successfully
- Checked the completion time of a task
- Checked the satisfaction rate of users
- Evaluated application performance and matched it with our system requirements

6.7. Acceptance Testing

Finally in this phase, the main requirements of the system specified in the acceptance criteria were tested and after a complete evaluation, the application passed the testing phase.

7. Conclusion

7.1. Conclusions

The application brings all the vital information together in one platform and focuses on the UI / UX which has resulted in an exceptional satisfaction rate and motivated us to add more to this application in future.

It was learnt that Flutter has some development issues and React Native is a more suitable alternate for development and offers more powerful libraries and comes with numerous tutorials for quick learning.

7.2. Recommendations

There are more features which can be added to this application and it can cover not just universities but also other educational institutions like colleges and schools.

7.3. Learning Outcomes

From this final year project, the learning outcomes can be listed down as follows:

- Project planning needs to be as detailed and comprehensive as possible
- Deadlines should be set with a realistic approach
- Technology for development should be chosen while keeping cost-effectiveness and project scope in consideration
- Project deadlines should be met at any cost

The overall learning experience can be used to initiate and complete projects in IT firms.

7.4. Future Work

We will add more functionalities like facial recognition for attendance, to the application and publish the application to the Google Play Store and App Store. Our work on these applications will continue and we will also add more functionalities to cater the needs of other institutes so that the application can be used outside of the education sector as well.

References

[1] https://www.pta.gov.pk/en/telecom-indicators

[2] https://play.google.com/store/apps/details?id=com.nust.asadullahbaig.nust_notification_app&hl=en&gl=US&showAllReviews=true